Investigating the relationship between:

Urban Identity, Quality of Urban Life, and Urban Physical Form in Iranian new towns

Case study: Andisheh new town

By

Mahsa Derakhshan

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Dissertation Committee:

Supervisor:	Univ.-Prof. Dr. habil. Nguyen Xuan Thinh
Supervisor:	Univ.-Prof. Dr.-Ing. Sabine Baumgart
Chairperson:	Univ.-Prof. Dr.-Ing. Stefan Siedentop

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New Towns in Iran have been located, planned, and built near the big cities since early 1981 to attract the overflow population of metropolises and reduce the density of the mother cities. Andisheh is one of the Iranian new towns that was built in 1992 in a 30 kilometers distance from the metropolis of Tehran.

Despite the efforts of the planners and urban designers in locating new towns, and designing open spaces, squares, streets, parks, appropriate width of roadways, and residential complexes, new towns lack something. Their urban spaces are not attractive for their inhabitants, residents are not satisfied with the quality of the urban environment and they tend to leave new towns. Moreover, most of the new towns are faced with such problems as being a dormitory for their residents.

It is important to study the quality of urban life and urban identity related to physical form in urban areas such as new towns since urban physical form affects perceptual aspects of residents, so perceived quality of life, sense of belonging, and sense of place. Human perception and experience of their surrounding urban spaces and QOUL affect the behavior of residents. Urban identity is related to the identity of residents and also the identity of the city. The urban environment reflects its resident's needs and values and all of the residents are part of their cities, because, without citizens, the cities would not be what they are.

The present research investigates the relationship between the quality of urban life (QOUL), urban identity (UI), and urban physical form (UPF) in Andisheh new town focusing on density, housing, land use, layout, and accessibility.

This study includes descriptive, analytical, and explorative research, in which a mixed-method approach including the qualitative and quantitative methods – a case study approach and a quantitative descriptive method- is utilized. The methods used in this research are (1) the literature review and theoretical analysis, (2) questionnaire to survey the case study with a sample of 413 questionnaires filled by residents, (3) the qualitative method to obtain fundamental knowledge and to collect information through the interview with urban experts, (4) quantitative method, to collect numeric and statistical data and finally, (5) Space Syntax analysis, GIS, and statistical methods including SPSS using KMO and Bartlett's Test of Sphericity and CFA, and SEM (structural equation modeling) through AMOS.

The Space Syntax Theory is employed by measuring the value of connectivity, integration, and mean depth. GIS has been used to evaluate the spatial scattering of land uses, and geocode the locations of the residents (through their addresses), and creating a set of geodatabase containing all the questions of questionnaires. Data collected through questionnaires and geocoded in GIS has been analyzed through SPSS and AMOS.

The SEM is applied to analyze the relationship between indicators of QOUL, UI, and UPF, as well as, the correlation between these dimensions. The hypotheses of this study, which are the main hypotheses of the research (HI and HII) and subsidiary hypotheses (H1- H9) related to each dimension, are analyzed through SEM analysis. The value of the path coefficient represents that if there is a positive, negative, or not any significant correlation between variables. Therefore, the results of SEM analyses indicate two types of acceptable or not significant correlation. The acceptable positive correlations are between: dimensions of UI and QOUL with the value of 0.87 (HI), objective measures of housing and satisfaction with housing with the value 0.32 (H2), activities and meaning with the value 0.12 (H4), objective measures of housing and objective measures access with the value 0.48 (H7), objective measures of housing and objective measures of land use with the value 0.52 (H7), objective measures of housing and objective measures of density with the value 0.42 (H7), objective measures of access and objective measures of land use with the value 0.39 (H7), subjective measures of access and overcrowding with the value 0.57 (H8), subjective measures of layout and overcrowding with the value 0.61 (H8), and subjective measures of access and subjective measures of layout with the value 0.77 (H8). The negative acceptable correlations are between: UF and QOUL with the value -0.64 (HII), UF and UI with the value -1.30 (HII), objective density and satisfaction with overcrowding with the value -0.53 (H1), mean depth and satisfaction with land uses -0.22 (H6), and between objective measures of land use and objective measures of density with the value -0.61 (H7). The results represent that there is not a significant correlation between: objective density and perceived overcrowding (H1), objective measures of land use and satisfaction with land use (H3), physical setting and meaning (H4), physical setting and activities (H4), objective measures of accessibility and subjective measures of accessibility (H5), objective measures of access and objective measures of density (H7).

It is significant to note that the results and findings are based on the questionnaires that were filled out by the residents of Andisheh new. Therefore, the correlations between variables may have a different outcome in other cities.

As a summary of the conclusion of the present research in Andisheh new town, it can be pointed out that although there may not be a significant relationship between some indicators of UI, QOUL, and UPF, but in general, there is a strong relationship between UI and QOUL in Andisheh new town. Moreover, UPF affects UI and QOUL, and this relationship is strong and negative.

Keywords: quality of urban life (QOUL), urban identity (UI), urban physical form (UPF), geocoding the location of residents, analysis of population and density/ housing/ accessibility/ urban layout/ and land use, Space Syntax analysis, structural equation modeling (SEM), the relationship between indicators of UI, QOUL, and UPF

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AGFI	adjusted goodness of fit index
AMOS	analysis of a moment structures
CBD	central business district
CFA	confirmatory factor analysis
CFI	comparative fit index
df	degrees of freedom
dph	dwellings per ha
EFA	exploratory factor analysis
GIS	Geographic Information Systems
GFI	Goodness of Fit index
IFI	Incremental Fit Index
Integration (HH)	HH is an acronym for Hillier and Hanson
KMO	Kaiser- Meyer - Olkin
NFI	Normed Fit Index
NNFI	Non-normed Fit Index
p-value	the probability of observing data as extreme or more extreme than the data under the null hypothesis
QOL	quality of life
QOUL	quality of urban life
UI	urban identity
UP	urban form
UPF	urban physical form
RMSEA	root mean square error of approximation
SEM	structural equation modeling
SPSS	Statistical Package for the Social Sciences
t	the ratio of estimation of each parameter to its standard error
TLI	Tucker-Lewis Index
t-value	a test statistic computed for hypothesis testing

Chapter 1:

INTRODUCTION

1.1 Research Context and Background

There is an ongoing migration of the population of all the countries around the world from rural to urban areas. More than half the world's population lives in an urban environment; the UN predicts that by 2050, two out of every three people are expected to live in cities and metropolitan areas.

In order to attract the overflow population of metropolises, to reduce the density of big cities, and to redistribute the population in the region New Towns in Iran were implemented since early 1981. Despite the efforts of the planners and urban designers in locating new towns, and designing open spaces, squares, streets, parks, appropriate width of roadways, and residential complexes, new towns lack something. They are faced with a lack of persistence of their residents, rootlessness of the population, and lack of social dynamics. Their urban space and streets are not attractive for their inhabitants, residents are not satisfied with the quality of the urban environment and they - especially the younger generation - tend to leave new towns. In urban areas such as new towns, urban physical form affects perceptual aspects of residents, so perceived quality of life, sense of belonging, and sense of place.

Many types of research about the function of new towns indicate that the primary goals are not achieved. Moreover, most of the new towns are faced with such problems as being a dormitory for their residents.

Qualities of urban life, identity of a place, and urban identity have been widely discussed in academic society and other organizations during the last decades. However, it is not easy to find an urban environment, which has all the needed characteristics for individual or social life. Increasing population growth in cities and the necessity to respond to their needs quickly leads to new environments that are types of continuous and discontinuous development, which are often constructed in uniform and monotonous forms.

It is important to study the quality of urban life and urban identity related to urban physical form since QOUL affects the behavior of residents: "The satisfaction that a person receives from surrounding human and physical conditions dependent and can affect the behavior of individual people, groups such as households and economic units such as firms." (Marans and Stimson, 2011); and Urban identity is related to the identity of its residents and also the identity of the city. The urban environment reflects its resident's needs and values. Citizens believe that their city is not like the others. All of the residents are part of their cities, because, without citizens, they would not be what they are.

Therefore it seems significant to investigate the relationship between the **quality of urban life**, **urban identity,** and **urban physical form** in a new environment, with special reference to **Andisheh new town** in Iran that is the focus of this research.

1.2 Research Questions and Objectives

In general, this research seeks to find the relationship between urban identity, quality of urban life, and urban physical form. Therefore, it aims to determine which indicators of these dimensions play useful roles in Andisheh new town, to evaluate the correlation between them, and to examine the following questions based on the objective of the present study:

1. How urban physical form can be analyzed through its objective features and subjective characteristics of urban identity and quality of urban life? And what are the criteria and indicators of UI and QOUL related to UPF?

2. Does urban physical form affect urban identity and quality of urban life in Andisheh new town? And what is the relationship between UI and QOUL?

3. How it is possible to link UI and QOUL with UPF in new towns? And how to evaluate classified subjective and objective measures of UI, QOUL, and UPF using GIS?

4. Obtaining practical results from the collected data and creating maps that represent several qualitative criteria in the whole city.

This research aims to examine two types of theoretical and empirical questions. In the theoretical part, questions associated with concepts of urban identity, quality of urban life, and urban form and their principles and indicators will be examined. In the empirical part, the questions related to surveying extracted indicators in the field study will be discussed.

All of the questions mentioned above will be considered in the present dissertation through a literature review, theoretical analysis, observation, questionnaires, GIS mapping and analysis, Space Syntax analysis, SPSS analysis, and SEM through

AMOS. The research questions will be analyzed in chapter 5 and discussed in chapter 6.

1.3 Research Hypotheses

Based on the objectives of the present research, some hypotheses are defined. These hypotheses include 9 subsidiary hypotheses as well as 2 main hypotheses, which are represented in the following part, evaluated in chapter 5 in different parts, and concluded in chapter 6.

- H1: Higher objective measures of density predicts higher subjective measures of overcrowding and lower satisfaction with overcrowding
- H2: objective measures of housing affects satisfaction with housing
- H3: higher objective measures of land use predicts higher satisfaction with land use
- H4: measures of activities, meaning, and physical setting are in correlation
- H5: higher objective measures of accessibility predicts higher subjective measures of accessibility
- H6: higher objective measures of mean depth to land uses predicts lower satisfaction with land uses
- H7: there are correlations between objective measures of access, density, housing, and land use
- H8: there is a correlation between subjective measures of access, overcrowding, and layout
- H9: lower measures of overcrowding, higher measures of subjective housing, subjective land use, subjective access, and subjective layout predict higher quality of urban life and urban identity

The main two hypotheses are pointed out as follows:

HI - There is a direct and mutual correlation between Urban Identity and Quality of Urban Life in Andisheh new town

HII - Urban Form affects Urban Identity and Quality of Urban Life in Andisheh new town

1.4 Research Design

The purpose of representing a research design is essential to offer evidence to answer research questions (Kerlinger and Lee, 2000). It indicates the main steps conducted in the study including process and methods for data collection, the sample of the research, methods for data analysis, and problem statements of the study (Monette et al, 2002). Therefore, a research design provides a detailed plan presenting approaches for collecting data and analyzing data. The research design of this study categorized as follows:

The first phase (theory), the theoretical part of the research includes the theoretical background of urban form, quality of urban life, and urban identity and dimensions of urban form, quality of urban life, and urban identity (Chapter two). Additionally, in Chapter three, Iranian new towns and Andisheh new town as the case study of this research are reviewed. Moreover, this phase of the study investigates the research problem, research objectives, and research questions.

The second phase (research strategy) assigns a research approach. Furthermore, it includes a case study; therefore, data collection methods and tools, qualitative and quantitative methods based on the case study approach, and designing the questionnaire and determining sample size.

The third phase determines the **evaluation and analyzing the collected data** which are gathered through questionnaires, statistical data, and geodatabase. To analyze data, and investigate the correlation between dimensions of urban form, quality of urban life, and urban identity in Andisheh new town, GIS analysis (ArcMap), SPSS analysis, and Structural Equation Modelling analysis through (AMOS) are applied.

The last phase, which is the **conclusion**, tries to answer the research questions and study the hypothesis of the research.

Figure 1.1 represents the research design.

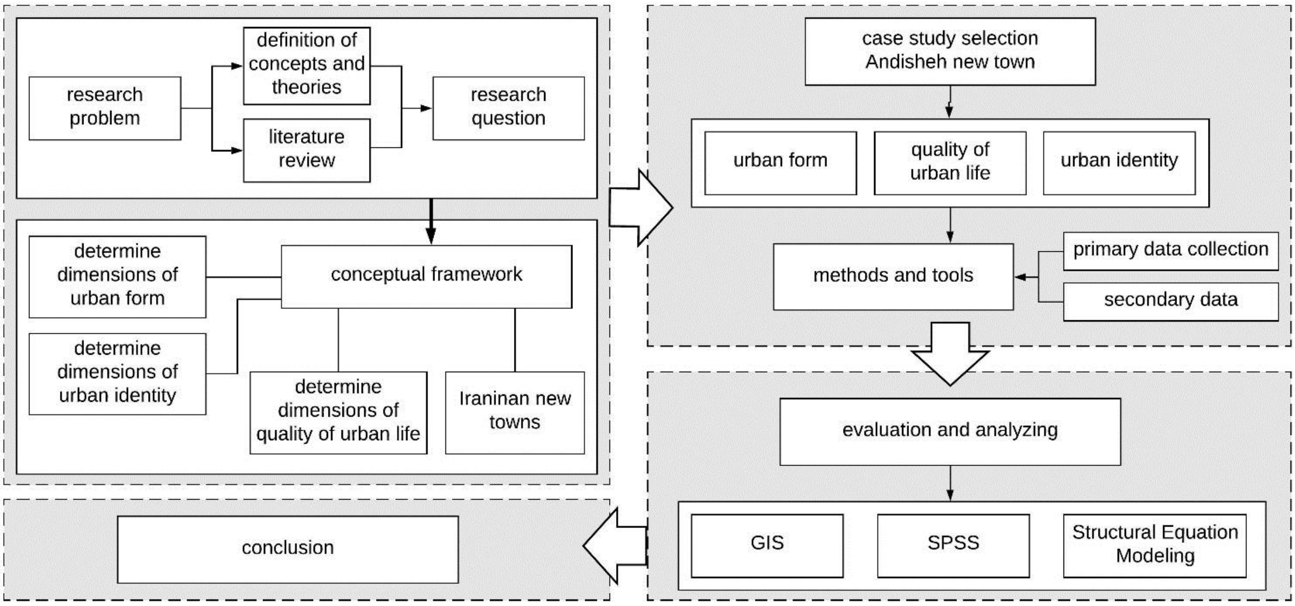


Figure 1.1. Research design

1.5 Research Organization

This research consists of 6 chapters and appendices.

Chapter (1) **Introduction**: The current chapter represents a brief background to the research and explains the gaps in knowledge that will be studied by this research. furthermore, it identifies the research questions, hypotheses, and describes the research organization.

Chapter (2) **Theory** sums up the theoretical background conducted in this dissertation and creates a theoretical basis for the analysis and discussion. The conceptual framework of the study is defined at the end of this chapter.

Chapter (3) **Introduction to the Case Study Area** introduces the case study of this research as well as the concept, classification, and evaluation of new towns in Iran.

Chapter (4) is **Research Method** and describes the methods and software used in this research. Additionally, the data sources are introduced and problems faced are explained.

Chapter (5) **Analyzing and Findings** are assigned to the analyses accomplished in this dissertation. It includes analysis of population and density, analysis of housing, analysis of land uses, analysis of layout, analysis of accessibility, and analysis of the other indicators related to UI and QOUL. Moreover, the relationship between subjective and objective indicators as well as the relationship between indicators and UI and QOUL, and finally, the main hypotheses are analyzed in this chapter.

Chapter (6) **Conclusion** summarizes the results of the analyzes have been done in the previous chapter and represents the conclusion of this research as well as the recommendations.

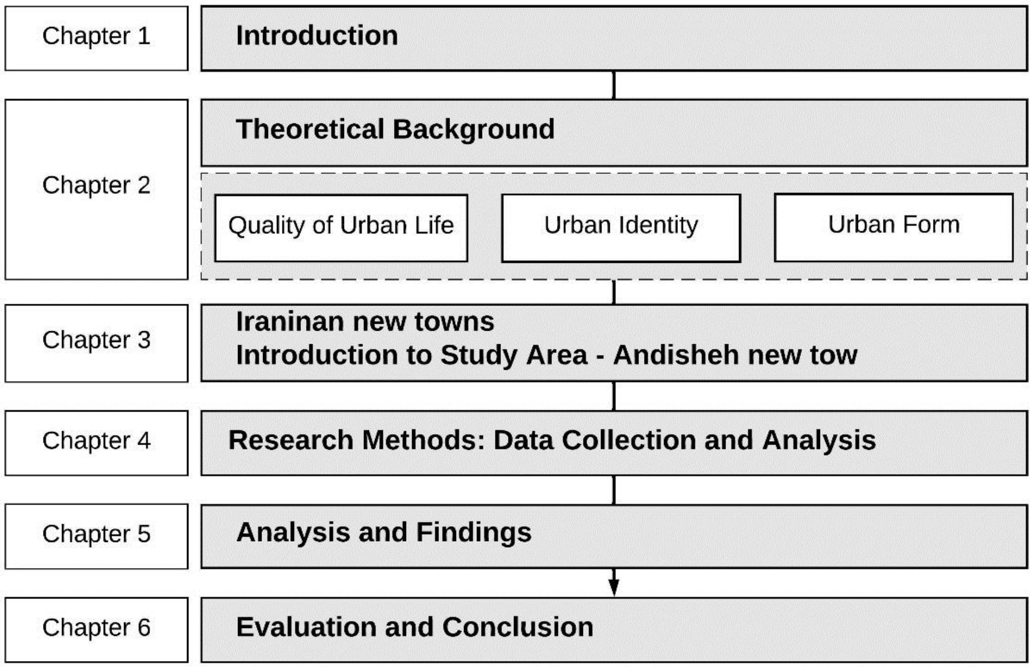


Figure 1.2. Research organization

Chapter 2:

THEORETICAL BACKGROUND

2.1 Quality of Urban Life

2.1.1 What is Quality of Life? Definition of QOL

Quality of life has been studied in various fields through different approaches. Researchers tried to define the components and elements of QOL under their expertise and field of work to apply or compare them in different geographical areas such as cities, states, and nations since the 1930s (Uelengin et al., 2001; Liu, 1997; Sufian, 1993). According to Szalai (1980) quality of life does not either have a clear origin nor accepted definition; it refers to "the more or less 'good' or 'satisfaction' of people's life" (cited by Dissart and Deller, 2000). Although the definition of this concept is not universally accepted and there is not any general definition, this concept has a general meaning, in general terms, QOL is related to welfare components or more or less satisfaction of people's life (Lotfi, 2009; Das, 2008).

In other words, the concept of quality of life is related to all people in all places, therefore many types of research of different disciplines such as sociology, psychology, philosophy, geography, planning, spatial and environmental research, and many other studies including individual well-being and happiness have been studied QOL to identify its component (Marans and Stimson, 2011; Thinh et al. 2010). Since the late 1960s, the concept of QOL has come into popular usage and was considered as field research academically (Khalili et al., 2014; Das, 2008).

The Netherlands National Institute of Public Health and the Environment (RIVM) claims that QOL is the factual material and immaterial equipment of life and its perception characterized by health, living environment and legal and equity, work, family, etc. (RIVM, 2000; cited by Khalili et al., 2014). Emphasizing on being a broad concept, McCrea et al. (2006) define the quality of life (QOL) as "a broad term which encompasses notions of a good life, a valued life, a satisfying life, and a happy life" (McCrea et al. 2006; 2011).

Romney, Brown, and Fray (1994) have tried to explain why there is not an accepted comprehensive definition of QOL. They have stated their findings as follows:

- The subjective processes dependent on experiences of QOL can be explained and interpreted through different perspectives and expressions.
- The concept of QOL is considerably ambiguous.

- This concept includes understanding human development and development processes, an average rate of life expectancy in their communities, and the extent through which these psychological processes are influenced by environmental factors and individual valuation systems. (Romney et al., 1994, P253)

The lack of a standard definition of the concept of QOL has sometimes led to the use of words such as welfare, living standard, and life satisfaction rather than the quality of life in related literature. However the concept of QOL and life satisfaction are used in the same context, QOL is not simply equal with life satisfaction, health, or well-being. It is a multidimensional concept involving perceptions of these and other aspects of life (Lee, 2008).

Some scholars define QOL as a continuous string of concepts; some others argue that quality of life is a multi-dimensional concept (Lotfi, 2009). Reviewing the literature of QOL (Epley and Menon, 2008; Lee, 2008; Massam, 2002; Sirgy and Cornwell, 2001; Uelengin et al., 2001) confirmed the ambiguity of this concept. Many of the literature related to QOL point to the variety of definitions of QOL so that many believe that the QOL can be defined as the number of human beings. This is confirmed by the fact that the importance and value of each of the different dimensions of QOL may vary in different people.

Despite the variety of concepts to measure QOL and so many ideas by researchers, there is a high correlation between them. For this reason, experts do not have tried so much to formulate a theory in order to define the quality of life, as they have noted that a lack of uniformity is normal and uniformity in concepts is not necessary (Lotfi, 2009; Khalili et al., 2014; Lee, 2008 van Kamp et al., 2003). Quality of life is a multidisciplinary subject; therefore it is a multidimensional concept (Uelengin et al., 2001; Thinh et al. 2010; Serag El Din et al., 2013; van Kamp et al. 2003). It is stated in each expression used to define the quality of life that the quality of life of a person depends on objective features of his life and his mental perceptions of these features. This is confirmed by most researchers. Therefore, it is tried in researches on quality of life to measure the effect of these objective and subjective factors on human well-being.

Studies on QOL can be applied using simple or multiple variables. To explain the relationship between quality of life and other variables, two models are proposed: a top-down model that is assumed that QOL is a stable feature that produces certain outputs (results) in people's lives; a bottom-up model that is based on the fact that certain variables affect the quality of life of an individual (Evans, 1994; cited by Lotfi, 2009).

2.1.2 Measuring QOL through dimensions of QOL

In a conceptual model, Shafer et al. (2000), describes the quality of life as the interaction between three domains that are community, environment, and economics. This model also pictures the relationships between livability, sustainability, and quality of life. (Shafer et al., 2000)

Mitchell et al. (2000) conclude "there is no agreement yet on quality of life, in terminology nor in construction methods or the criteria that compromise quality of life"; despite this conclusion, he represents different components of quality of life (Mitchell et al., 2000; cited by van Kamp et al., 2003).

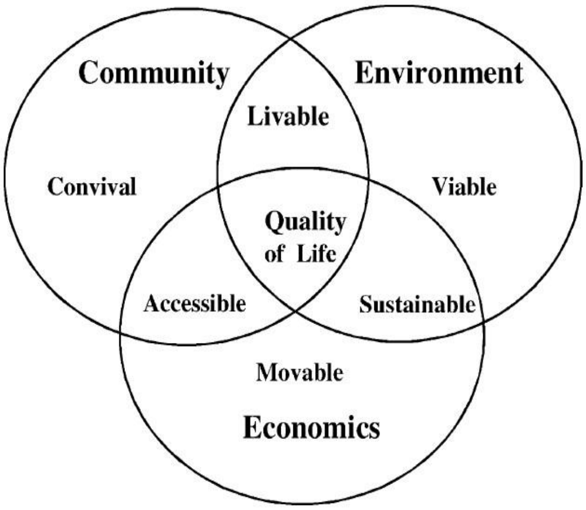


Figure 2.1.1. A conceptual model of factors that contribute to quality of life (Shafer et al., 2000)

The model represented by RIVM (2000) is a "thinking model" that presents layers of concepts, which are related to each other; the model investigates a combination of measurable spatial, physical and social features of the environment and the perception of these. The perception is not only objective dimensions but also the personal aspects of the environment (van Kamp et al., 2003).

Figure 2.1.2. Quality-of-life components (Mitchell, 2000; cited by van Kamp et al. 2003)

One of the most cited sources of QOL is the study of Massam (2002). It focuses on how to plan in the public domain based on the quality of life indicators. In his study, he examines and assesses the effects of projects on places and people through the QOL model using the indicators: health, cost of living, work opportunities, housing, family, friends, tourism, shopping, transportation, holidays, water, air, noise, peace and tranquility, and education; Massam (2002). In research about family life satisfaction in reforming urban China in two cities of Shanghai and Tianjin by Ji et al. (2002), this concept is analyzed as a multi-dimensional concept considering age and gender involving different types of variable such as individual and family resources, martial and parental roles, kinship ties, and social and political ties (Ji et al. 2002).

The concept of quality of life is studied through social researches using social indicators such as economic that is the main domain in social models, health which is another fundamental indicator, and the principle “the more the better” that is used in most approaches.

The main goal of the social approach is to make the comparison possible in three scales of countries, states, and regions. Most of these approaches are “data-driven or represent a compromise between models and a choice of available data." (van Kamp et al., 2003)

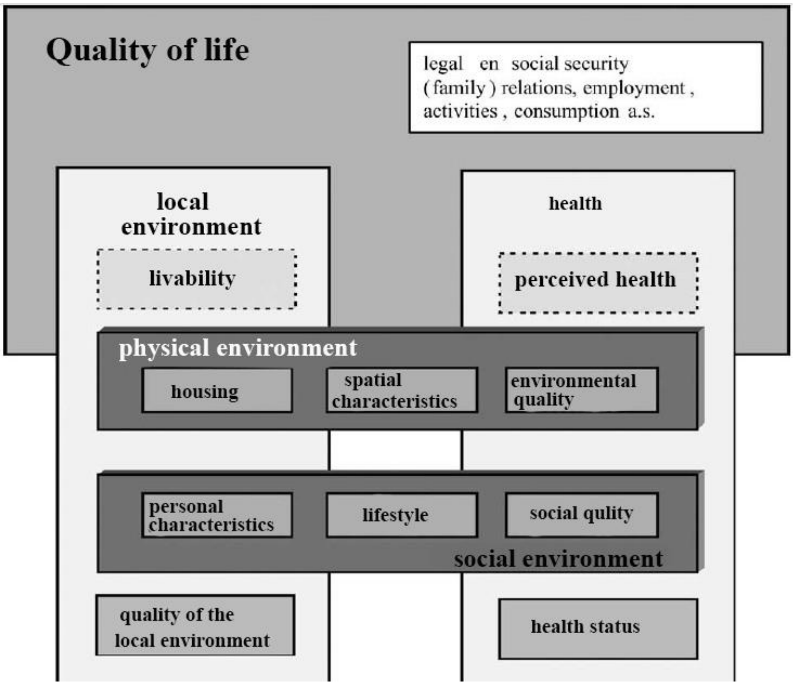


Figure 2.1.3. Model of the basic elements of quality of life, health, and daily living environment (RIVM, 2000; cited by van Kamp et al. 2003)

Diener and Suh (1997) argued that to define and determine the quality of life, there are three important philosophical approaches, which are related to three measures of quality of life. The three approaches are: 1- characteristics of QOL are imposed by normative ideals based on religion, philosophy, or other systems 2- the satisfaction of preferences (choice utility) 3- the experience of individuals; and three related measures which integration of them would facilitate informed policy-making, are: 1- social indicators, 2- economic indexes, 3- well-being. (Dissart and Deller, 2000)

Another approach to study the quality of life is the urban planning approach, which is supported by a set of empirical visions rather than theories. This approach is usually conceptual and time-dependent (van Kamp et al., 2003). In this view, the quality of the urban environment is a complex concept that includes the physical environment which provides opportunities for residents to provide for their needs (Smith et al., 1997). Therefore in this approach, the physical elements are more considered, as they contribute to the quality of the urban environment. This urban planning approach is studied as the quality of urban life, while it represents the quality of life of people regarding their urban environment. The research of Smith et al. (1997) conducted to develop a framework to investigate the relationship between physical form and quality of the urban environment is a sample of this approach.

In the table below (table 2.1.1) some significant definitions are presented.

Table 2.1.1. Definitions of QOL in literature

	Quality of life is	Reference
Szalai (1980)	The more or less 'good' or 'satisfaction' of people's life. Quality of life refers to the scale of satisfaction with life. Satisfaction with the life and well-being of a person is defined by objective factors of his life and also using subjective perception he has of these factors of life and himself.	Cited by van Kamp et al. (2003)
WHO-QOL Group (1993)	An individuals' perception of one's position in life concerning his goals, expectations, standards, and concerns regarding the culture and value systems in which he lives.	Cited by van Kamp et al. (2003)
Raphael et al. (1996)	"The degree to which a person enjoys the important possibilities of her/his life."	Cited by van Kamp et al. (2003); Dissart et al. (2000)
Veenhoven (1996)	happy life expectancy	Cited by van Kamp et al. (2003)
Diener and Suh (1997)	"life satisfaction"	Cited by van Kamp et al. (2003)
Musschenga (1997)	the good life is a combination of enjoyment, satisfaction, and excellence	Cited by van Kamp et al. (2003)
RIVM (2000)	"Quality of life is the factual material and immaterial equipment of life and its perception characterized by health, living environment and legal and equity, work, family, etc."	Cited by van Kamp et al. (2003); Khalili et al. (2014)
McCrea (2006)	A broad term contains notions of a good life, a valued life, a satisfying life, and a happy life	McCrea (2006)

Lee (2008)	The multidimensional concept involving perceptions of aspects of life	Lee (2008)
Das (2008); Lotfi (2009)	Welfare or more or less satisfaction of people's life	Das (2008); Lotfi (2009)
Marans & Stimson (2011); Thinh et al. (2010)	It is related to all people in all places, therefore it is studied from different disciplines such as sociology, geography, planning, and environmental research and includes individual well-being and happiness	Marans & Stimson (2011); Thinh et al. (2010)

The following table (table 2.1.2) shows attributes of QOL based on the literature.

Table 2.1.2. Attributes of QOL

attributes	Liu (1976)	Boyer & Savageau (1981)	Sufian (1993)	Protassenko (1997)	Shafer et al. (2000)	Mitchell (2000)	RIVM (2000)	Massam (2002)
environment	●	●	●	●	●			●
climate		●						
natural resources						●		
physical environment						●	●	
transportation		●						●
traffic flow			●					
housing		●	●					●
cost of living								●
goods & services						●		
shopping								●
food cost			●					
work opportunity								●
economics	●	●		●	●			
politics	●							
social	●							
community				●	●	●		

communication			●					
family/ friends								●
living space			●					
perception							●	
peace / quiet			●					●
public safeties			●			●		
crime		●						
health / public health	●	●	●			●		●
recreation		●						
arts		●						
education	●	●	●					●

To summarize this part, many researchers studied the literature on quality of life and all of them agree that a comprehensive definition of quality of life is when this concept involves two related dimensions: mental (subjective) dimension and environmental (objective) dimension

2.1.3 What is Quality of Urban Life? Definition of QOUL

The focus of this research is on the quality of urban life to measure the features of quality of life in the urban environment. As a definition, the concept of quality of urban life refers to human life relates to places.

Quality of urban life is a complex term that is defined in various researches as a response to problems facing the cities. Not only urban features, but also all the existing relationships, dynamics, and reticular relationships between the features are described in QOUL; therefore QOUL is a multi-disciplinary concept depending on the context.

According to Marans and Stimson (2011), the definition of quality of life that is explained by Mulligan et al. (2004) reflects the quality of urban life more exactly rather than the quality of life. They define QOL as:" the satisfaction that a person receives from surrounding human and physical conditions, conditions that are scale-dependent and can affect the behavior of individual people, groups such as households and economic units such as firm" (Marans and Stimson, 2011). Appleyard (1981) studied the quality of life in urban streets focusing on the impact of transportation on the residential environment. He finally developed five significant characteristics; a livable street should be good for children, safe from crime, convenient, free of traffic congestion, clean and unlettered appearance, and lined with affordable housing (Appleyard, 1981).

Quality of urban life is the quality of life that relates to place, in this context place is “the geography or environments of individuals and groups of individuals such as households, neighborhoods, and communities.” QOUL affects the behavior of residents and their happiness and life satisfaction; therefore it is significant to investigate it (Marans and Stimson, 2011).

Rosen (1979) has studied indicators of quality of life of metropolitan areas from wage data. Population, crowding, crime, climate, and market conditions are five major groups of place attributes that are distinguished based on the amenities in various places where people have to pay to work and live. The result of this study illustrated ranked places according to the level of quality of life. Roback (1982) extended Rosen's work by adding the housing market as a new factor to explain the regional wage differences using local attributes. The variables of his research are population density, heating degree days, number of clear days, number of cloudy days, and total snowfall. The result of the study is the prices of land are estimated based on the site price data, and quality of life rankings for the cities are presented. (Dissart and Deller, 2000)

According to Smith et al. (1997), urban quality of life is a multidimensional concept that is a result of various interrelated concepts. In order to develop the link between urban form and urban quality, a list of physical form indicators that will be contributed to the basic qualities of a community is developed. The main elements of quality of life are livability, character, connection, mobility, personal freedom, and diversity. The physical form criteria are categorized under community, urban block, buildings, streets, pedestrian ways, open spaces, vegetation, and feature areas. To analyze the communities, a matrix is used and the result shows the relationship between the quality of an urban environment and physical form. (Smith et al., 1997)

To explain the quality of place at different levels from project level to regional scale, Johnson developed a framework involving seven qualities that are identity, stability, security, choice, interest, convenience, and relatedness (Johnson, 1988; cited by Smith et al. 1997). Studies have represented that satisfaction with urban living occurs at different levels of geographical scale and affects the overall life satisfaction of residents (Campbell et al., 1976; McCrea et al., 2011b; Sirgy and Cornwell, 2001).

Improving the quality of life in a specific place for specific people, who live there, is an important goal for planners. It can also be argued that planning as a public activity can create a quality of life in people regarding their urban environment.

2.1.4 Context of QOUL

As it is explained before, QOUL is a multi-dimensional concept. Therefore, researchers in their studies on the quality of urban life have chosen almost similar components as various dimensions of QOUL, but the indicators which are considered to measure these components, are different.

QOUL is measured through indicators, which can be either objective or subjective. Moreover, it is important to study both subjective and objective dimensions of quality of life to provide a more complete picture of the quality of urban life (Lee, 2008; Marans and Stimson, 2011).

To investigate the quality of life in a city as a specific environment that leads to figure out the quality of urban life, indicators should be applied to measure conditions in that specific environment. It should be noted that an objective urban environment affects people's assessments of their QOUL.

In the research "monitoring urban quality of life", Santos and Martins (2007) presented two components: a quantitative approach based on statistical indicators and a qualitative approach based on residents' perceptions of the conditions of life. They argued that to aim for more effective measurement and better understandings of quality of urban life, using both types of approaches is useful and complements each other. To analyze these two approaches four domains and 25 thematic areas for the QOUL are defined in the city Porto (Portugal). (Santos and Martins, 2007)

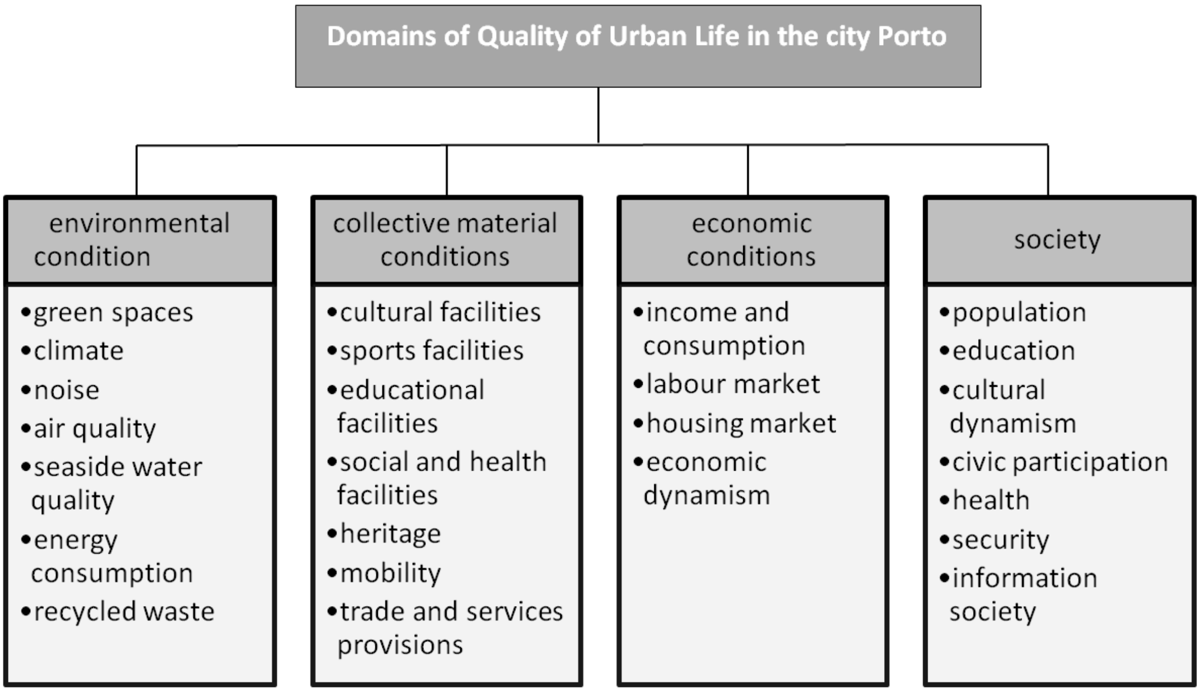


Figure 2.1.4. Domains of quality of urban life in the city Porto- Portugal (Santos and Martins, 2007)

The comprehensive research conducted at the national level in separated urban areas is related to the housing market and labor market in Russian cities by Berger and Blomquist (2008). In this research Russian cities are ranked using different indicators. Needed data is based on the various urban and regional scales prepared by the Russian Monitoring Center. The focus of the study is on objective indicators such as infrastructure, education, employment, access to physicians, air and water pollution, and crime, and public transportation (Berger et al., 2008).

Maybe one of the broadest studies of quality of urban life in the world is the "New Zealand QOL Reporting System". The main goal of the mentioned project is to provide data for decision-makers in order to improve the quality of urban life in New Zealand's metropolitan areas. The project includes 12 cities with 56% of the total population of New Zealand. It covers the opinions of more than 7500 people in the largest cities of this country. It studied 11 fundamental aspects with 68 main indicators of quality of urban life including 186 measures. (Khalili et al., 2014)

Uelengin et al. (2001) studied the quality of urban life in the city of Istanbul (Turkey) to model the priorities, expectations, and needs of the residents of Istanbul through a comprehensive strategy: the hierarchical structure model. The approach of the research is to measure the quality of urban life using objective indicators in four main aspects: physical environment, social environment, economic environment, and transportation and communication. To do so a group of experts of all fields related to the city determined the most important dimensions of quality of life in the city of Istanbul and developed indicators for each of these dimensions. As a result of this research, the priority of different dimensions of QOUL has been identified and all urban planning and activities focused on issues that have more impact on the quality of urban life. (Uelengin et al., 2001)

The following chart (figure 2.1.5) presents the defined dimensions of QOUL in Istanbul:

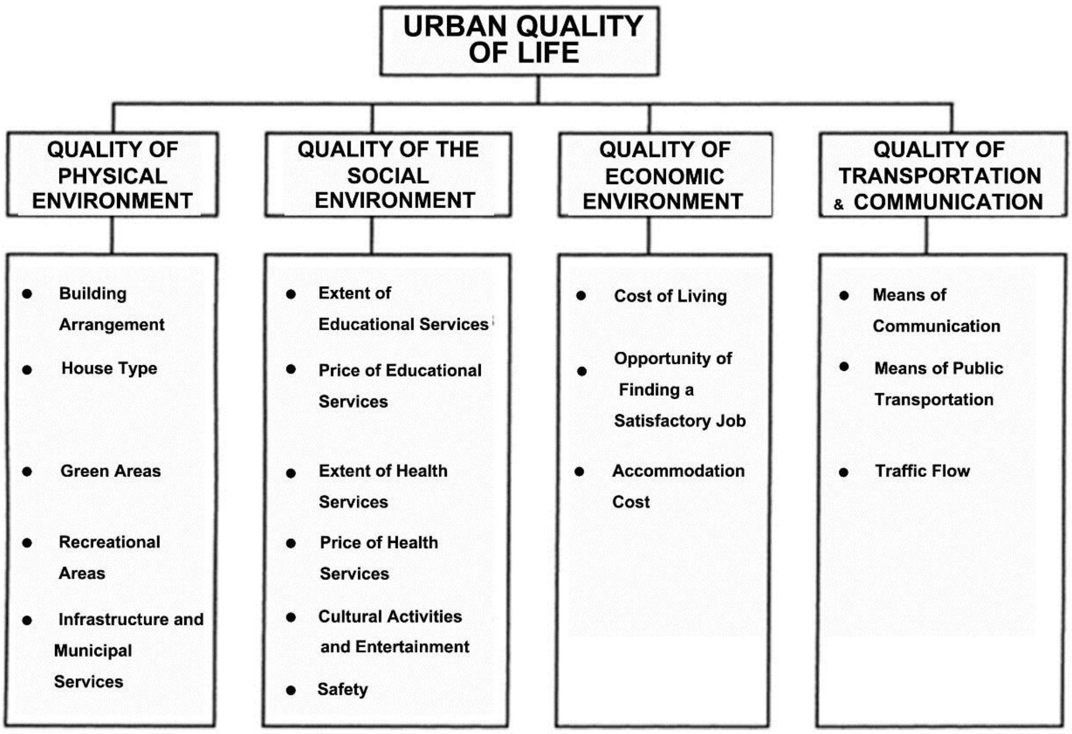


Figure 2.1.5. The hierarchical structure of QOUL model in Istanbul (Uelengin et al. 2001)

Fahy and Cinneide (2008) researched the city of Galway in Ireland focusing on a sustainable development approach in quality of life in five regions of Galway. One of the advantages of the research is the participation of residents of all different regions to determine 20 final indicators of QOUL. (Fahy and Cinnéide, 2008; Khalili et al., 2014)

The study of Mcmahon (2002) is conducted to measure the quality of urban life in the city of Bristol in the UK. The indicators of the research are categorized into five different levels: 1. European common indicators, 2- national and regional headline indicators, 3- stakeholder indicators, 4- local ward and city-wide indicators, 5- community group indicators (McMahon, 2002)

Lee (2008) studied five fundamental factors of QOUL that are 1) civic services, 2) neighborhood satisfaction, 3) community status, 4) neighborhood environmental assessment, and 5) local attachment in Taipei and analysis indicates that these five factors influence individual satisfaction with QOL directly. The research is conducted to survey the subjective resident assessment of QOUL. The findings of the research represent that to improve QOUL in Taipei, community status and local attachment should be focused on. (Lee, 2008)

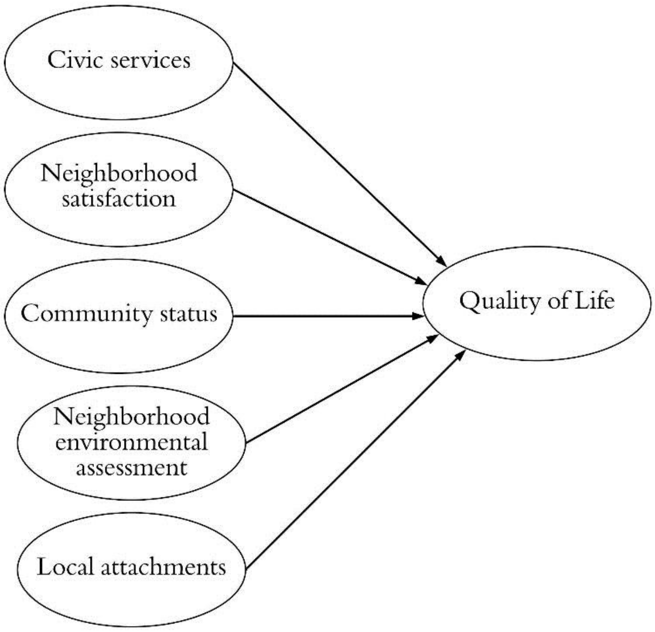


Figure 2.1.6. QOL conceptual model for Taipei (Lee, 2008)

The research of Das (2008), which is conducted in Guwahati in Northeast India, investigated the relationship between subjective and objective indicators. Das mentioned that many objective and subjective indicators are two-sided, so they can be used as subjective or objective indicators. In his opinion objective indicators reflect mostly standards of life; however subjective indicators represent satisfaction with all physical, social, and economic aspects. Das developed the conceptual model based on three main dimensions of social environment, economic environment, and physical environment. His findings show the correlation coefficient between objective and subjective QOL is not high. (Das, 2008)

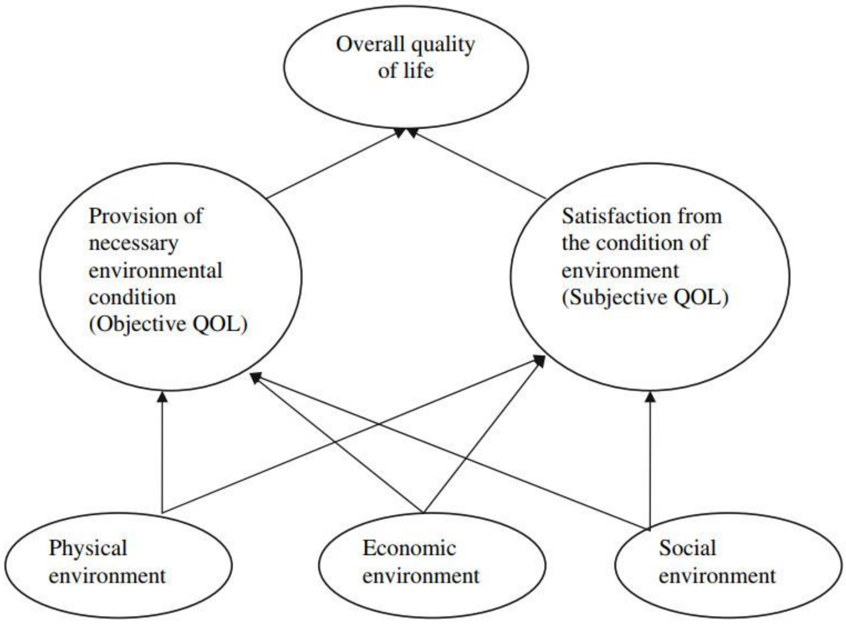


Figure 2.1.7. The conceptual model presenting the relation between environmental and subjective and objective QOL (Das, 2008)

In the research "Methodology and application development for monitoring quality of life in Dresden", six dimensions of QOL are proposed (see figure 2.1.8). Three dimensions of social, environmental, and economic conditions are based on sustainability and urban structure and the supply of age is for urban quality of life. These dimensions are 1) population, 2) socio-cultural conditions, 3) environmental conditions, 4) urban structure, 5) community, and 6) institutional capacity and economic conditions that are categorized under sub-dimensions. Each sub-dimension is described by two types of subjective and objective indicators. (Thinh et al., 2010)

El Din et al. (2012), studied the principles of urban quality of life and developed 7 dimensions of QOUL. In the research, the dimensions of QOUL are argued in different urban planning theories and approaches. These seven dimensions which are interrelated and dependent on each other are physical (facilities, urban fabric, land use, services, facilities, and infrastructure), social (social dimension of the neighborhood and the people interaction), psychological (feeling of citizens toward their neighborhood, such as the identity of place), economic (characterizes the neighborhood as a place of economic activities), political (which support the concept of QOL and the extent to which these policies are implemented?), and mobility (discuss the accessibility, traffic and transportation issues) urban quality of life.

The model of Heptagon Shape is illustrated in figure 2.1.9 (Serag El Din et al., 2013)

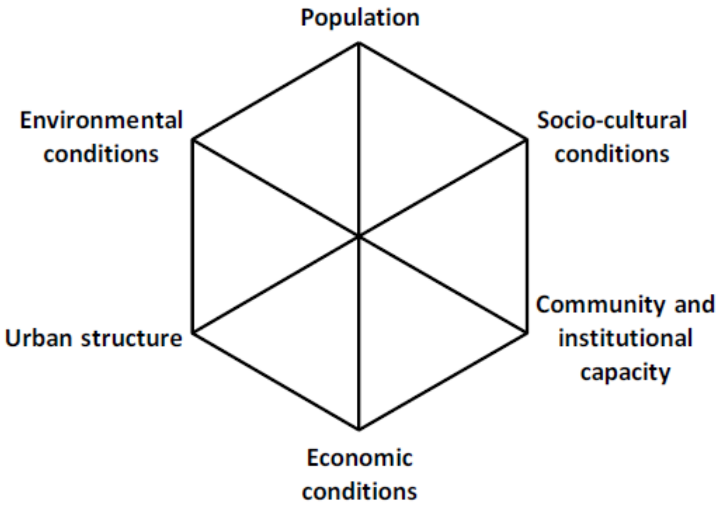


Figure 2.1.8. "Diamond" of Quality of life (Thinh et al., 2010)

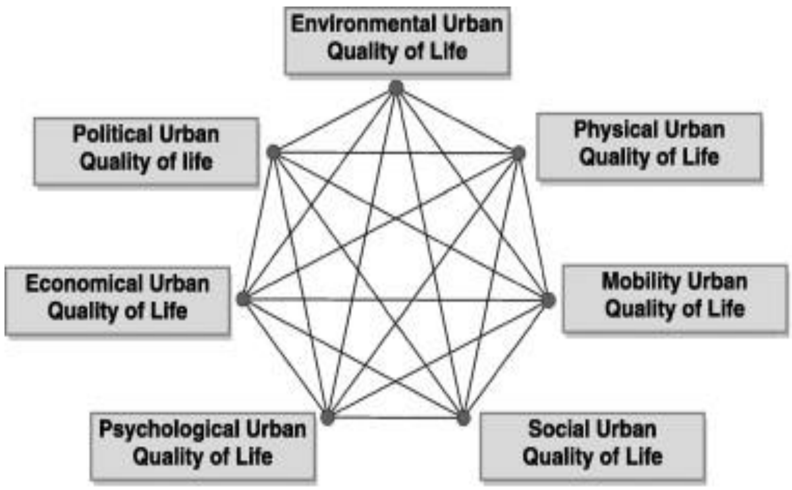


Figure 2.1.9. Urban quality of life dimensions- Heptagon Shape (Serag El Din et al., 2013)

One of the most cites research in measuring QOUL is about the measuring quality of urban life in Brisbane South East of Queensland region conducted by McCrea et al. (2005). Urban quality of life is measured based on the three levels of housing, neighborhood or local area, and the wider metropolitan region. Their findings represent that generally, neighborhood satisfaction is not an important indicator of overall life satisfaction compared to regional satisfaction and housing satisfaction. Moreover, the basic aspects of urban living such as service provision and cost of living are the most significant indicators among different population groups. (McCrea et al., 2005)

In the other research 'What are the strengths of the link between objective and subjective indicators of urban quality of life?' McCrea et al. (2006) developed a new and innovative approach to assess the quality of urban life. They applied Geographic Information Systems (GIS) to link the subjective indicators (satisfaction with urban living) with objective indicators (objective characteristics of the urban environment) of QOUL (McCrea et al., 2006). Dimensions and indicators of the research is presented in figure 2.1.10

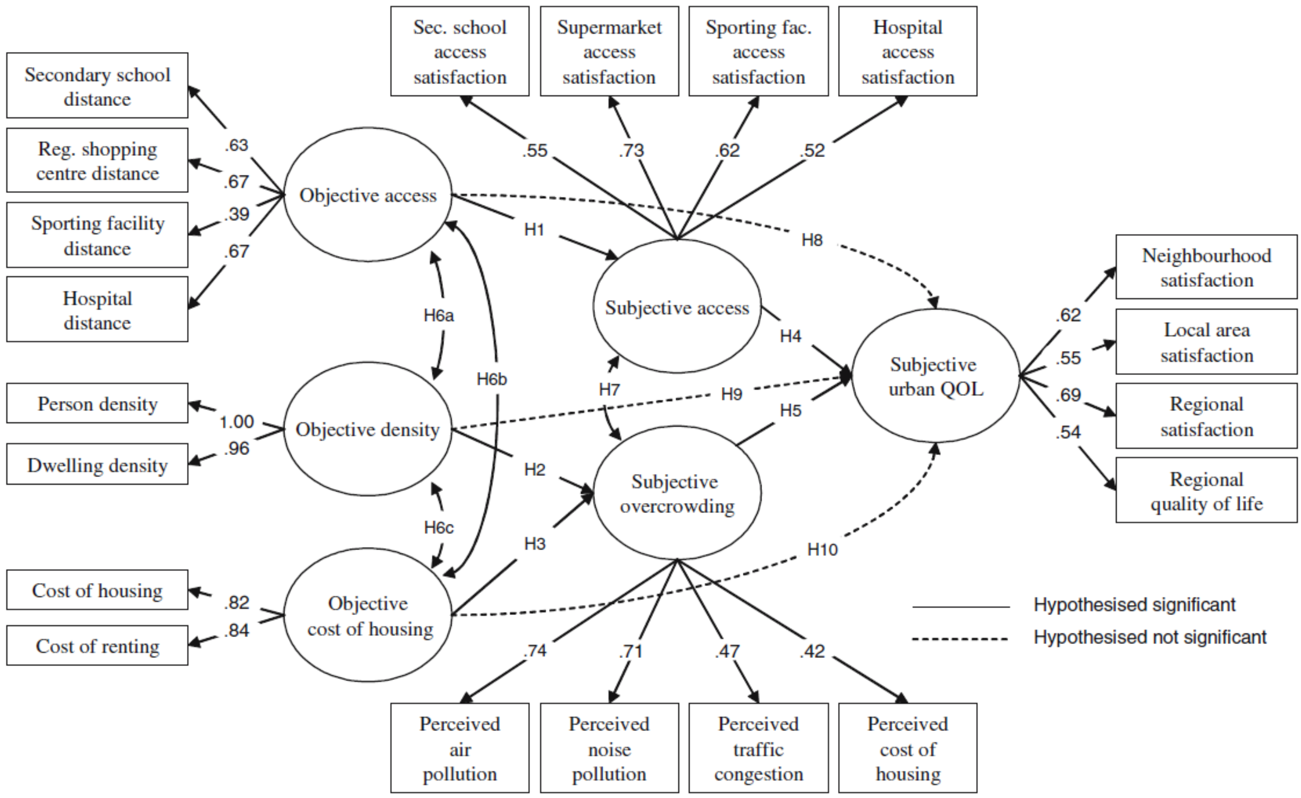


Figure 2.1.10. The structural equation model (McCrea et al., 2006)

Access to facilities and services is a significant component of subjective QOUL. (McCrea et al., 2011b). Emergency services, education services, public transportation, parks, leisure opportunities, and shopping are the services that make community satisfaction. Further, satisfaction with access to those services is also significant to structure residential location decisions (McCrea et al., 2011b). Density is another domain and researches represented that residents prefer a lower-density urban environment. However, people living in higher-density urban environments have better access to services and facilities (McCrea et al., 2011b).

Table 2.1.3. Indicators of quality of urban life based on the literature

	Satisfaction with	Das (2008)	Uelengin et al (2001)	Lee (2008)	McMahon (2002)	Santos and Martins (2007)	Berger & Blomquist (2008)	Ji & Xu (2002)	Massam (2002)	Appleyard (1981)	Rosen (1979) & Roback (1982)	Smith et al, (1997)	New Zealand QOL Reporting System NQRS (2007)	Thinh et al. (2010)	McCrea et al. (2006)	Fahy and Cinneide (2008)
1	population										●			●		
2	Housing	●	●		●	●	●		●	●	●		●		●	
3	Price to rent/ buy housing	●	●		●	●	●		●	●			●		●	
4	Structure & design of dwelling unit		●													●
5	Area of dwelling unit	●	●				●									
6	Quality of buildings			●	●											●
7	Quality of dwelling unit	●	●	●		●	●									●
8	Building density			●					●				●			●
9	Population density in urban spaces		●												●	●
10	Relationship with neighbors	●	●	●					●							
11	Socio-cultural condition													●		
12	community													●		
13	Accessibility to facilities: water, electricity, gas, phone …	●	●	●	●		●						●			●
14	Lighting of streets & urban spaces		●							●						
15	Accessibility to shopping centers	●	●										●		●	
16	Transformation condition	●	●		●	●	●		●	●		●	●			●
17	Pedestrian		●		●				●			●				●
18	Traffic	●	●							●						●
19	Accessibility to public transformation		●	●												
20	Accessibility to bike facilities		●		●											
21	Quality of streets and pedestrians		●	●	●				●	●		●				●
22	Employment status	●	●	●	●		●	●	●				●			
23	Income and economic	●	●					●						●		
24	Cost of living	●	●													
25	Accessibility to work															
26	Quality of educational units					●			●				●			
27	Accessibility to educational units		●		●	●	●	●							●	
28	Sports facilities		●			●										
29	Recreational and leisure facilities	●		●		●							●			

30	Environmental condition													●		
31	Open spaces	●	●			●			●			●				
32	Accessibility to healthcare center/ physician	●	●			●									●	●
33	Participation in local decision making	●						●	●				●			
34	Sense of place, urban identity and sense of belonging			●					●							●
35	Individual relationship					●		●								
36	Participation in social and cultural program		●	●					●				●			
37	Cleaning of streets and public spaces	●	●		●	●										
37	Green spaces	●	●		●	●			●			●			●	●
39	Urban structure													●		

As is presented in the table above, although different aspects of quality of urban life vary in each research, but there are similarities in the type of aspects studied in these researchers too. Accordingly, based on the literature, principles that form QOUL are categorized as follows:

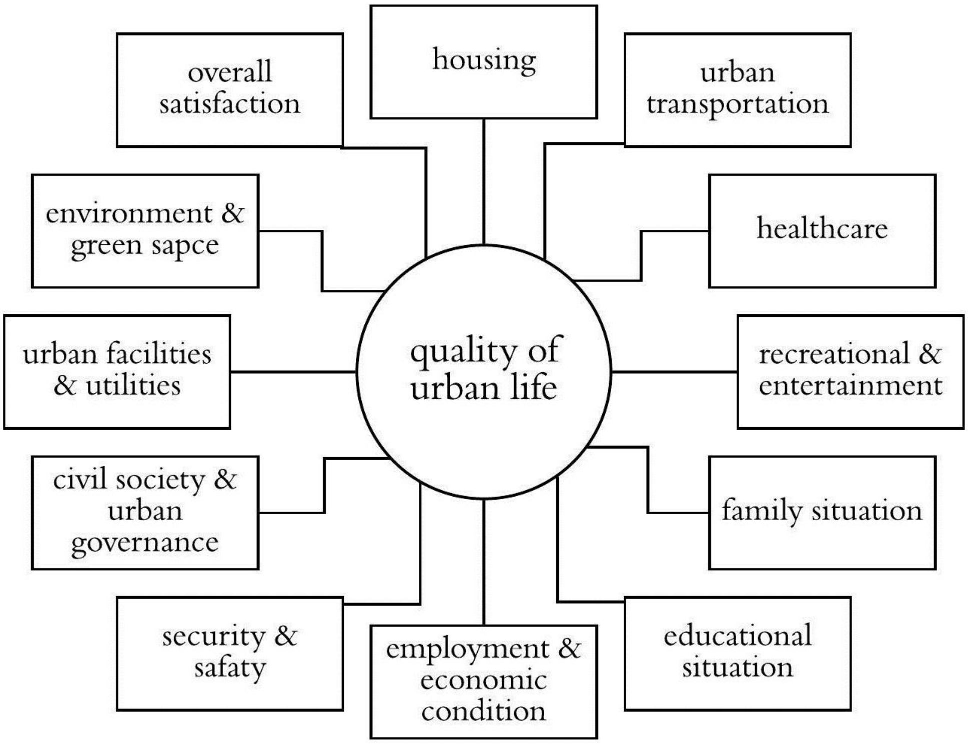


Figure 2.1.11. Categorizing principles of quality of urban life based on literature

Different attributes of the urban environment affect QOL; the effects of these attributes are various from different people's points of view. Therefore the subjective judgments of these attributes are also various, while different people have different perceptions.

2.1.5 Approaches to investigate Quality of Urban Life: Subjective & Objective QOUL

Marans and Stimson (2011), categorized two main approaches that have been studied by researchers to investigate QOUL. The first approach is derived from aggregated spatial data using official sources that are related to the perceived quality of urban life. This approach includes monitoring the quality of urban life through defined indicators such as housing costs, population levels, and so on (Marans and Stimson, 2011). The next approach measures the link between the urban environment and people's subjective assessments of the quality of urban life domains and their satisfaction with life. This approach contains data collected through survey research methods (Marans and Stimson, 2011).

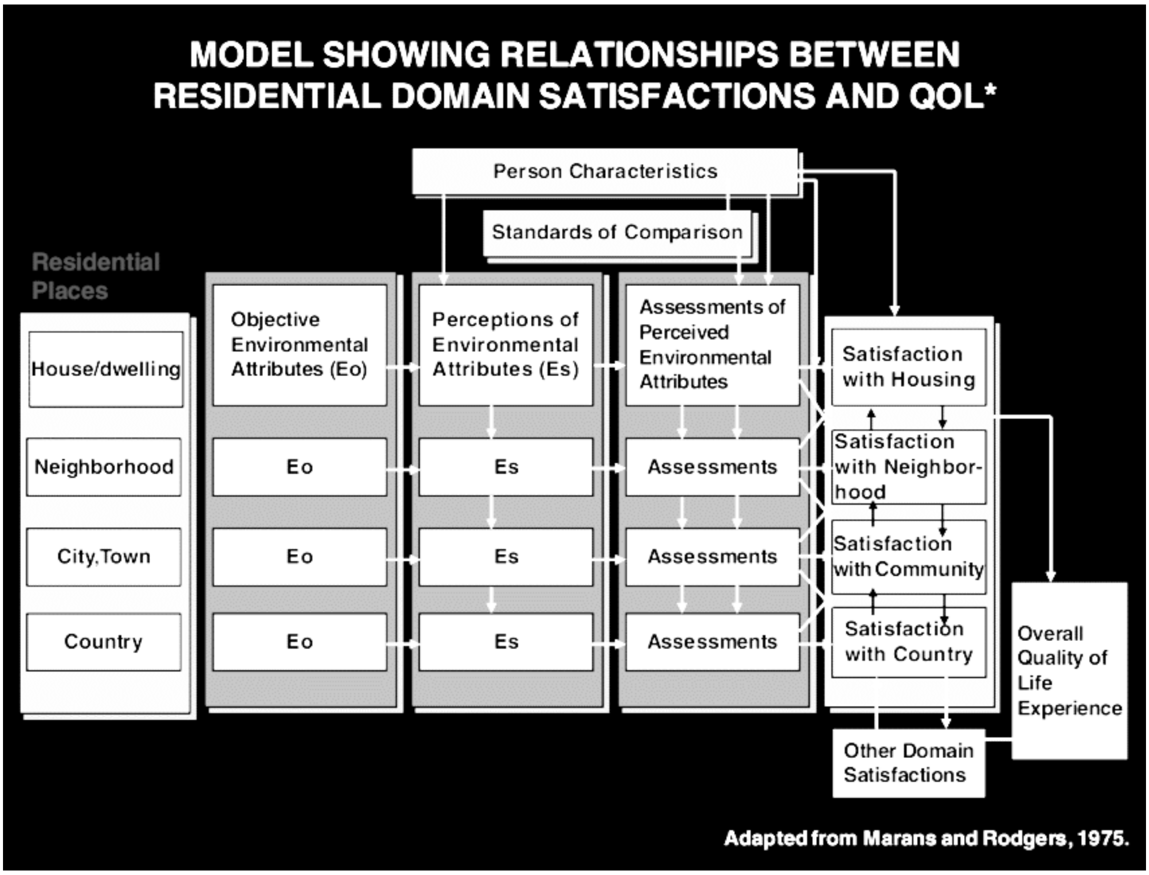


Figure 2.1.12. Model showing the relationship between residential domain satisfactions and QOL (Marans and Rodgers, 1975)

In general, researches on the quality of urban life measurement can be categorized into subjective and objective dimensions, which are strongly related to each other. It is impossible to have a community that does not have a good objective living condition and improves the subjective quality of life.

It seems that it is not simple to set such various dimensions and factors into one model. However, Marans and Rodgers (1975) proposed a model of satisfaction with residential environments that offered satisfaction with housing, neighborhood, the wider community, or the broader region. The model demonstrates “such relationships for different residential domains of urban environments and how those domains, together with other domains, contribute to QOL”. Campbell et al. (1976), developed the approaching model that represents the relationship between different domain satisfactions and life satisfaction (QOL) at multiple levels of analysis and geographic levels of urban scales. (Marans and Stimson, 2011)

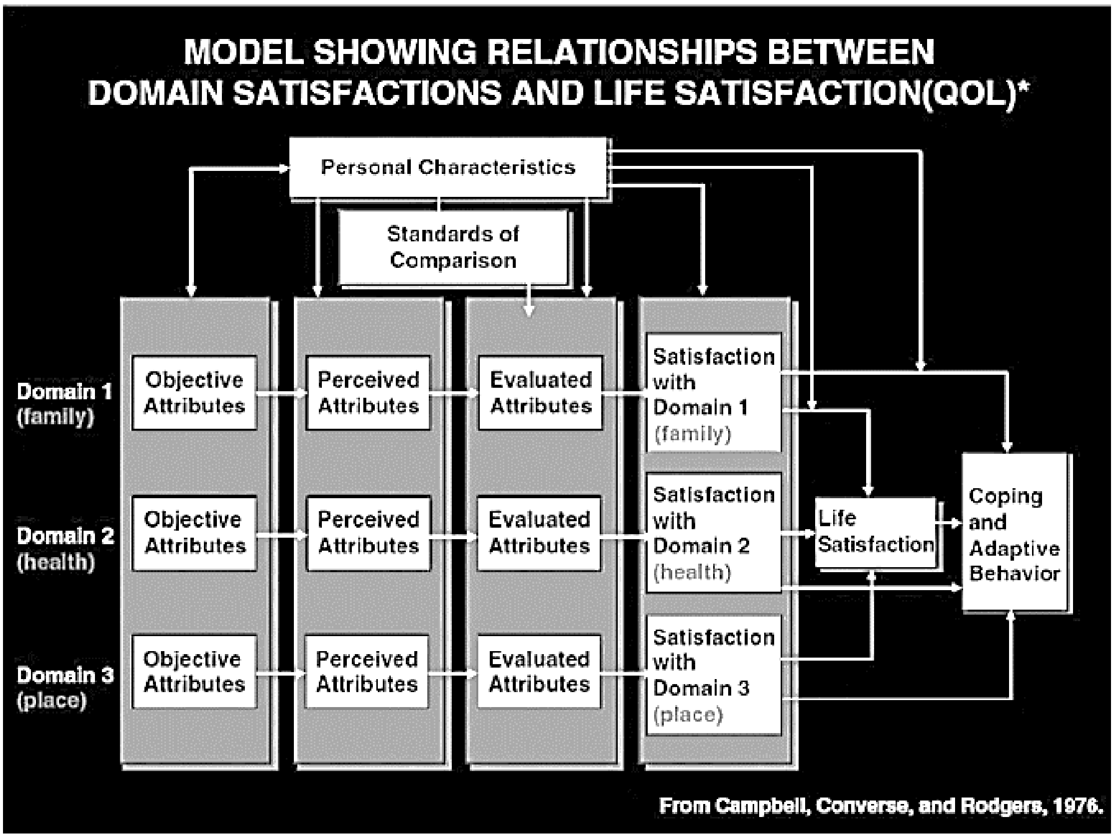


Figure 2.1.13. Model showing the relationship between domain satisfactions and life satisfaction (Campbell et al. 1976)

Subjective indicators

Subjective indicators are used for the measurement of attitudes (Das, 2008). These indicators are based on primary data collected through sample surveys using the measurement of personal satisfaction by asking people their feeling regarding life and their living environment (Lee, 2008; Stimson and Marans, 2011); therefore, subjective indicators cab be obtained by surveys (Thinh et al., 2010). They show the individual’s assessment of objective conditions of life. The accurate meaning of subjective dimension “depends on the context in which it is used” (Das, 2008).

Subjective indicators are considered to have higher efficiency but lower measurement reliability (Lee, 2008). It is cited by McCrea et al. (2011b) that researches focusing on the subjective QOUL represent that “people’s subjective evaluations of many aspects of the urban environment can contribute to satisfaction with urban living and overall life satisfaction” (McCrea et al., 2011b). Therefore subjective QOUL is influenced by subjective assessments of the urban environment.

Measuring subjective quality of urban life through field survey:

Generally, to measure the subjective indicators of QOUL, people’s perceptions and assessments of QOL are collected through survey methods. In this type of research, different aspects of people’s lives that are considered as quality of life domains are asked to assess these domains. Levels of satisfaction are collected through a standard response format such as questionnaires to evaluate aspects of quality of urban life which might be different in different respondents (McCrea et al., 2011a).

Objective indicators

Objective indicators indicate the external condition of life, they are measures based on frequency (Das, 2008). They can be measured by observable indicators (Thinh et al., 2010). These indicators are based on secondary analysis of data and involve the statistical data, governmental statistics, and aggregated data at the national level as well as existing information and indicator system (Lee, 2008; Das, 2008; Thinh et al., 2010; Stimson and Marans, 2011). Their outcomes do not represent the attitude of individuals certainly. Objective indicators are considered to have lower efficiency but higher measurement reliability. (Lee, 2008)

Measuring objective quality of urban life:

In studies developing objective dimensions of QOUL, there are some given measures that people are asked to answer the questions about their living conditions based on these measures. People are not even asked if their living conditions are bad or good (Das, 2008).

To investigate the objective quality of urban life, McCrea (2007) represented physical and social dimensions that may affect or be related to the quality of life of individuals or maybe indicators of quality of urban life. Figure 2.1.14 shows the types of objective indicators of the urban environment.

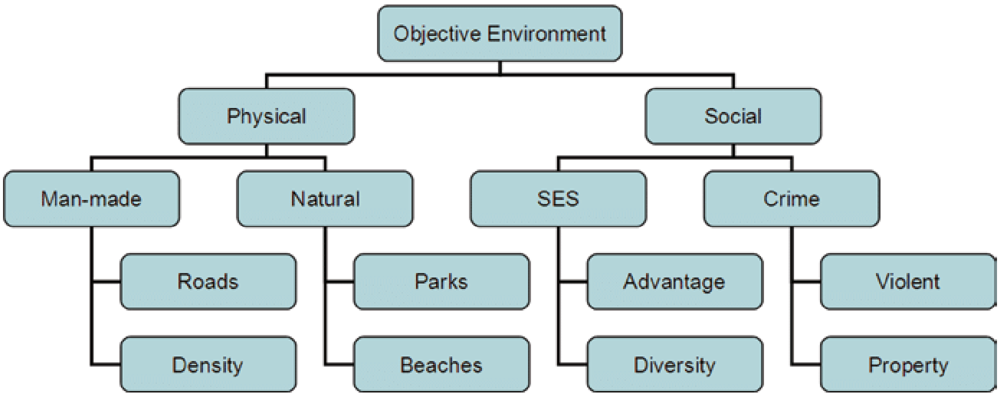


Figure 2.1.14. Types of objective indicators of the urban environment (provided by Rod McCrea; cited by Stimson and Marans, 2011)

The studies of objective QOUL involve many objective characteristics of the urban environment to combine or to weight objective indicators “to generate an objective QOUL index for ranking place” (McCrea et al., 2011b).

Linking Subjective and Objective indicators

Two approaches study both objective and subjective QOUL, in the first approach both types of indicators, objective characteristics of the urban environment, and people’s subjective assessments of the urban environment, are included but the links that related them together are not investigated. The objective and subjective indicators are often assessed independently and the results are compared in these researches.

Another approach is the studies that have tried to link objective and subjective indicators. The first attempt by McCrea et al. (2006) is defining a model that is adapted from Campbell et al. (1976). As this model was too complex, a simplified bottom-up operational model is developed to find the link between objective dimensions and subjective evaluations related to those dimensions (figure 2.1.15).

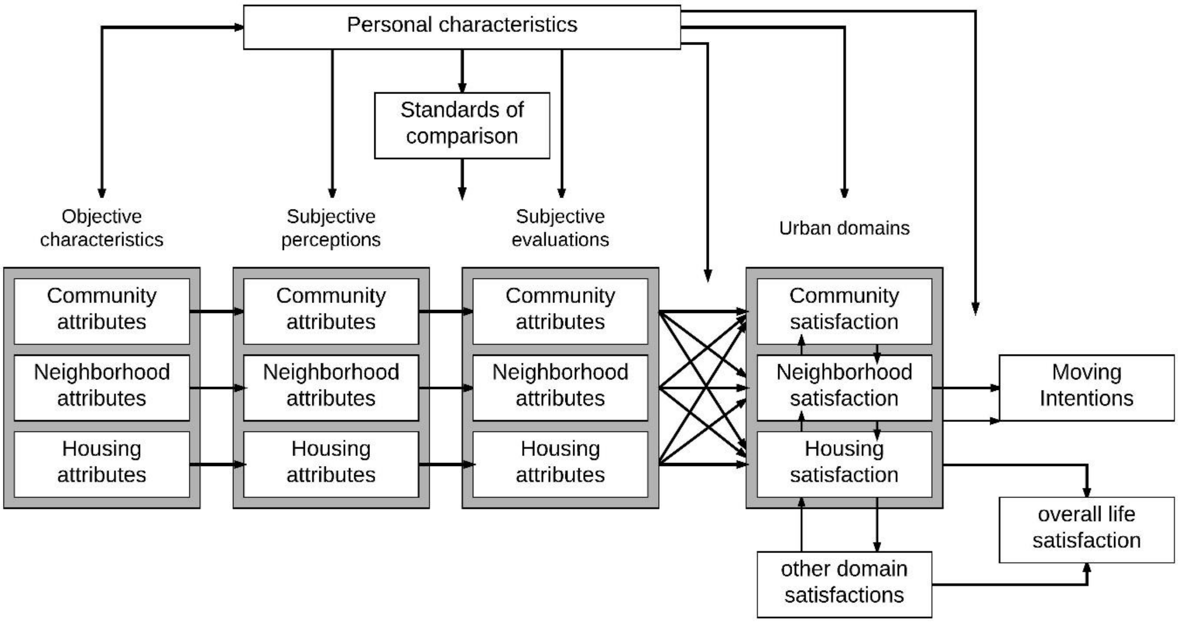


Figure 2.1.15. Model of determinants of satisfaction with the residential environment (McCrea et al., 2007, adapted from Campbell et al. 1976)

McCrea et al. (2011a) explore the links between objective and subjective urban environment and particularly, the effect of their integration on understandings of the relationship between them. As it is cited by McCrea et al. (2011a, 2011b), this new approach assumed one of the important results that there are not strong links between objective features and subjective indicators of QOUL (McCrea et al., 2011a).

2.1.6 Using GIS to study objective and subjective indicators

In order to link characteristics of urban environments to individuals, which reflects objective and subjective measures, McCrea et al. (2006) developed a method using the geographic information system (GIS). GIS methodology can be used to link objective information about urban environments with subjective indicators of the urban environment through geographic information and linking it to residential locations of survey respondents. (McCrea et al., 2011b)

Asking residential addresses of respondents, geocoding these addresses, then relating subjective responses with these spatial reference points, the link between objective and subjective indicators is investigated (McCrea et al., 2011b). Using the results and findings f McCrea et al. researches in different years (2005, 2006, 2007, 2011) it is not considered in this research to find the relationship between the subjective and objective indicators of quality of urban life, but the way to link them together.

To merge the survey data with objective data including census data, environmental data, and community data associated with each respondent, Marans and Kweon (2011) developed the following data set model (Marans and Kweon, 2011), and used GIS to integrate data sources to generate a merged data set.

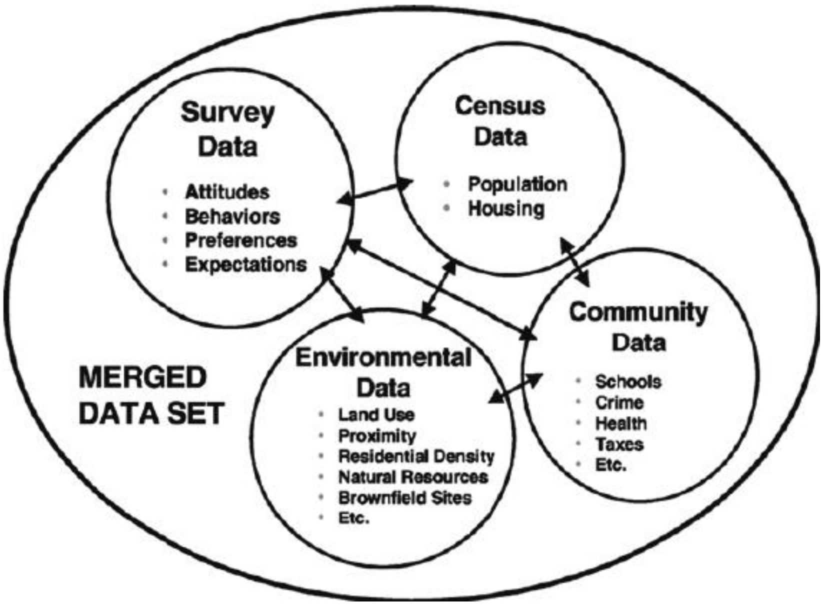


Figure 2.1.16. Merged survey data and objective data (Marans and Kweon, 2011)

2.1.7 Measuring QOUL in this research

Quality of urban life is a multi-disciplinary concept; in other words, it is a multi-dimensional concept. As it has been discussed in the literature, this complex concept cannot be figured out through only one dimension. It should be investigated using various dimensions; in other words, the relationship between different dimensions, while QOUL is the consequence of the relationship between dimensions. Of course, the relationships between these dimensions vary in different communities.

Based on the literature review, the main dimensions which contribute to realizing the quality of urban life have been developed. Housing is the most considered indicator in the literature review, additionally, access to different land uses such as health centers and educational centers. Therefore to organizing principles for the quality literature to link QOUL to physical form the dimensions of QOUL that are represented by McCrea et al. (2007) is used in this research as basic principles of quality of urban life.

Objective characteristics (for instance cost of housing) predict subjective perceptions (for instance decision to buy or rent housing) which predict subjective perceptions (for instance, the price of housing is too expensive), which predict satisfaction in different urban domains.

This research is conducted to examine the relationship between objective measurements and subjective dimensions in the urban environment in terms of overall satisfaction. The objective density and subjective overcrowding and relationship between them, as well as proximity to services including objective access and subjective assessments of access, will be investigated in this research, as it has been examined by McCrea (2007). According to previous studies, the social environment is another important factor that affects QOUL. Satisfaction with the social needs of residents in social environments such as the sense of community and friendly relationships with neighbors is related to subjective QOUL that is mentioned by various researches. Objective dimensions of social environments are related to household structure. (Farrell et al., 2013; McCrea et al., 2011a; Sirgy and Cornwell, 2001)

To develop the framework model, the operational model of McCrea et al. (2006, 2011b) (figure 2.1.10) which is simplified by skipping the process of subjective perception as well as combining the different geographic levels of subjective QOUL into an overall measure of subjective QOUL (McCrea et al., 2011b) is applied. Moreover, to the subjective perceptions of indicators, satisfaction with those indicators are also considered in this research.

Considering the literature review, three main indicators will be examined. The first indicator is population, the second one is structure, which refers to the built environment, and the third indicator is land use.

The first indicator of QOUL: Population

Studies show that there is a relationship between population and QOUL, and the population affects people’s satisfaction with their environment. The first sub-indicator of the population, which affects the QOUL is **the size of the population**. **Population structure** and **household structure** are the next indicators that affect QOUL. Another factor of population, which influences QOUL is **population density**. **Perceived overcrowding** and **satisfaction** with it are the last sub-indicators of the population.

Measuring population:

The size of the population, population structure, and household structure are objective indicators of QOUL. The objective indicators of QOUL will be studied through statistical data and census of the case study, as well as maps and shapefiles of Andisheh new town.

Subjective indicator of QOUL in this study includes perceived overcrowding and satisfaction with overcrowding in two scales of neighborhood and city. Satisfaction with the number of households is another subjective indicator. These subjective indicators will be reached through the questionnaires, which will be filled out by residents of Andisheh new town.

The second indicator of QOUL: Built Environment (Structure)

This indicator will be studied **housing, accessibility,** and **urban image**. Housing is one of the most important factors that affect QOUL. “Housing satisfaction is predicted by the level of housing ownership, housing age, and housing temperature, the size of the home is not an important indicator in the unmoderated model even though other studies show many people prefer to live in a low-density environment” (McCrea et al., 2005). Accessibility is another significant indicator, which has an effect on QOUL. Urban Image is related to how residents consider the built environment around them and how satisfied are they with the urban structure.

Measuring the built environment (structure):

Using objective and subjective indicators, the effect of the built environment on QOUL will be discussed. The indicators related to housing include housing cost (rent or buy), area of a dwelling unit, and age and quality of building as objective indicators and satisfaction with each indicator as subjective indicators. Accessibility contains access to different land uses such as green spaces, shopping centers, health centers, and educational units as well as satisfaction with access to them. The objective indicators should be measured via census, statistical data, existing maps, and analyzed through software such as ArcGIS and Depthmap. The subjective indicators including people’s satisfaction with housing, accessibility, and the way they imagine the urban environment around should be investigated by asking residents of the case study through questionnaires, then analyzed using SPSS and descriptive approach.

The third indicator of QOUL: land use

Based on the literature review, green space is one of the most important indicators that affect QOUL, which has been studied in QOUL research by Das (2008), Uelengin (2001), McMahon (2002), Massam (2002), Santos and Martins (2007), McCrea et al. (2006), and Fahy and Cinneide (2008). Furthermore, the other type of land uses affect QOUL are educational units, health centers (Das, 2008; Fahy and Cinnéide, 2008; McCrea et al., 2006; Santos and Martins, 2007; Uelengin et al., 2001) and shopping centers (Das, 2008; Uelengin et al., 2001; McCrea et al. 2008;2011).

Measuring land use:

This objective indicator of land use includes proportional land use per capita and will be studied through existing maps by measuring the total amount of each land use and considering the population of Andisheh new town. Subjective indicators include how satisfied are the residents with each land use; it will be investigated through questionnaire by asking residents.

Indicators of QOUL in this research

The following table (table 2.1.4) represents the indicators of QOUL as well as objective and subjective indicators of QOUL in this study.

Table 2.1.4. Indicators of QOUL in this research

Indicators of QOUL		
Indicators	**Objective**	**Subjective**
Population	• Population size • Population structure • Household structure • Population density • Number of households in the building	• Perceived overcrowding (neighborhood, city) • Satisfaction with overcrowding (neighborhood, city) • Satisfaction with the number of households in the building
Built environment (structure)	• Housing (age of the building, area of the dwelling unit, cost) • Accessibility (access to various land uses)	• Satisfaction with housing (age of the building, area of the dwelling unit, cost) • Satisfaction with accessibility to land uses
Land use	• Green space per capita • Educational units per capita • Health centers per capita • Shopping centers per capita	• Satisfaction with green space • Satisfaction with educational units • Satisfaction with health centers • Satisfaction with shopping centers

2.2 Urban Identity (Place Identity)

In environmental psychology, “Place” is the core concept, which involves meaning that makes it different from the related concept of space. Many researchers have been tried to define the people’s relationship with the place and evaluate it using the notions of “place attachment”, “place dependence”, “place identity”, “sense of place”, “spirit of place”. Each of them has a somewhat different meaning, although the differences are still not clear. There is no agreement on defining the relationship between a person and place and assessing it; moreover, the relationship between these notions is still not clear (Altman and Low, 1992; Arbab and Azizi, 2009; Falahat, 2006; Hidalgo and Hernandez, 2001; Jorgensen and Stedman, 2001; Relph, 2008). Despite the differences, the relationship between people with the place gives people a sense of stability that leads to their activities in the place (Pol et al., 2002; Brown and Perkins 1992).

As the concepts used to define people’s attitudes towards their living urban places are numerous, the notion of “place identity” is focused on in this study.

2.2.1 The concept of identity

The term of identity has a very broad concept. The concept of identity indicates the ‘uniqueness’ of a person or a thing from different views, aims, and perspectives. This word is used to define “the unity of the self” by the philosophers from the 16th century until the middle of the 1950s (Gleason, 1983). Identity is defined as the statement of recognizing features based on their uniqueness (Azizi and Arbab, 2013). The uniqueness of features can only be understood through their relationships with others. Identity means “who or what somebody/something is” and “the state of being closely involved with or part of something” according to the Oxford English Dictionary; it is also defined as “the fact of being who or what a person or thing is”, this word is originated from the Latin word *identit* (Hornby and Wehmeier, 2003).

This concept has a relatively clear definition in terms of sociology and psychology. In the field of psychology sense of identity is one of the characteristics of personality; that is the feeling of a person related to the continuity of his mental life. On the other hand, about identity, sociologists believe in the theory of symbolic interaction; they distinguish identity as a social issue (Komeili, 2008). As a famous sociologist, Erikson believed that social interaction affects identity, while identity is formed by a person's experiences and activities in life (Gleason, 1983). However in social sciences, it is explained that identity is formed socially (Wendt, 1994), Cheshmehzangi and Heat (2012) imply the influence of the environment and what takes place within it (Cheshmehzangi and Heat, 2012).

Identity indicates the relationship between a person and his society that is determined by social categories that define him in his environment (Jenkins, 2002). It is suggested by some researchers that identity is to distinguish "self" and the "other" with emphasis on the relationships between the self and the others (Cheshmehzangi and Heat, 2012). People can find their identity by understanding themselves and their environment.

According to Giddens (1995), the concept of identity as reflexive awareness and consciousness is what a person has knowledge about it; therefore this concept means continuity of person in time and place (Giddens, 1995). Identity is evolving images of individual and other, so it is formed mutually (Katzenstein; cited by Kaymaz, 2013). It is also defined by Castells as "people's source of meaning and experience" (Castells, 2004). Therefore, at different times in different places, people feel a various sense of identities.

Identify contains a comparison between people and things, so that a person can understand "who is who" and "what is what" (Kaymaz, 2013). It is like a glue that binds people together and connects them to place, it brings a sense of belonging and it is the opposite of rootlessness (Aly, 2011).

Kaymaz (2013), describes some aspects of identity as follows:

- "Uniqueness of a thing or a person is central to the identity concept
- Identity requires comparison between things of individuals
- Meaning and experience play an important role in the perception of the identity
- Identity is never a stable construct, on the contrary, it is a continuously evolving and dynamic phenomenon
- Identity involves interaction with others" (Kaymaz, 2013)

Identity is not a found object, it is a process; therefore, it cannot be fabricated. It is not a self-conscious thing, since self-consciously is trying to understand identity without considering the issues people faced; (Aly, 2011). Levels of identity can vary between more specific and more exclusive or abstract levels, and each level of identity can mediate perception and judgment at the relevant level (Bonaiuto et al., 1996).

2.2.2 The concept of place

The concept of place is mainly defined by Relph (1976) and Canter (1977) that is developed by Punter (1991) and Montgomery (1998) as components of sense of place. Relph (1976) developed the theory that there are three main components formed place: “the physical setting”, “activity”, and “meaning” (Relph, 2008). Canter (1977) represented a theoretical model known as place type, he recognized that places could be conceptualized as an integrated system. Based on Canter’s model, the urban environment is a place consisting of three tangled dimensions “physical attributes”, activities”, and the “conceptions” moreover, the potential relationships between these components will lead to creating a place. The quality of the urban environment is the result of these three components (Canter, 1977). According to Relph, understanding the place can lead to the maintenance of existing places and creating new places (Relph, 2008, p. 29). Without a comprehensive understanding of a place that contains human characteristics, the reason for the specialty of some places can be explained difficulty (Seamon, 1982). The place is the result of the interaction of its three components. Halpenny defines that “place is a spatial location that is assigned meanings and values by society and individuals (Halpenny, 2010).

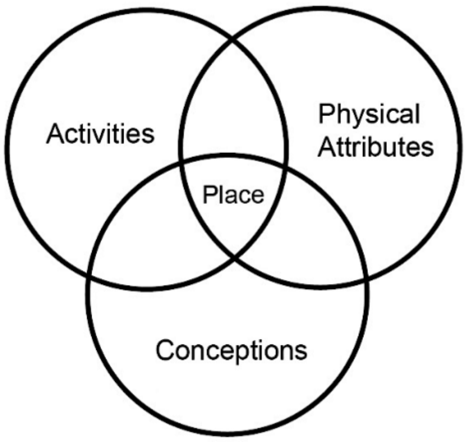


Figure 2.2.1. A visual metaphor for the nature of places (Canter, 1977)

Madanipur defines place as a part of space with a sense of value and meaning (Madanipour, 2005), where a person has a perfect understanding of existence and life

(Habibi, 2008). A place is a space that has meaning for individuals or groups of people. It is defined as “space + meaning = place” (Harrison and Dourish, 1996, p. 6).

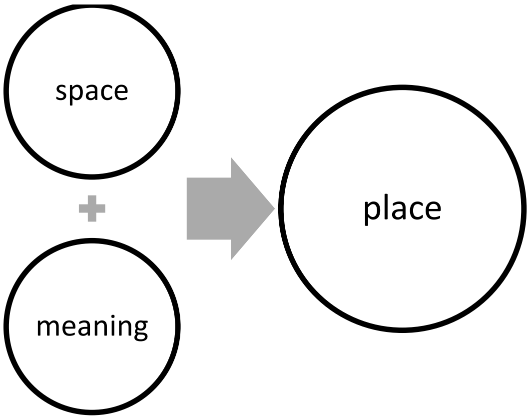


Figure 2.2.2. Definition of place (Harrison and Dourish, 1996)

Norberg-Schulz noted that a place is a space with a distinct character (Norberg-Schulz, 1975). The physical characteristics of a place are significant, as it contains buildings and natural features that describe that place. Norberg-Schulz emphasized concrete things with material substance, shape, texture, and color in defining place (Norberg-Schulz, 1975). All of these components define the environmental character of the place (Partovi, 2008). However, the meaning and interaction of people with the physical setting of the place are important as well, since meaning links an individual with the physical environment.

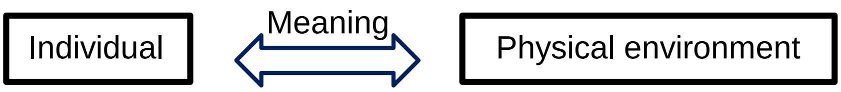


Figure 2.2.3. Environmental character of the place (based on the literature)

Relph (1976) noted that place is a space that contains meaning (Relph, 2008). It is the human experience in a specific space, which gives meaning to it (Arbab and Azizi, 2009; Harner, 2001). Place and space are interconnected that the physical dimensions of space are connected with meaning due to the values that people give to that place (Ujang and Zakariya, 2015).

The concept of place refers to multifaceted aspects of an individual’s experiences rather than a location (Relph, 2008), since it is developed, understood, and experienced differently by various people (Harner, 2001; Hay, 2013); it means a place may have a range of meanings and values for different people at the same time. Donat (1967) noted that places contain different levels of identity and they reflect the concept of identity; when a user tells about his/her place, levels of identity (related to different levels of street, city, country) are indicated (Azmi et al., 2014).

Finally, there are two ways in which place has been related to identity. The first way is place identifications, which refers to an individual's represented identification with a place. In this case, the place can be considered as a social identity theory. In the second way, the place has been related to identity through the term of place identity (Twigger-Ross and Uzzell, 1996). The second way is constructed by Proshansky (Proshansky et al., 1983; Proshansky, 1978).

2.2.3 Sense of place, place identity, and place attachment

Many researchers have tried to explain the relationship between people and their physical environment in various ways. They use the concepts that involve the affective and cognitive link between an individual and his environment including *place identity*, *place attachment*, and *sense of place*. However, there is no agreement on definitions of these concepts, and how place identity and place attachment are related to each other (Kaymaz, 2013). Stedman defines place identity as well as place attachment as objective dimensions for measuring sense of place; because place identity and place attachment have been considered as components of personal identity (Najafi and Shariff, 2011).

Sense of place is the results of people's interaction with their environment, the relationship between people, their imaginations, and environmental characteristics and indicates human identity, feelings, and attachment towards the urban environment (Falahat, 2006; Ghoomi et al., 2015); this concept is rooted in the subjective experiences such as memories, traditions, history, culture, and society and can be affected by the objective effects in the environment such as design, landscape, smell, and sound (Ghoomi et al., 2015).

Jorgensen and Stedman (2001) offer a three-factor model that illustrates the components of the sense of place that assumed that *identity*, *attachment,* and *dependence* can differ within individuals (figure 2.2.5). It means although each component is presented as a distinct construct, potentially is correlated with one another. For instance, "a person may strongly identify with a setting, and be attached to it but feel that it is a poor place to earn a living or raise children" (Jorgensen and Stedman, 2001).

Norberg-Schulz defines the sense of place as a general phenomenon with structural, special, and atmospheric values that man achieves through the perception of navigation and identification. The sense of place has remained over time and becomes more evident when the usual rhythm of life is disrupted, for example, when a place is changed because of the war or natural disaster. The concept of sense of place specifies the nature of the place and it is found in places that contain a distinct characteristic. (Norberg-Schulz, 1975; Partovi, 2008, p. 122)

The concept of a place is formed when a person is relating to other layers. These layers can be appeared by common activities with other peoples, being in nature, or built environment. Moreover, man becomes familiar with other layers of himself concerning them. Therefore, his understanding of himself and the environment around him is increased (Habibi, 2008).

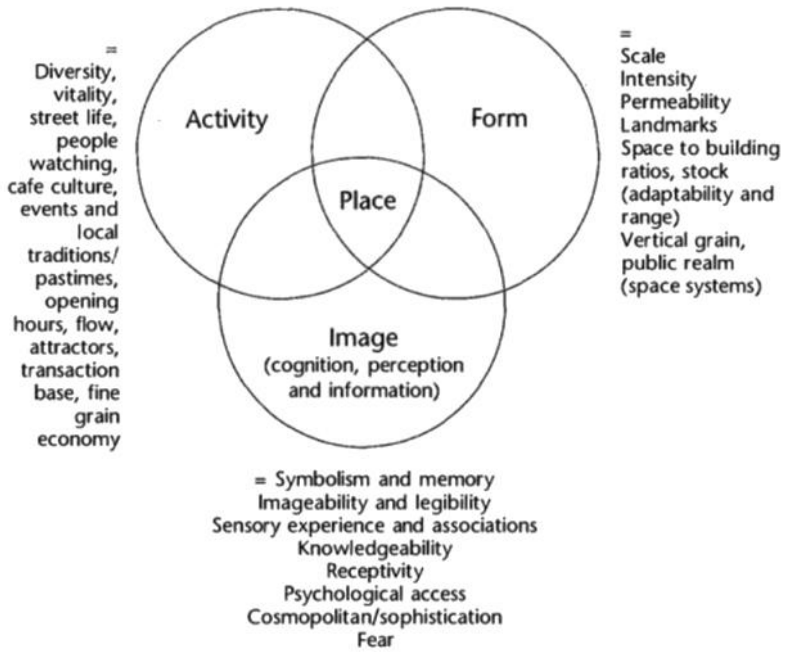


Figure 2.2.4. Components of Sense of Place (Punter, 1991)

Punter (1991) and Montgomery (1998) – see figure 2.2.4 and 2.2.6 - developed the Relph (1976) study on place identity and Canter (1977) study on the place and developed the factors that create the sense of place in the urban environment. According to Punter, physical setting, activities, and meanings are the main three components of place that create a sense of identity (Punter, 1991).

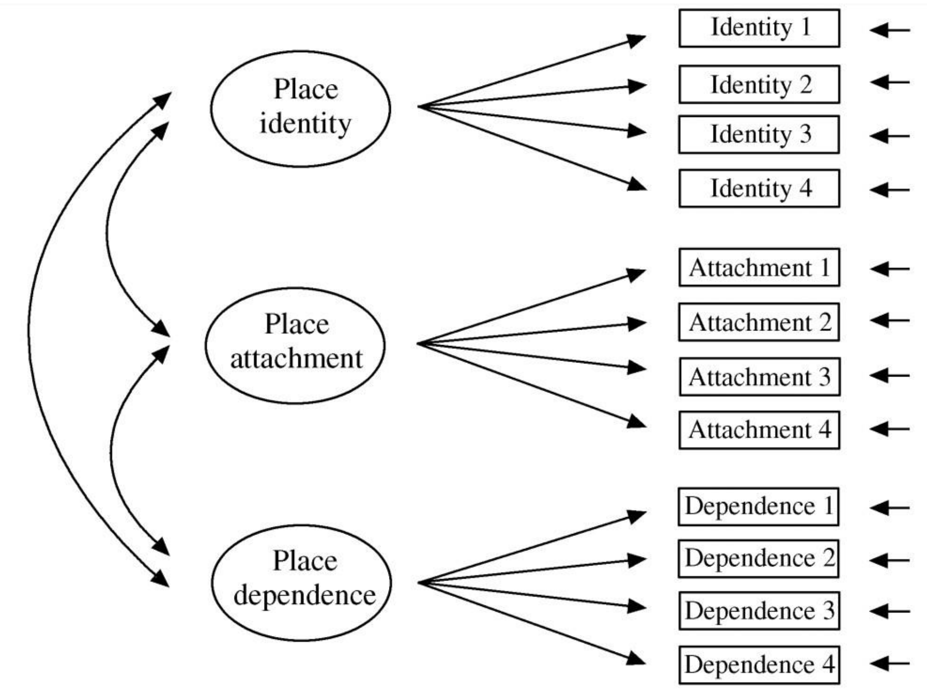


Figure 2.2.5. Three-Factor Model of Sense of Place (Jorgensen & Stedman, 2001)

Montgomery suggested forms, activities, and images as the factors determining the user's cognition of a place (Montgomery, 1998). He proposed that his model will identify the quality or characteristics of a place more precisely and enhance the potential sense of place.

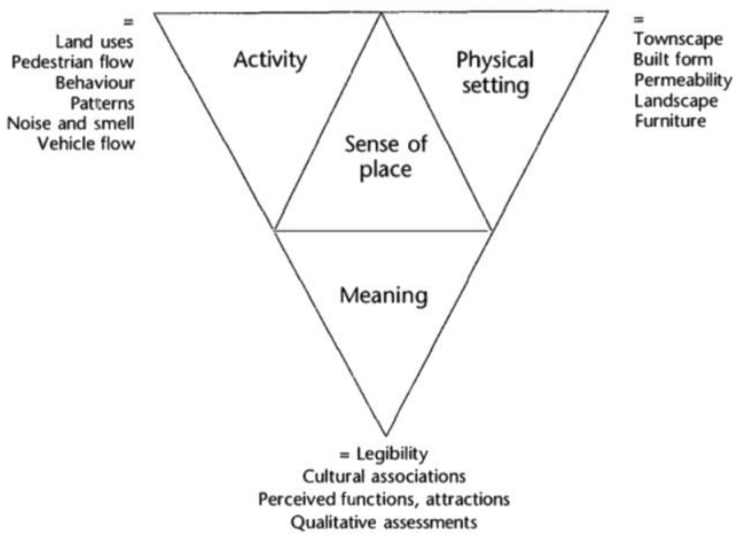


Figure 2.2.6. Components of Sense of Place (Montgomery, 1998, 97)

Based on the model of Canter, Falahat (2006) noted that the physical attributes improve the conceptions and activities as well as being the result of a series of perceptions, satisfaction, and a sense of place. In the model of important factors forming a sense of place, Falahat illustrated that the physical characteristics affect activities, meanings, and individual characteristics and also are influenced by individual characteristics. Figure 2.2.7 shows the factors affecting the components of place and how the process would be based on the viewpoint of Falahat. (Falahat, 2006)

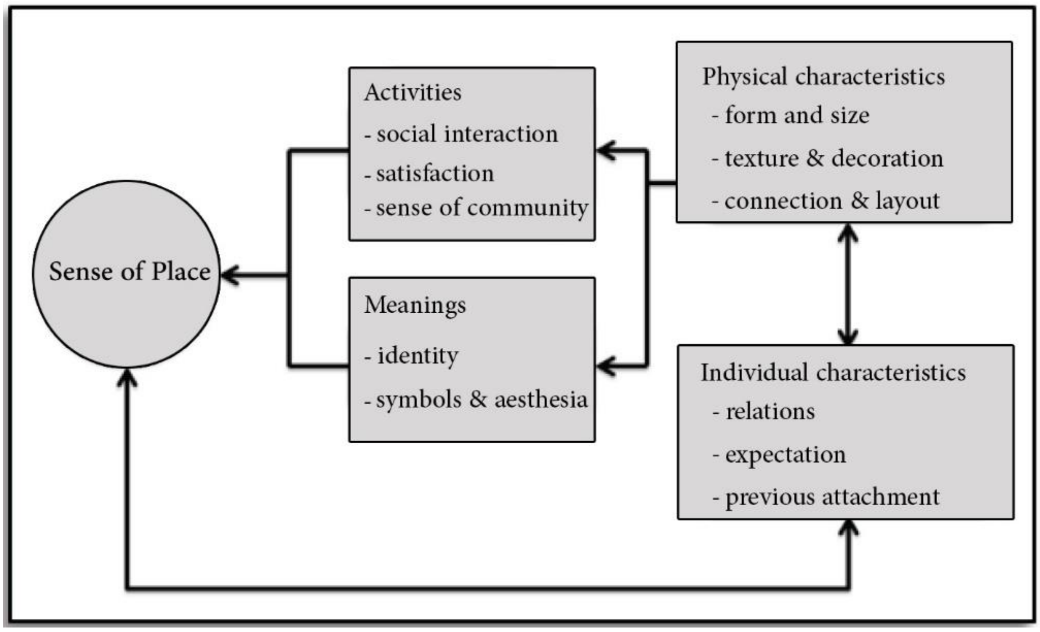


Figure 2.2.7. The model of important factors forming a sense of place (Falahat, 2006)

Approaches of sense of place

Sense of place including place attachment and place identity has various interpretations in different approaches such as phenomenology and environmental psychology.

Sense of place and phenomenology approach:

In the study of the concept of place, phenomenology is one of the most important approaches in understanding and defining a sense of place. The term “phenomenology” is turned into a descriptive method by Edmund Husserl, based on that it is a systematic discipline, which seeks to describe how the universe is created and its experience through consciousness (Rikhtegaran, 2001). From the perspective of phenomenologists, a sense of place means connecting with place through understanding symbols and daily activities. This sense can be created in the living places of individuals spread over time (Relph, 2008). Individual and collective values influence a sense of place, and sense of place also affects values, attitudes, and in particular, individual and social behavior in the place. People usually participate in social activities according to their sense of place (Canter and Craik, 1981).

Since the sense of place means the personality of the place, which has a meaning close to the spirit of the place. In phenomenology, experience is the main principle of perception. This experience means mental purity and achieving the nature of things (Falahat, 2006). In this regard, it may also be noted that the spirit of the place is in the place itself, but the sense of place is formed in the mind of the user. A sense of place can be manipulated by utilizing its factors, but the spirit of the place depends on the characteristics of the place itself.

According to Norberg-Schulz's point of view, the place is more than an abstract space. It is a whole thing made up of real objects and things that has material, shape, texture, and color. The set of these elements defines the character of the environment; that is indeed the nature of the place (Norberg-Schulz, 1975). But according to Seamon, the place refers not only to a geographic location but also the main character of a site, which makes it different from other places. In this way, various dimensions of perspectives and prospects create a distinct environment and a special sense of place in a place (Seamon, 1982).

Sense of place and environmental psychology approach:

From the perspective of the environmental psychology approach, the human requires an emotional, sensory, mental, and spiritual experience relating to the environment. These needs can be realized through intimate interaction and a kind of affiliation with the place in which they live. This intimate interaction is called spirit or sense of place (Habibi, 2008). From a psychological point of view, the sense of place is a catalyst that turns the environment into a place. The process of experiencing a place not as an object, but as a living organism, which is realized after successive mutual adaptions. Hence, the relationships between people and places require certain stability. The environment gains these attributes by combining natural and human order. (Falahat, 2006, 60)

The most important meaning of the sense of place in terms of the environmental psychology approach is in the experience of the symbolic relationship of the person, group, and place that can be understood from social, political, historical, and cultural sources.

The level of sense of place

The sense of place has different levels. In studies about different levels of feeling about a place, Shamai developed three main degrees that are the sense of place, place attachment, and commitment to a place; this sense is categorized in seven levels:

1. Incuriosity to place: this level is usually not considered in the sense of place literature, but it is used to measure the sense of place.

2. Awareness of being in one place: this level is when a person knows that he lives in a distinct place and recognizes the symbols of that place, but he is no feeling to connect him to that place.

3. Place dependence (sense of belonging): at this level, the person is not only aware of the names and symbols of the place, but also has a sense of being and common sense with that place. In this case, the symbols of the place are respectful and what happens to the place, is also important for the individual.

4. Place attachment: at this level, a person has a complicated emotional connection to the place. The place has meaning for him and place is the center of the individuality. The collective experiences and individual identities give the place personality in combination with the meanings and symbols. In this case, it is emphasized the uniqueness of the place and its difference from other places.

5. Integration with aims of the place: this level represents the integration and coherence of individuals with the needs of the space. In this case, a person has passion, love, support, and self-sacrifice to the place.

6. Attendance in place: at this level, the active role of the individual in the community because of their commitment to the place can be seen.

7. Sacrifice for the place: this level is the highest level of sense of place, and a person has the deepest commitment to the place and shows many sacrifices in the direction of tendencies, values, freedoms, and prosperity in different situations. At this level, there is the possibility of abandoning individual and collective interests because of the greatest interest in the place. (Shamai, cited by (Mirgholami and Ayshem, 2016)

The two primary levels mentioned by Shamai are mainly contain perceived and cognitive levels of the individual relative to the place, from the third level, it includes an emotional dimension of the person to the place so that Relph also points to the deepest level of dependency to place unconsciously, he states that the unconsciousness of this sense indicates itself when a person is separated from the place; the sense of belonging has a wide range. (Foruzandeh and Motallebi, 2011)

Due to the concept of sense of place in different approaches and levels, the elements of sense of place can be categorized into two groups of perceptual and cognitive factors and physical factors (Falahat, 2006, 62).

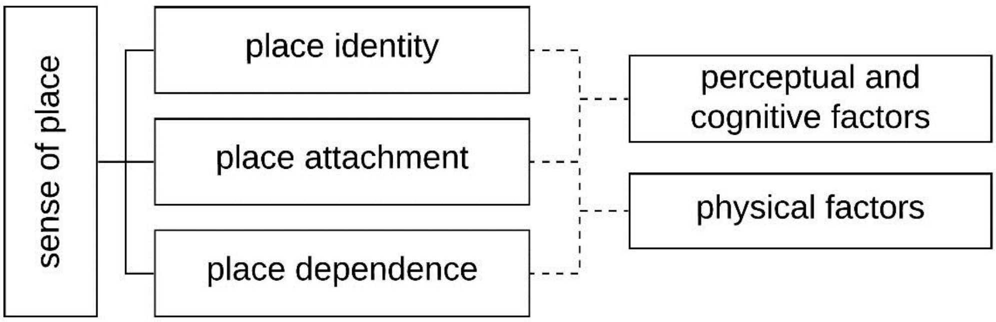


Figure 2.2.8. Components and factors of sense of place (based on the literature)

As a phenomenologist, Relph believes that in place phenomenology, experience is the main element of perception. In experiencing a place, a person may have the same feeling as others; this emotional feeling is a sense of place which leads to the identity of the place. Based on Relph's opinion, the deepest dependence on place occurs unconsciously. He calls this dependence rootedness. He describes seven degrees for the sense of place that includes a wide range from self-alienation to belonging to a place and deep identity. In his opinion, place attachment influences the formation of identity of a place considering the importance of place in developing and keeping self-identity and group identity and the composites of its characteristic features. (Falahat, 2006; Relph, 2008; Ujang, 2012)

2.2.4 Definition of urban identity (place identity)

Identity, which is related to a city is an issue that has always been the subject of many scholars to represent various ideas about it. More researchers in social and environmental psychology fields have been conducted regarding the nature of this concept (Aly, 2011a).

Place identity is one significant concept that refers to people's bonds with places. The message based on interactions of environment or built space on human's mind and his behavior is the same concept that is referred to in various studies as "identity" and also 'personification or distinction', 'meaning', 'sense of place', 'belonging to place', and 'rootedness' (Arbab and Azizi, 2009). This concept is explained as "the subject of the built environment, as a powerful communication field, includes meaning and messages that people can decode and understand them by their rules, preferences, motivations and other factors" (Azizi and Arbab, 2013). The notion of place identity refers to identity regarding the place, so it should include the meanings of identity that are two aspects of continuity and uniqueness and the features of place (Jacobson-Widding et al., 1983).

According to Giddens in one of his latest social and psychological point of views, identity (identity of place) is what a person is aware of it (reflexive awareness), a concept that means the continuity of a person in time and place (Giddens, 1995). Place identity involves "those dimensions of self that define the individual's personal identity relating to the physical environment by means of a complex pattern of conscious and unconscious ideas, beliefs, preferences, feelings, values, goals, and behavioral tendencies and skills relevant t to this environment" (Proshansky, 1978; cited by Jorgensen and Stedman, 2001)

This term is used first by Proshansky as a substructure of self-identity consisting of cognitions about the physical environment in which people live. These cognitions can be attitudes, feelings, memories, ideas, values, meanings, preferences, and conceptions of behavior related to the environment where people experience every day; in other words, he defines place identity as those dimensions of self that define the individual's personal identity relating to the physical environment (Proshansky et al., 1978, p.147;1983). Twigger-Ross and Uzzel (1996) define place identity as a means to distinguish oneself from others and to preserve a sense of continuity to create a sense of self-efficiency (Twigger-Ross and Uzzell, 1996).

"Urban identity is a reflection of all the local people's traditions, culture, aspirations grouped together. It reflects their needs, their successes, their failures, and their future"

(Aly, 2011b). It can be also defined based on the combined understanding from various urban elements of the place such as buildings, streets, public spaces, and urban furniture (Ziyaee, 2018). So, since cities are constantly changing, and evolving new forms, their urban identity is created through the complex interaction of natural, social, and built elements. Urban identity is linked to meanings and perceptions held by the people relating to their environments (Ujang, 2012). Culture and experience influence meaning and attachment that affect imageability (Rapoport, 1990).

Proshansky compared place identity with social identity and explained that as social identity describes a person's socialization, place identity in another aspect of identity (Proshansky, 1978).

According to Kaymaz (2013), the continuity of place identity is strongly linked to place attachment and a sense of belonging that are essential to creating an emotional and cognitive relation to a place, which leads to a sense of community. Therefore, the identity of a place is more than physical appearance, but also involves a "meaning" for the individual and the community (Kaymaz, 2013). The urban environment has to be considered through the evolution of the local urban context, concerning human activity, built form, and nature.

A comprehensive study on the characteristics of the place identity has been conducted by Relph (1976). He defines identity as the basic concern in an individual's everyday life which refers to the unity of the objects that makes them different from the others. He argued that place identity is influenced by three interrelated components that are physical features and appearance, activities, and meaning and symbols (Relph, 1976, 2008). Physical features including natural elements such as mountains and lakes and manmade elements such as buildings and streets that present their characteristics. Activities contain events, situations, and functional patterns of the place. Experiences and interactions of the users form meaning and people experience a sense of identity through their living environments.

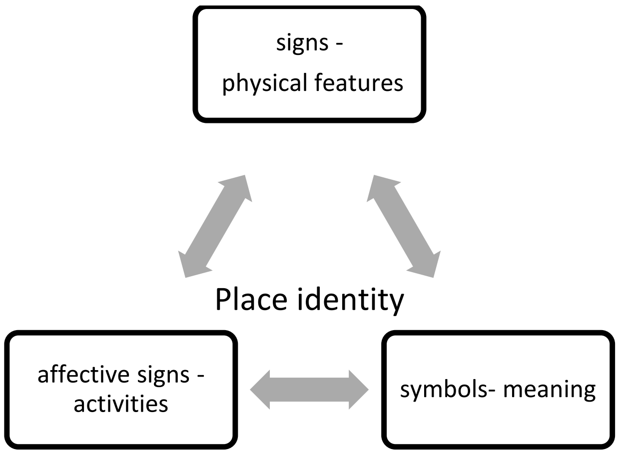


Figure 2.2.9. Three interrelated components of place identity (based on Relph, 1978, 2008)

Rapoport (1990) in his study about the urban environment explained that people react to the urban environment based on the meaning that is created through their perception of the environment. The physical setting of the urban environment also affects the sense of the users regarding the place that will create a further precise image of that place (Rapoport, 1990). Based on his opinion, signs and symbols of the place can create perceptional meaning for its users. Additionally, the surrounding environment can be studied through signs that shape behaviors, affective signs which guide feelings, and symbols that affect thoughts (Ziyaee, 2018).

Lynch (1960) also explained that physical features and appearance influence the sense of place and make places more legible, organized, and navigated for their users. A detailed image of a place can be formed in users' minds when a place is legible; therefore, users are able to orient themselves (Lynch, 1960). As a phenomenologist and also an urban planner who developed the most specific definition of identity that is related to the city and urban spaces, he believes that the simplest form of meaning is the identity that is the meaning of a place. Identity means that a place can be recognized by a person as a distinct place from other places so that it has a distinctive, unique, or at least a specific characteristic. Identity of the place has a close relationship with individual identity, because personal memories, feelings, and values are created in meaningful and understandable places. (Lynch, 1992)

Alexander defines identity as an embodiment of a nameless quality, which is the basis of life and soul of every person, city, building, or nature. In his point of view, defining this quality in buildings and cities should begin by understanding that the identity of each space is obtained by continuous repetition of specific patterns of events in that location. The process of recognizing the space is not so that preformed components put together and create the whole, but in this process, the whole is before the components and creates its components step-by-step. Therefore as the whole is created, it becomes an eternal identity. (Alexander, 1980, cited by Arbab and Azizi, 2009)

As the term “identification” refers, this concept represents the process of comparing existing “objectivity” with information and data of it in memory (“subjectivity”). People interact with their environment. The role of humans as a receiver and the environment as a sender shows the importance of its independence as a subjectivity containing messages. Accordingly, an environment will have an identity for a person, when it can be considered as an objective and independent feature. On the other hand, a person also can act and behave in that environment as an objective creature, and be able to adapt perception of the environment with his mind. (Pakzad, 1996)

To summarize the views explained “meaning” and “concept of identity”, it can be mentioned that identity is a factor to distinguish an environment and change it to a special place. Identity of place or urban identity is objectivity with subjectivity: objectivity because a part of identity depends on the elements and their appearances that can be seen, and subjectivity, while another part of identity is formed in residents’ minds and is reflected in their memories, feelings, and values. Identity is not only the result of social relations in a place but also apparent factors and elements of it. Therefore, this concept refers to two important dimensions: first, the objective dimension of identity, second, the perception of identity that is subjective.

Table 2.2.1. Some definitions of urban identity based on the literature

definition of urban identity in literature	
Arbab and Azizi (2009)	people's bond with places
Azizi and Arbab (n.d.)	the subject of the built environment includes meaning and messages that people can decode and understand
Jacobson-Widding et al. (1983)	it refers to the meaning of identity and includes two aspects of continuity and uniqueness and the features of the place
Proshansky (1978); Proshansky et al. (1983)	a substructure of self-identity consists of cognitions about the physical environment in which people live those dimensions of self that define the individual’s identity relating to the physical environment
Twigger-Ross and Uzzell (1996)	means to distinguish oneself from the others and to preserve a sense of continuity to create a sense of self-efficiency
Aly (2011)	reflection of all the local people’s traditions, culture, aspirations, needs, successes, failures, and future

Ziyaee (2018)	it can be also defined based on the combined understanding from various urban elements of the place
Ujang, 2012	it is linked to meanings and perception held by the people relating to their environment; it is not only physical elements but also meaning and interaction between people and their environment
Kaymaz (2013)	it is more than physical appearance, but also involves a “meaning” for the individual and community

2.2.5 The components of urban identity

Urban identity like the sense of place is a complex combination of meanings, symbols, and qualities that a person or group perceives consciously or unconsciously from a specific space. The meanings and concepts that are decoded by people after the perception of the place are the factors that make the identity of the place. In this case, urban identity does not mean just a feeling or any relationships with a particular place, but a system and a cognitive structure by that a person feels attached to subjects, people, objects, and concept of a place.

Urban identity is affected by the physical features as well as the emotional aspects of environmental experience. It is also related to the significance of a place for emotions and relationships that gives meaning and purpose to life and reflects the sense of belonging. To maintain urban identity is to “ensure continuity in the physical, social together with meanings and attachment held by the people” (Ujang, 2012).

“Place-identity is the source of meaning for a given setting under relevant cognitive clusters that indicate what should happen in it, what the setting is supposed to be like, and how the individual and others are supposed to behave in it”. The meaning of spaces and places leads to not only recognition of an environment by the individual but also understanding the intended purpose and activities relating to its design (Azizi and Arbab, 2013; Proshansky et al., 1983b). Place identity is affected by physical (functional) as well as the emotional aspects of environmental experience (Ujang, 2012).

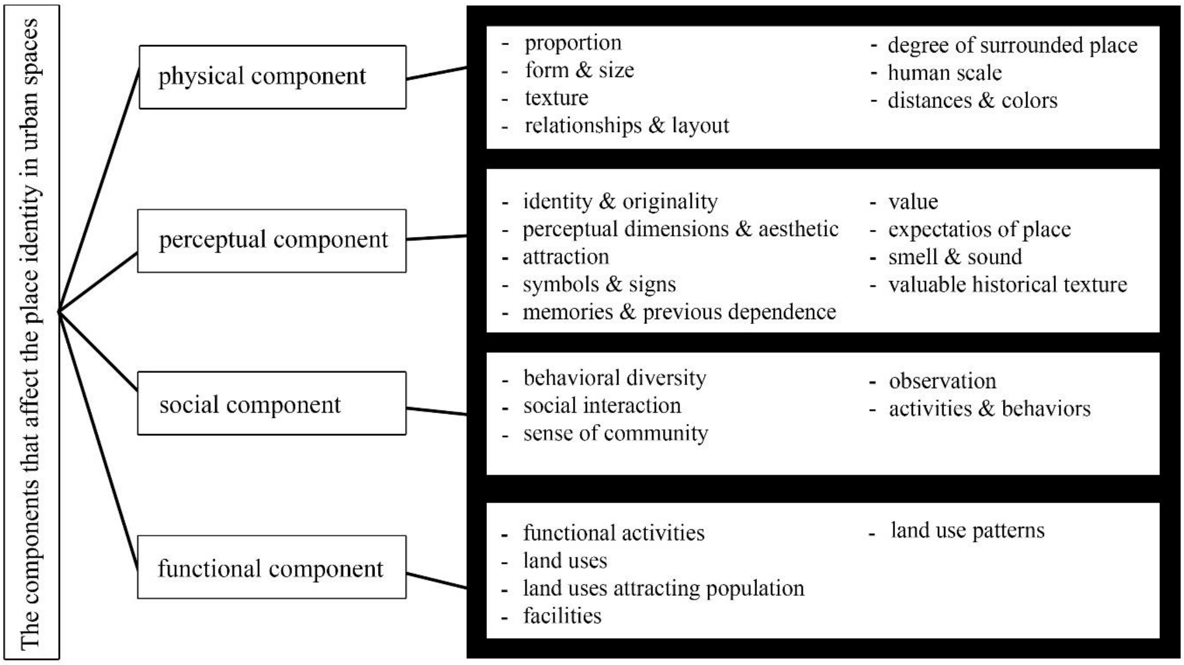


Figure 2.2.10. The indicators of evaluation of urban identity in urban spaces (Mirgholami and Ayshem, 2016)

In the research about the process of urban identity in Hashtgerd new town in Iran, Arbab (2009) argued that identity is not a predetermined concept in new towns; it is formed by the interaction between people and their environment over time. He studied six indicators: four indicators related to identity are legibility and personification, social interaction, memory, and belonging to place; 5th and 6th indicators that affect identity are: satisfaction with living in Hashtgerd new town and time of habitation. The result of the research shows that residents who have been living in that new town longer, have not only more feeling of identity but also more satisfaction. (Arbab and Azizi, 2009)

According to Aly (2011), there are three basic elements for urban identity: the static physical setting, the activities, and the meaning. Physical settings can be analyzed containing the built environment and nature. Activity can be investigated as being creative, destructive, or passive, and meaning can change from one set of objects to another (Aly, 2011a). According to Lynch, the identity of a place is a factor that links humans and places and creates unity. Space should have a perceptible identity that is recognizable, memorable, and appealing. (Lynch, 1992)

Studies indicate that the physical characteristics of the environment are effective in creating the identity of the place by creating meanings and providing specific activities. Providing activities is created by satisfying with variable characteristics of environment such as temperature, sound, and ability to do individual activities and social interactions by static elements of the environment such as dimensions, proportions, forms, and scales. Recognition and affection relative to space are achieved by understanding the meanings, symbols, aesthetics of the form, meaning of the space, and identity. (Falahat, 2006)

The static physical setting and the activities can be understood easily, but the meaning is more difficult to realize. The physical setting can be found out containing nature and the built environment. The activities can be understood as being creative, destructive, or passive. Meanings have their own qualities of complexity, obscurity, or clarity and they can change from one set of objects to another. (Aly, 2011b)

Therefore, urban identity is defined not only by physical elements but also by meaning and interaction between people and their environment (Ujang, 2012). Physical elements are mainly the first accessible and perceptible features of the place to be realized. Then, activities, meanings, and image features concern some nonvisible perceptional factors. Activities show functional abilities of public space, however, meaning and images belong to semantic values of that place (Ziyaee, 2018).

Lynch believes that various factors affect the meaning and identity of a place such as recognition and being familiar (familiarity) that leads to a sense of place, events that make the urban spaces more memorable, structure as the concept of how elements and components in the city are related to and combined. (Lynch, 1992)

In conclusion, the relationship between humans, their mental imagination, and environmental characteristics can lead to urban identity. People cannot live in a particular environment without a sense of place identity; with this sense, the place provides the individual's relationship with all the concepts, persons, and other things in that place. In this case, people recognize all the activities and events with the place.

To sum up this part, physical setting, activity, and meaning can be considered as the basic elements of the urban identity of places (Aly, 2011b; Arbab and Azizi, 2009; Marcus and Francis, 1998; Shaftoe, 2008).

Physical Setting: the first component of urban identity

Proshansky defines that physical settings have a primary purpose, which is the goal of designing features, their required objects and facilities, and the types of people and related activities that are found in them (Proshansky et al., 1983b). According to Steadman (2003), physical features do not produce urban identity directly but affect the meanings of the urban environment, which relates to the strength of place attachment (Ujang and Zakariya, 2015).

To study physical setting, in the research conducted by Aly (2011), he considered the following elements as the elements of physical setting: landscaping includes: choice of trees and plants, hardscaping: streets and sidewalk paving, and street furniture: streetlight, bus shelter, police kiosk, traffic barriers, benches, and building restoration. (Aly, 2011b)

Mirgholami and Ayshem (2016) stated that the most important physical factors in perceiving and feeling place identity are the size of the place, degree of surrounded place, contradiction, scale, proportion, human scale, distance, texture, color, smell, sound, visual diversity. (Mirgholami and Ayshem, 2016)

According to Rasouli (2013), the density that is defined as population or buildings square footage per unit of area, and land uses are the other components of physical setting in studying urban identity. They are related to the amount of activity found in an area. accessibility is also significant because it is the available alternatives way between spaces and places (Rasouli, 2013).

Activities: the second component of urban identity

Whyte (1980) emphasized the role of an individual’s activity in the success of the place (cited by Rasouli, 2013). Some places may be characterized by certain activities, and some activities are appropriate to particular places (Canter, 1977). The activity of people in urban spaces, so bringing them in the street lead to vitality, therefore, a successful place will do it and support their activities (Jacobs, 1961).

The accessibility, which is considered by Carmona as movement through places and by Hillier as the relationships between pedestrian movement and the configuration of urban spaces can affect activities in urban spaces (Carmona, 2010; Hillier et al., 1993). Densities of people’s movement are related to land uses.

Vitality and diversity are the main concepts of activities within a place defined by Montgomery (1998). The concept of vitality indicates the number of present people within the space during day and night, moreover, it is measured based on the number of cultural events taking place and the active street life; therefore, it identifies successful urban spaces (Montgomery, 1998). The concept of diversity is related to urban vitality containing uses and activities. Diversity can be created through the combinations of mixtures of activities to make a prosperous urban place. Population density leads to social interaction and affects diversity (Montgomery, 1998). Diversity in an urban setting provides people various choices and ranges of uses by a mixture of various things (Bentley et al.,1985 cited by Ujang, 2012).

Montgomery also suggested indicators to attain vitality and diversity in urban places, these indicators are providing street markets, cinemas, restaurants, and meeting points and considering cultural diversity for the users, extending variety of uses, determining opening hours, availability if public areas such as gardens and squares for offering cultural programs, providing mixed uses, providing different types, styles and designs for buildings and streetscapes and create street life.

Aly proposed that retail, commercial, residential, and recreational creating a lively neighborhood, so he considered these indicators to measure activity.

The physical setting and activities are usually working independently of each other, therefore they will be investigated separately in the analytical part of this study. But the linkage between these two components of place identity can also be investigated.

Meaning: the third component of urban identity

Meaning is related to “individual’s internal psychological and social processes that generate perception” (Ujang, 2012). This concept is related to the perceptual and psychological aspects of environmental experience that forms place identity.

Meaning is composed of symbolic and affective associations between individuals and different parts of the physical environment, more than being aware of how to behave and what to expect from a particular setting. Meanings and also appropriate behaviors and expectations about the place lead to the place identity of people through their experiences in their physical environment (Proshansky et al., 1983b).

Imageability is related to particular physical features that make the place unique (Ewing et al., 2006). Lynch defines imageability as a quality of a space that makes it recognizable, memorable, and distinguishable (Lynch, 1960).

Legibility occurred when the urban spaces are understandable and recognizable to define a coherent pattern for it (Lynch, 1960). It can be improved through reference points and a sense of orientation provided for people (Ewing et al., 2006). People can achieve an accurate and clear image of a place when that place is legible. A legible place guides people to navigate and orientate themselves (Lynch, 1960).

2.2.6 Measuring urban identity in this research

This research is conducted to investigate the indicators of urban identity and the relationship between physical and perceptual factors. Considering the literature review and the previous study in this field three components of urban identity that are physical setting, activity, and meaning are examined based on their attributes.

Physical Setting

The physical setting in this research will be focused on the urban structure, access, mixed land use, and urban facilities.

The indicators of physical setting relating to urban identity will be measured through questionnaires by asking residents of the case study.

Activity

Another indicator of urban identity in this study is activity. Regarding the literature review, activity implied on social participation of respondents; therefore, it is significant to measure the participation of respondents in various events in their neighborhood as well as their city. Relationship with neighbors is the other important social indicator of urban identity.

To measure activity, residents of the case study will be asked through the questionnaire to determine how often they participate in events in their neighborhood or their city and how the relationship with their neighbors is.

Meaning

Meaning in this research will be studied through legibility, memory, attraction, value, and symbols and signs, as well as, the feeling of residents about the city, living there, and being a part of it.

The indicators of meaning will be measured through questionnaires to find out if the city is legible for its residents if people feel any values, memories, or attractions in the city if the city provides symbols and signs for its residents.

The residents will also be asked how they feel to recognize as a citizen of the city (not only a resident), how their feeling about this city is, and finally if they would like to stay and live in this city or would move.

Indicators of urban identity in this research

Table 2.2.2 represents the indicators and their attributes that will be used in the following research.

Table 2.2.2. Indicators of urban identity in this research

Indicators of urban identity	
Indicators	**attributes**
Physical Setting	• Urban structure • Access • Mixed land use • Urban facilities
Activity	Social interaction: • Relationship with neighbors • Participation in events in neighborhood • Participation in events in city
Meaning	• Legibility • Memory • Value • Attraction • Symbols and signs • Feeling about city • To be a citizen rather than a resident • To stay and live in the city

2.3 Urban Morphology and Urban Form

The urban forms created by people are the continuation of those people's thinking process. Different shapes and arrangements derived from their combination are the product of thought. Human activities and constructions that are guided by thought are within such a space, and this is a mutual relationship.

In other words, experience in space has its own emotional effects and provides content for thinking, so a basis for thought. Therefore, the urban form is a combination of thinking and experience in the mutual influence of each other. It is necessary to study various approaches and perspectives in order to achieve the aim of creating and enhancing the quality of urban form.

This part is going to argue how the environment, people, and human activities, space, and place have influenced shaping urban form.

2.3.1 What is Form? Definition of Form

Although the words *form* and *shape* are considered sometimes to have the same meaning, there is a significant difference between these two concepts. Since the concepts of *form* and *shape* are different, to explain the concept of form and then urban form, there is an emphasis on the differences and distinctions between the two words.

The word *form* has roots in ancient Romans and is the Latin equivalent of *Forma*. It is also used in the same way in many modern European languages such as Italian, Spanish, Polish, and Russian. In English, French, and German it is written and pronounced as form (Habib, 2006). By referring to the meanings of these two words (*form* and *shape*), it can be understood that *shape* is a character or feature of things that represent the external aspect of that thing such as physical characteristics and appearance such as scale, dimension, size, position, and location. Therefore *shape* is a tool for visual expression (Stiny, 2006).

In Jamil Saliba's philosophical dictionary, the concept of *shape* is equivalent to the English word of *figure*, which means face and appearance of everything (Saliba, 1987). The definition of *form* based on this dictionary is the way in which one thing lives, acts, and reveals itself. To define *form* in the philosophical dictionary of Saliba, *form* is against the substance. That is what the object cannot be distinguished through it

(Saliba, 1987). Thus, *shape* includes the apparent characteristics, but the concept of *form* is more than shape and beyond it.

The definition of *form* by Christopher Alexander should be also considered, while he considers the creation of a form as the main purpose of design, in this definition he states that each form is a consequence of relationships between a set of forces. To recognize these forces is the first step to design form (Pakzad, 2009). In the book 'Notes of the Synthesis of Form (1964)' Alexander explains the forces that are effective in creating form. As an example, he illustrates the pattern of the swarf while placing it in the magnetic field. In other words, D-Ross Thomson states form as a diagram of forces on irregularities. These irregularities are mostly referred to as functional resources of the form. (Alexander, 1964)

In conclusion, the exact definition of the *form* is more than the relationship between visual elements and their appearance, but the *shape* is the apparent skin of the form; the way that often is achieved through experiences.

2.3.2 Definition of Urban Form

There are various attempts to define the term '*urban form*'. In the specialized dictionary of urban planning, *urban form* is defined as an urban built environment (Cowan, 2005). This term is used to describe a city's physical characteristics (Dempsey et al., 2010).

Many parts of literature from the book of Vitruvius to the book of Camillo Sitte, moreover, Morris (History of Urban Form: Before the Industrial Revolutions), Lynch (Good City Form), Rob Krier (Urban Space), and Alexander (Notes of the Synthesis of Form) define urban form. Study different views about urban form show that the different approaches can be applied to examine urban form. For instance, some scholars have a historical approach (James Morris), some researchers emphasize socio-cultural aspects (Mumford), and some of them consider the aesthetic approach and some others focus on urban structure and its functions that represent the spatial aspects.

Urban form is defined by Lynch (1960) as the spatial pattern of the large, inert, permanent physical objects of the city (Lynch, 1960). Barton (2000) defines urban form as the pattern and distribution of human settlements within the city region (Barton, 2000). Urban form is a result of combining various indicators and aspects of urban patterns (Jabareen, 2006).

Schwarz, 2010 defines the urban form that itself is mainly referred to as a property of a city and therefore static for a given point. The definition of the urban form applied in her research is that the urban form of a specific city is the result of different influences such as planning efforts in the past, site and topography, and economic and demographic development. It encompasses the physical structure and size of the urban fabric as well as the distribution of population within the area (Schwarz, 2010).

Many theorists consider the urban design and urban form design as one similar concept, (Cuthbert, 2006) because the urban form has been defined as the spatial configuration of several fixed elements (Anderson et al., 1996; cited by Dempsey et al., 2010).

As it is important to understand if it is enough to examine the physical or spatial dimensions of this concept, therefore, the meaning of the concept of urban form and its factors should be studied first.

In the review of this concept, Cuthbert criticizes the theories represented in the field of urban form design by other theorists, because in his opinion, there is a lack of distinct theory of urban design, moreover it is dependent on planning and architecture (Cuthbert, 2006). Considering architectural theories in designing form has led to a special emphasis on physical dimensions regardless of social, economic, and political aspects. In other words, emphasis on spatial aspects and not on non-spatial aspects are the result of such an approach. As Whitehand explains in his research about urban form, many variables affect the spatial-temporal arrangement and size of the city. Based on his opinion, it is not only urban structure, but its relation to the perception and activities of society (Whitehand, 1992; cited by Habib, 2006; Madanipour, 1996).

So the issue is how the urban form is defined in urban studies?

In defining the form, this concept was considered to be the result of various forces, which do not only include appearance. Accordingly, urban form is the result of forces that are not only physical and spatial.

While urban form is related to scale, it has been defined as 'morphological attributes of an urban area at all scales' (Williams et. al., 2000; cited by Dempsey et al, 2010). Moreover, the concept of morphology is used to describe a more precise definition of the urban form. The term morphology refers to the science of form that is the study of shape, form, structure, and arrangement (Madanipour, 2005). Urban morphology is the systematic study of a range from a very localized scale to a broader scale; from features such as buildings material to housing, street type, and their spatial arrangement and functions, moreover, the origin and evolution of it over time (Dempsey et al., 2010; Madanipour, 2005). Urban morphology focuses on studying a city as a physical environment, additionally implies a link between urban elements, urban spatial elements, and social and economic forces that shape them (Lee and Moudon, 2006). In other words, urban physical form is the effect of human tendencies and activities. Therefore, as the built environment can be related to a particular historical period, it can be considered as the result of activities that are done and designed to place there.

It should be considered that urban form is not only physical elements but also non-physical aspects (Dempsey et al., 2010). The urban physical form presents the history of the city, it is not only a document of its construction history but also a document of the lives of the people who have made it and lived in it. During the life of humans and societies, activities, and needs have been changed; they tend to change and this change provides the context for the physical and built urban environment to grow and modify. (Kropf, 1996)

Urban form is closely related to the functions of the city, it has the static characteristic along with dynamic characteristics. Further to the physical environment, the urban form consists of activities, movements, systems, and fields of events with all its physical and non-physical manifestations. Thus, urban form is the result of the interaction of all of the forces forming the urban built environment and includes all of the environmental elements that people can associate with them potentially. These factors are artificial factors, natural factors such as climate, vegetation, water, location, landscape, type, and shape of the land, and human factors including social, historical, ethnic, religious, political, economic, cultural, psychological, and operational factors. (Habib, 2006; Jenks et al., 2000)

As explained above, urban form is defined with urban morphology; therefore, urban morphology is described.

2.3.3 Urban Morphology

The term urban morphology refers to a field that examines the process of forming a city and its products or its results (Pourmohammadi et al., 2011). Considering the various factors affecting urban formation, urban morphology is referred to as interdisciplinary knowledge. For this reason, experts from various fields of urban science are studying urban morphology.

The study of morphology investigates the urban physical and spatial structure. Urban morphology explains the urban form based on categories of buildings and open spaces in various scales. It considers urban form as a dynamic nature that is changing and is in a dialectical relationship with its creators and inhabitants. Moreover, based on this attitude, urban form is understandable only due to its formation over time (Whitehand, 2007).

Urban morphology includes three main schools British, Italian, and French, which are explained briefly.

British School

The framework of this school consists of more definitions rather than theories (Whitehand, 2007). The founder of British School, which is considered by many scholars as to the most comprehensive research method in urban morphology, is "M. R. G. Conzen". The followers of this school believe that the study of urban landscape forms the basis of the theory of the process of city formation, which is not explained the history of urban development, but also leads the future planning (Pourmohammadi et al., 2011).

Figure 2.3.1. Main elements of town plan from the view of Conzen (street, lot, building) (Pourmohammadi et al., 2011)

Conzen developed a technique called "town-plan analysis". The basic aspects for analysis consist of examining three complexes of plan elements that are streets and their arrangement into a street system, lots (or plots), and their aggregation into street blocks, and buildings, in the form of the block-plans which are tied up like pieces of a puzzle. These three elements are related to each other functionally. The necessary documents to explain urban form include *the town plan, pattern of buildings form and pattern of land use*. According to Conzen the method of "town plan analysis" includes studying three elements: streets, plots, and buildings. In his opinion, these aspects and elements should be comprehended and analyzed through time and its changes - historical development- to understand urban form (Pourmohammadi et al., 2011; Vance, 1990).

Italian School

The Italian School is founded by "Saverio Muratori" in the 1940s. He tried to develop an "operational history" for cities. His opinion was to look for the roots of architecture, not in the imaginative designs of modernists, but in the more coherent tradition of urbanization from the old era to the 1930s. Additionally, he believes that the structure of cities is understood only through their history and based on the pattern of buildings (Pourmohammadi et al., 2011).

Urban form is the result of many beliefs, preferences, and different activities that are embodied in the form of buildings and their surrounding spaces. These buildings and spaces can be included in the form of patterns that are the abstract character of each one. Many urban planners under his influence regarded the historic city as the source of knowledge and inspiration. The negation of modernism by Muratori led to many types of research by famous architecture (Franck and Schneekloth, 1994). Caniggia who was the follower of Muratori knows the environment around people as a built object that is interconnected. Each object as a complex is formed of a set of elements, structures, and organisms. In his opinion, the physical city is not an object but a process (Moudon, 1997).

French School

The French school is founded in the 1960s in French. Similar to Italian School, the French school was also against modern and anti-historical architecture and emphases on built space; moreover, this school was supported by the mighty critic "Henri

Lefebvre”. To analyze urbanization processes and related architectural models, a wide range of methodological knowledge has been generated in this school (Moudon, 1997; Pourmohammadi et al., 2011).

He argued that overcoming physical space including the city too is the ultimate goal of social life. This school is between British and Italian Schools and focuses on both the design and process of forming a city. Both public opinion and the views of experts have been studied in this school. These two theoretical sources lead to different architectures: one is the common architecture and the other is specialized architecture.

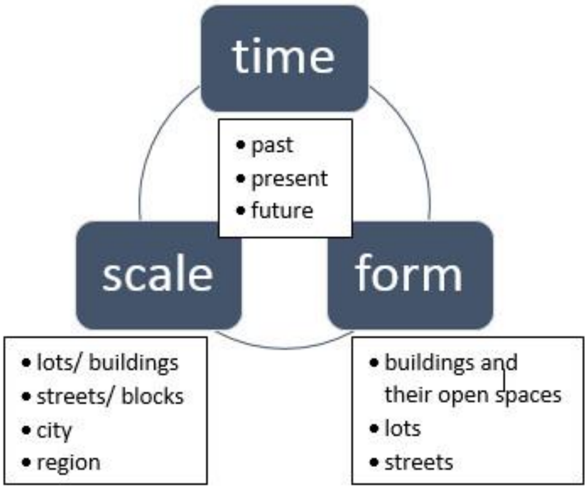


Figure 2.3.2, The common main factors between three schools of urban morphology to understand the built environment (researcher)

They did not accept the fact that specific architectures tend to disconnect the relationship with the city. (Panerai et al., 2004)

From the perspective of all three schools, the built environment should be understood in three main aspects: time, form, and scale. The built environment is changing continuously, and subordinate to the cultural-social forces that are involved in creating, applying, and change of space. Therefore, all of the researches about morphology should be related to time (Moudon, 1994; cited by Franck and Schneekloth, 1994).

2.3.4 The Spatio-temporal Typo-morphology of Urban Fabric

“Scheer” defines urban morphology as a study of urban form during the time (Scheer, 2002); to a better understanding of the relationship between main elements of a city, she employs a model used by environmental scientists. Using the Spatio-temporal hierarchy, the elements of time into the urban morphological analysis are introduced (Scheer, 2001). In this model, various components are classified according to their degree of variability. As the city grows and changes, its physical components also grow and change in varying degrees. The site (land) on which the city is located, the overall shape of the land, and its water sources vary in the geological time scale. Streets and

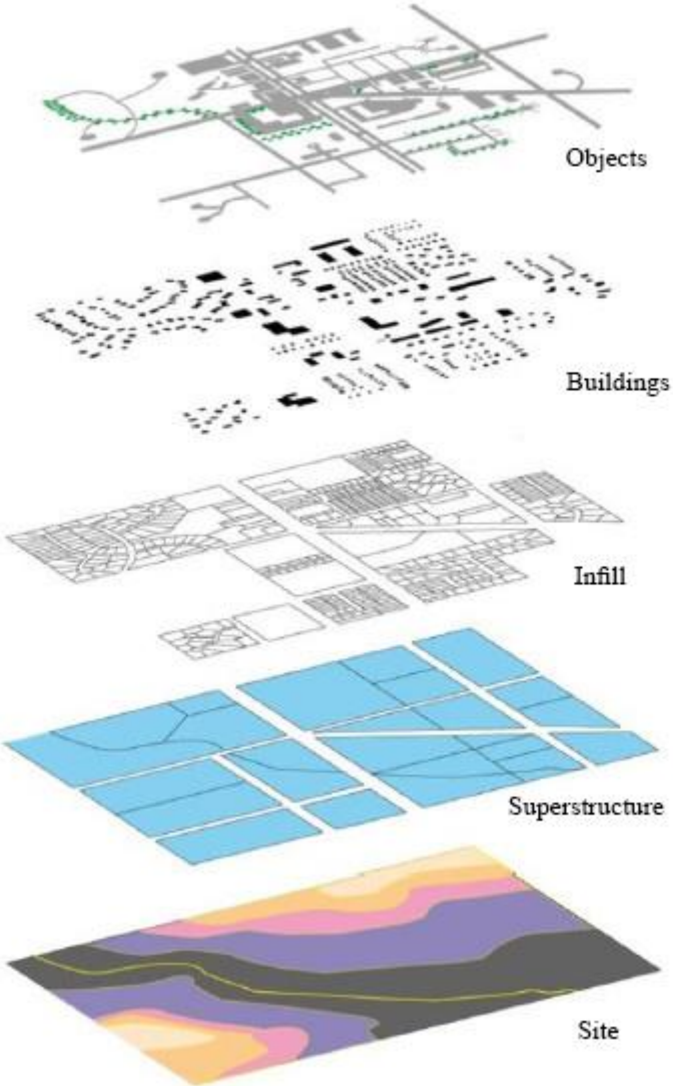


Figure 2.3.3. The Spatio-temporal hierarchy introduces the element of time into the urban morphological analysis (Scheer, 2001)

public roads in historic cities are fixed and may last thousands of years, but many buildings have a relatively short life and during this time some changes may be made by their owners. Objects and elements such as trees and road signs have usually very short life. The components of the spatial organization of the city are based on the hierarchy of the degree of ability to change from the slowest (land) to the fastest (objects) are illustrated in five layers in figure 2.3.3.

Relatively permanent layers present a tangible view of the physical built-up environment, history of the city, and its relationship with the land. The layers above show the more immediate actions. The slower a layer changes in the system, the more effects it has on the changes of the layers that change more rapidly in a hierarchy. The daily usual changes occur in the scale of buildings and objects, while buildings and objects are constantly destroyed and rebuilt. Usually, during these changes road networks, plots, and superstructure remain constant (Scheer, 2001).

Scheer categorizes urban fabrics into three categories based on her suggested model:

1. static fabric

The term “static” refers to the relative stability of the fabric. Most static fabrics are residential, even though land use is not so accurate term to define a static fabric. They have a long persistence. The lots and paths are planned together. The small size of subdivided plots causes partially divided possession which consequently resists against aggregation or further subdivision of lots. The rapid formation of such fabrics leads to the construction of homogeneous forms of buildings.

2. elastic fabric

This fabric is the least stable of the three types of infill and primarily, is composed of retail, commercial and industrial land uses such as shopping centers and gas stations, although residential buildings are sometimes mixed in. In a suburban area with rapid development, elastic fabrics operate as breathing spaces. Changes in this fabric are faster and include features such as the rapid conversion of business (commercial units); destruction or deformation of buildings, and aggregation or subdivision of land plots to create opportunities for new urban development. This fabric is not pre-planned; it evolves over time. Increasing pressure for development and redevelopment of this type of fabric is not associated with inhibitor factors such as homology, the stability of fabric with small-scale private ownership systems; therefore the elastic fabrics s are the only place that many changes can occur over a short period.

3. campus fabric

Campus fabric consists of significant areas of the developed suburb that are composed of larger tracts of land and developed with multiple buildings and contain more than one significant structure. Some samples of this type of fabric are airports, universities, apartment complexes, medical centers, industrial complexes, and government centers that their internal roads are organized as private streets and do not form boundaries between plots. In most cases, internal changes occurred related to functional requirements; the boundaries of plots or paths around them do not disturb these changes. (Scheer, 2001)

Urban growth and urban function are also considered as other definitions of urban morphology. The most important factor in this point of view is the quality of land use. Residential density, distribution of them in the whole city, urban centers, shopping centers, streets, green spaces and parks, governmental buildings, airports, military districts, and religious buildings are the important factors of urban morphology (Shahali and Sanayi, 2010). The function of these factors is different in various cities; therefore, urban morphology depends on the geographical environment and cultural and technological condition of countries. Urban morphology is created from natural and cultural factors (Shokouyi, 2011).

Table 2.3.1. Characteristics of type of urban fabrics (based on Scheer, 2001)

Type of fabric	Characteristic
Static	lots and paths are planned together, small and similar subdivided lots, one building in each lot, the formation of fabric within a short period, similar building type, mostly residential buildings, long persistence of fabric and slow-changing process, divided ownership and management, resistance against further aggregation or subdivision
Elastic	rapid change rate, variety of lot sizes, the formation of diverse plots, various types of buildings and paths, different age of buildings, larger lots rather than static fabric, a major single structure in a plot, not pre-planned, relying on pre-existing paths for access, changing at a faster rate(aggregation or subdivision)rather than other fabric, major remodeling and destruction
Campus	the size of the plot is very large, several buildings in a single large plot of land, tendency to penetrate in the surrounding fabric, possibility to expand or shrink a plot according to operational conditions, private paths within the site, the rate of change of fabric is faster than static and slower than elastic fabric

2.3.5 Measuring Urban Form

Urban form has a very broad definition in the literature, therefore definitions and indicators for urban form vary in different researches. To measure urban form many researchers emphasize the physical structure of a city, some researchers consider land use/land cover, and some others include also population number or density. (Frenkel and Ashkenazi, 2008; Herold et al., 2002; Huang and Xie, 2008; Kasanko et al., 2006)

Every quality of urban form cannot be measured directly, so perception indicates how inhabitants interpret the qualities of their surrounding environment. The only way to collect information about perception is to ask residents.

2.3.6 Indicators of Urban Form

In Jabareen's research (2006) urban form is defined as a result of combining various concepts of urban patterns, therefore it is defined as size, shape, and intensity of urban settlements and the spatial organization of various types of land uses (Jabareen, 2006). Perspectives of urban form are classified into five categories by Clifton et al. (2008) that are landscape ecology, economic structure, transportation planning, community design, and urban design. These categories allow different perspectives of research on urban form and provide a framework for the rapidly growing literature of sustainable urban form. (Clifton et al., 2008)

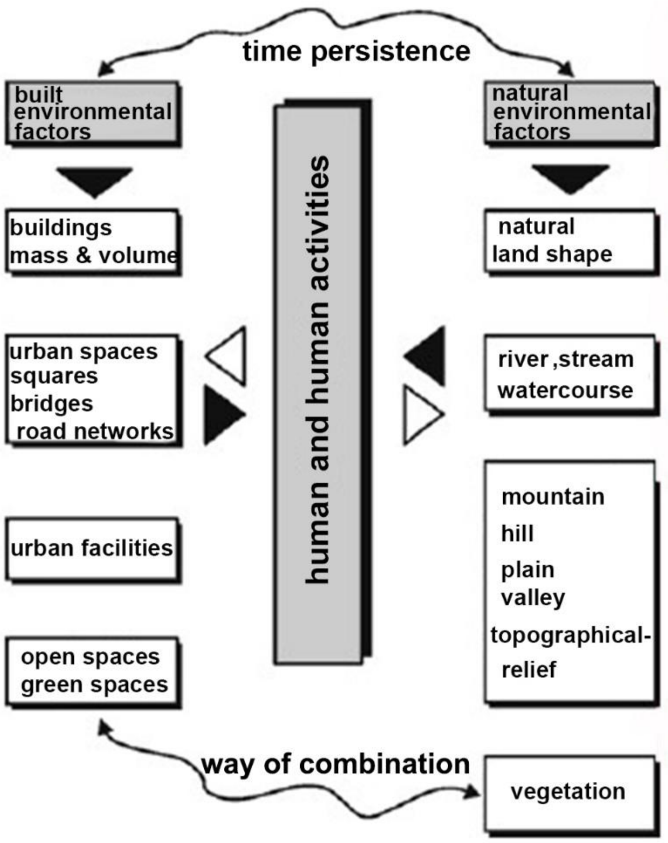


Figure 2.3.4. Components and elements of urban form (Habib, 2006)

Habib (2006) described the urban form as the result of the interaction of many forces. It is the spatial form of social and civil life of the city and the activities of urban communities regarding time and place, which consists of subjective characteristics and objective elements, so as a result a combined with more than two-dimensional nature.

The smallest components of this composition are the elements created by the human - man-made elements - such as buildings, masses and volumes, urban spaces, open spaces, roads, squares, and urban facilities. The natural environment with its main elements such as natural land shape, land, and topographical relief, water flows, and vegetation affect the combination of elements so it affects urban form. (Habib, 2006)

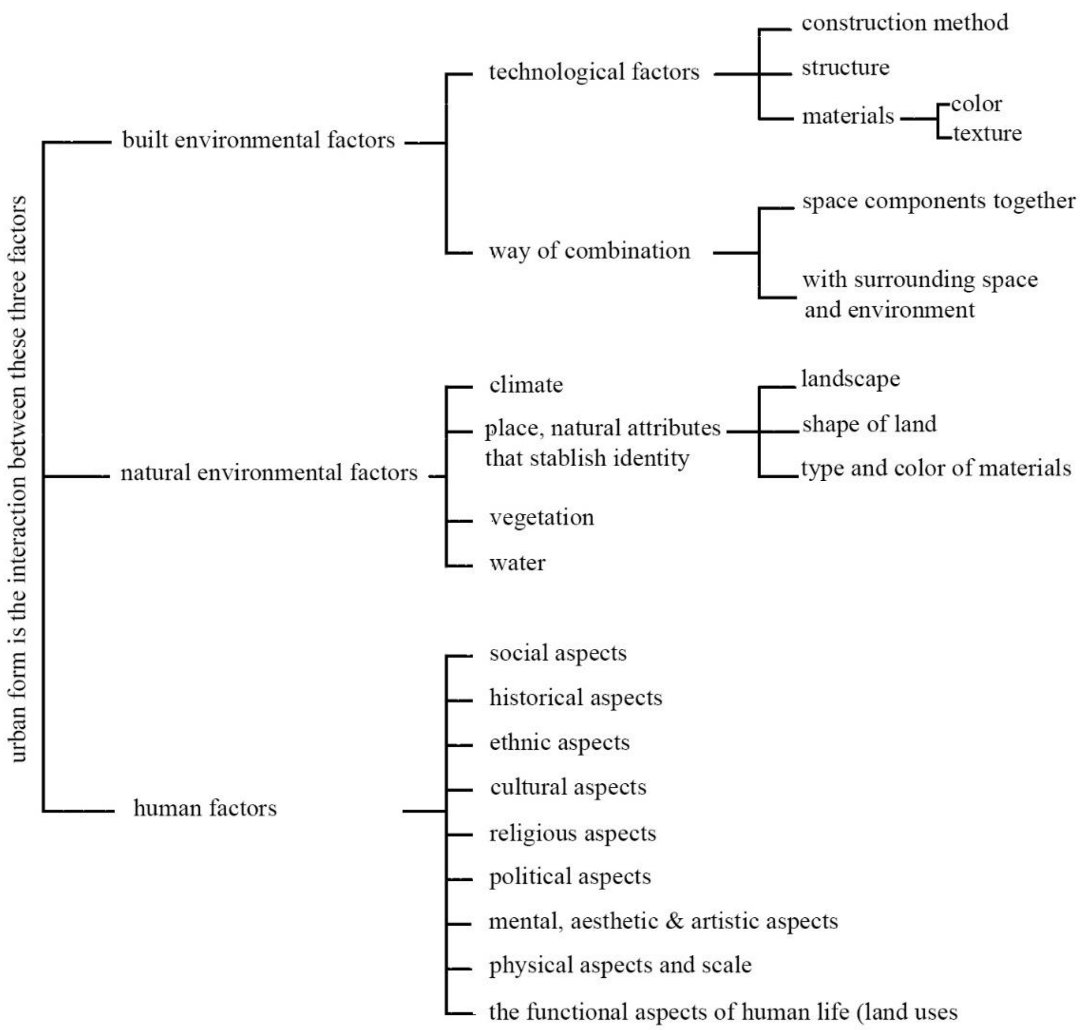


Figure 2.3.5. Factors affecting urban form (based on literature)

Finally, the relationship between its components makes the whole as a unit that is linked to the surrounding environment; it represents urban form as a representation of the present and the interface between the past and the future. Urban form has a mutual relationship between urban functions. Synchronously, it contains both dynamic and static characteristics. In other words, in addition to physical elements, urban form includes activities, moving systems, humans, and all of the forces of urban life.

Urban form is the spatial configuration of fixed physical elements within an urban area (Anderson et al., 1996; cited by Dempsey et al., 2010). Based on Dempsey et. al.

(2010), urban form is made up of physical features and non-physical characteristics that are categorized into five broad and inter-related elements. The foundation of this category is that they influence human behavior and sustainability (see figure 2.3.6).

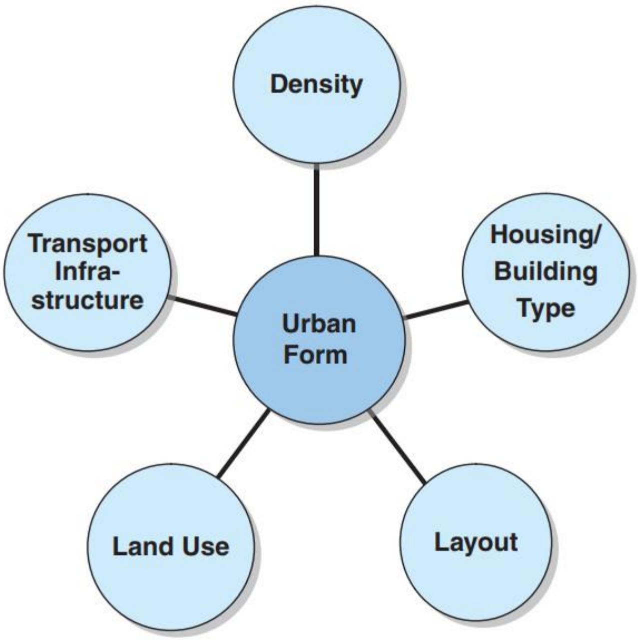


Figure 2.3.6. Elements of urban form (Dempsey et al., 2010)

2.3.7 Measuring urban form in this research

Although in this categorization of elements of urban form by Dempsey et al. (2010), transport infrastructure is one of the elements of urban form in developing countries, this element is not discussed in this research. The reason is lack of access to this type of data, optimistically, if it is available; but accessibility that is a part of transport infrastructure is studied. Therefore, the physical elements of urban form that are density, housing/ building type, layout, accessibility, and land use provide the framework of this research. These elements are significant factors to be considered in studying urban form related to urban identity and quality of urban life according to the goals and objectives of the research.

Density

One of the factors of urban form that has received the most attention in the literature is density regarding its social impact. In recent years, planning policy in many countries has been attempting to increase the average density of new development, but it is still unclear at what point density becomes high or too high (Dempsey et al., 2010). According to Churchman (1999), density is a complex concept as it is interrelated with not only objective measures but also subjective dimensions. Although density is defined as a measure to assess the number of people in a given area, it is also evaluated subjectively while as a social interpretation it may be different from resident to the resident (Churchman, 1999). Cheng (2010) represents some examples to point to the different range of perceptions of density.

Table 2.3.2. Examples of different perceptions of density (Cheng, 2010, 14)

Density levels	**Residential development per country**	
	United Kingdom	United States
Low density	< 20 dph[1]	25 – 40 dph
Medium density	30 – 40 dph	40 – 60 dph
High density	> 60 dph	> 110 dph
source	TCPA, 2003	Ellis, 2004

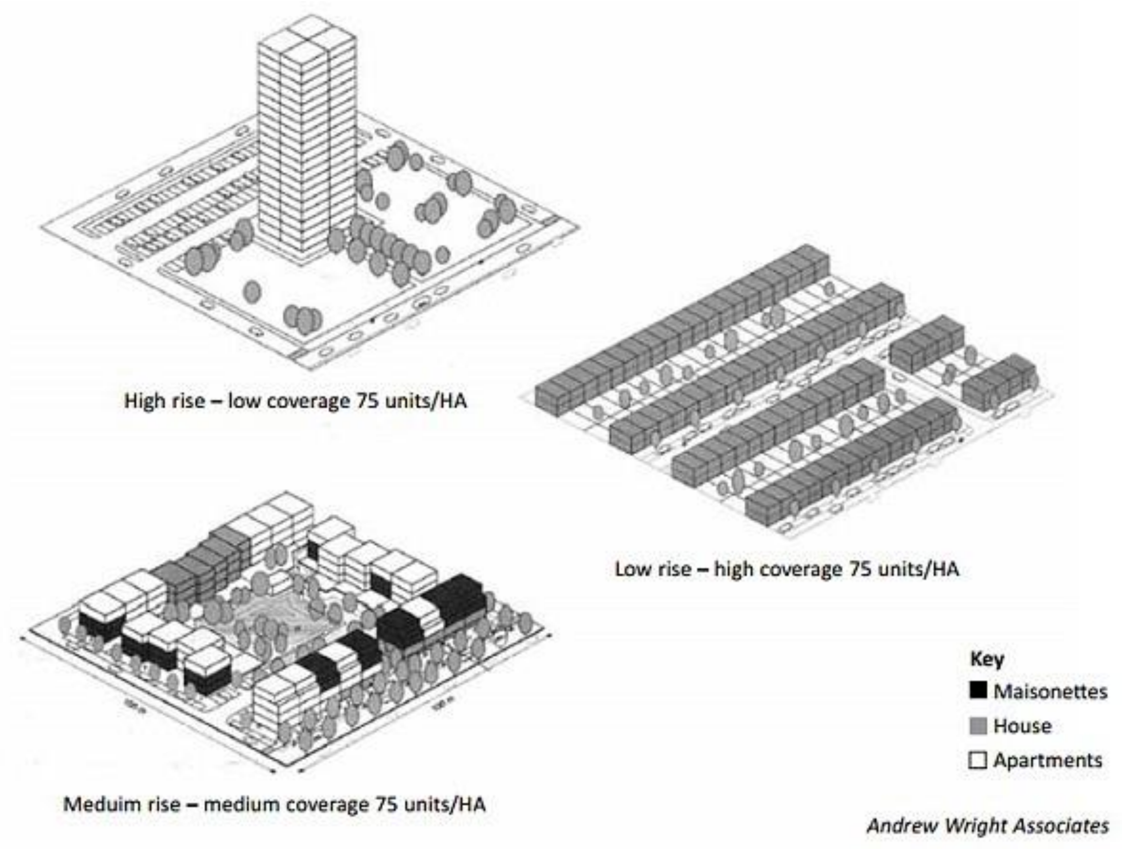


Figure 2.3.7. High-density design (Andrew wright Associates cited in Kiang Heng et al., 2010, 44)

Density is closely related to other elements of urban form, based on Clifton et al (2008), density is associated with transportation because density and diversity of development have an influence on trip distribution, trip generation, and mode choice. More density means a greater concentration of trip origins or destinations (Clifton et al., 2008).

[1] dph (dwellings per ha)

Dempsey et al. (2010) explained land use and access to services as related elements of urban form with density. For instance, it is necessary to consider a population of a specific area to plan a service or facility. To measure the viability of service providers such as public transport infrastructure, and the possibility of special land uses such as commercial and service, density has been applied as a tool in urban design and construction. (Dempsey, et al., 2010)

To consider the concept of density in planning can decrease much congestion of urban life from environmental pollution to lack of public spaces and reduction of mental and social problems, additionally improve the public services and performance of infrastructure equipment. Determining the density means that the environment and its conditions (social, economic, geographical) are sufficiently recognized and the dwelling population is determined. Therefore, appropriate distribution of residential density in planning and designing residential complex means to determine the desired level of welfare and general comfort, and the relation of residents with their surroundings (Akbari Motlagh, 2014)

Measuring density

According to Dempsey, et al. (2010), to argue stronger, a number of density measures in different scales of the urban form should be employed while using one indicator cannot exactly measure the density of a given area. A wide range of various measurements are used to evaluate the density of a given area are person per hectare (pph), dwellings per hectare (dph), and habitable rooms per hectare (Dempsey, et al., 2010). To have a comprehensive study on density Dempsey represented the following table including indicators of density (table 2.3.3: indicators of density). Density has a significant role in creating urban fabrics and affects the urban morphology of the area. In urban planning studies, density is studied in two categories: people density and building density (Cheng, 2010).

Considering a range of indicators of density presented by Dempsey et al, to provide a complete picture of the overall density of the case study of this research, these indicators are presented in the table (2.3.3). The population indicators are added in this table and some indicators are omitted because there is no data or information about them.

Table 2.3.3. Indicators of density (Dempsey et al. 2010)

Measurement	Description	Examples of aspects/ features measured	Sources of information
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	- Census data - Local authorities
Gross density (Neighborhood)	Number of persons, households, or dwelling units per hectare of the total neighborhood area.	- Total population - No. of households - No. of dwelling - Case study area	- Census data - Local authorities - Valuation Roll - Ordnance Survey
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	- Census data - Valuation Roll - Ordnance Survey
Net residential Density (Neighborhood)	Number of persons, households, or dwelling per hectare of the total land area devoted to residential land use.	- Total population - No. of households - No. of dwellings - Total residential land area	- Census data - Ordnance Survey
Net residential Density (Sub-area)	Number of persons, households, or dwelling 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	- Census data - Valuation Roll - Ordnance Survey
Net residential Density (Street & Plot)	Number of dwellings per plot.	- Number of dwellings per plot - Plot area	- Ordnance Survey
Floor Area Ratio (Neighborhood & Sub-area)	The ratio of floor area to site area.	- Floor area (of each building) - No. of Stories - Site area (of each plot)	- Ordnance Survey - Site survey
Coverage Ratio (Neighborhood & Sub-area)	Ratio of building footprint to site area	- Building footprint (each building) - Site area (of each plot)	- Ordnance Survey

Population

The number of people who live in a specific place is the population which is the first indicator of studying population, and the statistical study of population is known as demography. For different reasons, the population can change in structure and numbers, and these changes can affect the physical environment. The basic measures to study demography are population size and population density. Population size is the number of individuals and population density is the number of individuals per area. To describe the existing situation both measures of size and density are significant. The second indicator is population structure which is the composition of a given population that is broken down into categories such as age and gender. Population structure can be used to categorize populations into many subsections and demonstrate population demographics on a local, regional, or national scale. (Doyran, 2011)

- Population size:

Population size achieved through the census enumeration of population by geographic sub-divisions of a country is the basic information employed in most studies.

- Population structure:

To study population structure that is the structure of age and gender (especially age) is one of the most fundamental parts of a demographic study. The structure of age and gender is defined as the distribution of population based on age and gender. The importance of studying that is since the composition of age and gender is a consequence of the combination of demographic processes, and it affects these processes too. The composition of the population means population structure which refers to the structure of population and practically used as a set of elements, characteristics, and stable relations of the population that have been formed and combined relating to each other over time, as it is difficult to change in a short time. Age and gender are the most important demographic variables; however, analyzing these data is different due to the various purposes. Many public and private planning require age and gender data base. Another reason that presents the importance of studying age and gender structure is that it is a slice of information that can be viewed as the demographic history of a population. In fact, population structure reflects changes in the past.

- Population density:

In urban planning studies, population density is the number of the resident population in a unit of surface which is considered hectare most of the time.

- Perceived overcrowding:

Perceived overcrowding is the feeling and sense of the residents about crowding and population density around them; therefore this sense affects their satisfaction with the surrounding urban environment. The method to measure this indicator is to ask inhabitants through the questionnaire.

Table 2.3.4. Indicators of population and density used in this research

measurement	indicator	description
population	Population size	Number of inhabitants of the whole city
	Household size	Number of households of the whole city
	Population structure	Number of inhabitants according to their age and gender
	Population density	The ratio of persons to the specific area
Density	Gross density (City)	The ratio of persons, households, or dwelling units to the entire area of the city regardless of land use
	Gross density (Quarter)	The ratio of persons, households, or dwelling units to the entire area of the quarter regardless of land use
	Gross density (Neighborhood)	Number of persons, households, or dwelling units per hectare of the total neighborhood area.
	Net residential Density (City)	Number of persons, households, or dwelling per hectare of the total land area devoted to residential land use within the city.
	Net residential Density (Quarter)	Number of persons, households, or dwelling per hectare of the total land area devoted to residential land use within the quarter.
	Net residential Density (Neighborhood)	Number of persons, households, or dwelling per hectare of the total land area devoted to residential land use.
	Perceived overcrowding	Satisfaction of residents with population density and population around them.

It is clear from the table that the indicators measure physical density and not perceived density, therefore, perceived density is added as another indicator, which should be evaluated through field survey. “It should be noted that the indicators of net residential density used here are based on the definition of residential which includes outdoor space such as gardens but excludes streets and footpaths. This method of calculation, according to Dempsey et al (2010), results in density figures which are higher than those usually reported.” (Dempsey et al., 2010)

Housing type and characteristics

The everyday living of residents of an urban area can be affected by the features of their housings and buildings. Considering urban fabrics, residential buildings are static fabric and sometimes elastic fabric in categories of urban morphology (Habib, 2006). Not only the density of the urban environment, but also other factors such as building type, age, and height influence inhabitants. As an example of density, residents who live in a high-rise in the city center have a different experience of their surrounding urban environment than residents of a low-density detached house, and as an instance, other factors such as the number of types of rooms of dwelling may have influences on the efficiency of buildings (Dempsey, et al., 2010).

Measuring housing type and characteristics

According to Dempsey et al., an efficient way to measure the housing and building characteristics is to ask households through questionnaires. Another method is to identify the prevalent housing types in each street or neighborhood and highlight the exceptions. (Dempsey, et al., 2010)

Table 2.3.5. Indicators of housing and building characteristics (based on Dempsey, et al., 2010)

indicator	description	examples of aspects/ features measured	sources of information
Housing type (individual buildings)	predominant housing type per street with exceptions marked	- detached housing - semi-detached housing - terraced housing - tenements - flat/ apartments	- ordnance service - site survey - questionnaire
Housing characteristics (individual building)	characteristics of individual dwellings	- lowest level of living accommodation - access to garden - number of bedrooms - condition of building	- questionnaire
Building type (individual buildings)	building type according to land use categories	- commercial buildings - offices - community buildings	- ordnance service - site survey

Urban Layout

Urban layout, which refers to urban spatial structure, defines as the arrangement of streets, blocks, buildings, and public and private spaces in urban areas, connectivity, and accessibility (Dempsey et al., 2010). The concept of urban layout can be understood through a simple example. If a house as a whole meaningful concept is considered, it consists of details that are arrayed by each other. The arrangement of rooms and decorations can create various shapes inside the house, but the building of the house is fixed and keeps the meaning. Therefore, it is not possible to decrease the whole concept to its details; in fact, the characteristic of the whole concept shapes the behavior and situation of its details (Ghanbari, 2009).

Metabolists, who were a group of Japanese structuralist architectures and urban planners, determined two types of short-lived elements and permanent elements, which were also specified as the main part and non-main part. In their opinion, in urban evaluation, two points appear: first, urban mega-structures that live longer, and second, neighborhoods, blocks, buildings, and routes used to provide daily needs, which live shorter than the first elements (Pakzad, 2009). The permanent (long-lived) elements are urban structures. Giedion mentioned the mega-structure and group form in the book “Space, Time and Architecture: The Growth of a New Tradition”. He defines a mega-structure as a very large foundation of a city that responds to different needs and purposes of it (Giedion, 1974). Lin (2007), believes that the word mega-structure is used by one of the architectures of Metabolist, “Fomihiko Maki”, who distinguishes three pre-pattern of urban form: combined form, mega-structure, and collective form. In his idea, mega-structure is a large frame that contains all of the urban functions or parts of the city (Lin, 2007).

According to Hamidi et al. (1997), the physical structure of a city is a combination of an integrated network including land uses and various and diverse urban elements that coherent the whole city to its all urban elements such as the smallest component, which is residential neighborhoods. The characteristics of physical structure can be classified into four categories (Hamidi et al., 1997):

- physical features: physical components and elements, location in the city, urban fabric, roads networks and accessibilities, open and green spaces
- functional features (activities): functional components, combination and proximity of functions (activities), population and activities
- spatial and visual features: symbols and unique elements, views and landscapes, spatial qualities (spatial continuity)
- coordination of physical forms, activities, and spaces

The physical features contain natural and human-made elements; human-made components include special buildings such as palaces, mosques and churches, fences and huge walls, roads networks and main streets, open and green spaces and special facilities, and natural elements include mountains, hills, rivers, seashore, forests, etc.

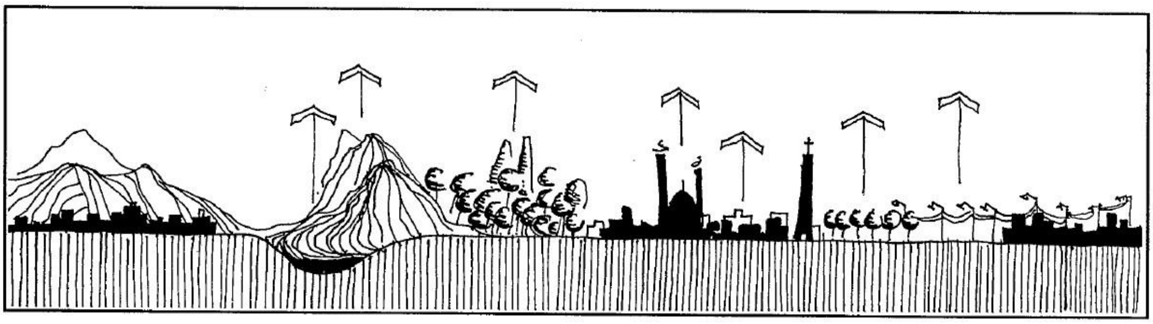


Figure 2.3.8. the main structure of a city (Hamidi et al. 1997)

The main physical structure of the city, in other words, the principal components of the physical form is influenced by natural and man-made factors within or around the city and also by different urban functions and cultural, social, and economic features. This structure follows various patterns and in many cases, it is a combined pattern.

Urban main structure is the result of the forms, activities, and spaces of the city that have outstanding features because of their shapes or spatial or functional reasons. In other words, the main structure is the main part of the city that contains the main functions of the city and determines the future development of that city, such as main axes of communication, main open spaces and public buildings. This main structure provides not only economic, political, governmental, cultural, religious, and recreational activities but also social relationships. This part presents the principal characteristics of the city and leads to the durability, identity, and stability of the city (Bahreini et al., 2009; Pakzad, 2009).

The main features of urban structure can be summarized as: communication network (urban street network), land use, density, and linkage with nature. The networks of urban main paths are the most important element of forming urban structures. The combination of land uses, spaces, and various activities on the scale of the whole city is the essence of urban main structure. Considering density, it is important to provide the balance of building density in the main structure to maintain not only compatibility but also the distinction of this part to other parts of the city. The natural elements can affect the forming mental image of the city by improving function so that increasing the effect of urban structure. (Hamidi et al. 1997)

The road classification system consists of three classes that may be changed in each country according to its traffic situation. The five main categories of the road classification system in Iran are city expressway, major arterial, minor arterial, collector, and local (Transformation Infrastructure Management, 2013).

Considering the Iranian transportation system, Gharib (2008) defines road classification as follows: (Gharib, 2008)

- City expressway: it provides quick communication between the main districts of the city. The intersections of this street are at different levels (non-level intersection.
- Major arterial road: the main function of this type of street is to establish a connection between the expressway, the collector, urban main centers, and neighborhoods. Using arterial roads, there is access to urban utilities. The intersections are at the same level and must be equipped with traffic light.
- Minor arterial road: the main function of a minor arterial road is to establish a connection between the expressway, the collector, urban centers, and neighborhoods. There is direct access to urban utilities. In most Iranian cities, the minor arterial road is considered a major arterial road.
- Collector roads: the term collector originates from the word *collect* which means to gather. The function of this road is to connect the main and local streets. It collects the traffic of local streets and transfers it to the main or arterial roads. There is direct access to urban utilities around the city, and the traffic light is used in the intersection with the main streets.
- Local street: it provides communication between the neighboring units and access to land uses such as residential, commercial, industrial areas. Sometimes, there is no clear distinction between collector roads and local streets in Iranian cities.

Measuring urban layout

The concepts of urban form and urban structure, moreover, the mutual relationship between them is explained. Urban form is defined as physical and natural elements, activities, and time. Urban structure is a particular and permanent elements of urban form. Hildebrand Frey compares different models of urban structures considering public transportation, mixed land uses, access to urban services and facilities, access to open and green spaces, the possibility of social mixing, the possibility of local independence, the possibility of self-sufficiency and the degree of city compliance with needs. He argues by reaching a sustainable urban structure, its urban form can be sustainable too (Frey, 1999). Therefore, the determinant factor in urban form and the relationship between its components is urban structure. Main accessibility network, particular natural elements in the city, and primary land use centers are the principal features of urban structure; so to measure the layout of a city, the physical characteristics of urban structure, physical setting, and activities should be studied. These measures are classified as follows:

Table 2.3.6. indicators of layout (based on the literature)

Indicators of measuring layout
the main structure of the whole city
main access network
natural elements
the hierarchy of physical divisions in the whole city • Phases • Neighborhoods • Phase centers • Nodes • symbols
physical setting
Activities

Land use

The sequencing and relationships of various factors make it possible for an urban system to reveal its physical foundation as the integrity of the whole urban complex in urban structure by finding identity elements, which have been used in areas of land uses. The existence of these centers in the physical structure of the city indicates the needs of the urban community, which occurs in terms of the activity of its inhabitants through the functions of these centers in the entire urban space and urban complex. In this process, the special and non-specific elements should be in line with the whole urban system. This process is due to two important components in an urban system; these components should be close to the urban optimum in placing land uses considering the similarity tendency. The proximity of these two components together makes homogeneity, uniformity, and continuity of the desired level. These two components are:

1. The relationships between land uses with each other in common space
2. The relationships between land uses with humans in common space (urban space) (Nasiri, 2008)

These aspects may not be very tangible at first, but the importance of the issue is that a set of interconnected factors such as land uses can accelerate the formation and expansion of the concept of urban life in the cities (or new towns) due to the time factor. In other words, to recognize them makes the relationships between people with each other through the points about land uses more completely. Moreover, factors such as the time of formation or the period of activity of land-uses can encourage residents to stay and continue their residence. Other qualitative aspects that have resulted from land uses, can be considered as factors for identity and an appropriate indicator for a place and an urban system. (Etemad, 2007)

Depending on the characteristics of land uses, the role and image of land uses to develop the growth of new urban environments is distinguished in two different dimensions based on Rappaport's opinion (Ebrahimzadeh and Negahban Marvi, 2004). These two dimensions can be categorized as **physical and objective characteristics of land uses** and **non-physical and subjective characteristics of land-uses**

- **Physical and objective characteristics of land uses**

Throughout history, following the performance of cities and new towns, their area was considered. Reviewing cities and new built environments in various periods of history shows that some of the centers and elements of the urban system have been repeated in historical evolution. The physical elements, which are named as areas of land-uses, have changed over time in terms of physical symbols. These changes in the structure of a city are taken place through the evolution or development of physical elements and factors in determining the levels of land uses (Ebrahimzadeh and Negahban Marvi, 2004). The need for residence and dwelling is a consequence of human behavior. A city without residential spaces and centers is not located in the structure of the urban system. New towns are designed to control and defend the borders, human habitation determines the role and meaning of the city. Based on this, the majority of land allocated to new towns and new urban development is limited to **residential land use**. The second type of these elements is the centers and areas allocated to the administration and management of the urban and regional areas. These **administrative land uses** are in different forms, different scales, and dimensions in various cities. (Nasiri, 2008).

The third type of land uses includes **religious** centers, which found their place in the cities since the formation of a city in history (Etemad, 2007). Even its establishment and its location as a symbol determined the special manner of government and the continuation of their ideological system in ancient cities. This physical index has changed by time and place, and has special significance before the Industrial Revolution. However, its fundamental importance in comparison with its previous social relations has been changed after that; instead, other symbols of land uses are presented on urban scale (Ghanavati et al., 2010).

The fourth type is the areas allocated to **open and green spaces** within cities. This particular case is related to several land uses at various urban scales, each of them presents a way of function and special use of lands. The unity of all of the land uses is based on open spaces that link them together. This land use includes communication networks, green spaces, playgrounds, landscapes, and storage land within cities.

The fifth type can be determined according to the type and geographical location of the city. That means, the types of **urban equipment and infrastructure centers** are determined based on the type of the new town, if a new town has a military background or is a harbor, or is located near the mines, industries, and important roads. This type of land use is usually located based on its type and activity inside or outside of the city. Hospitals, healthcare centers, and educational units can be categorized in this type (Nasiri, 2008). The last type is the **communication network (urban street network)** that is used for **accessibility**, which is explained further as another indicator.

To predict land-uses and physical-objective centers in new urban development and new towns represents how these centers use land and urban areas. Totally, the six characteristics can be considered to determine land-uses. Of course, type, size, measure, and level of them in each city depends on the goals and geographical situation of that city. Moreover, urban and governmental management affects the designation of land-uses.

- **Non-physical and subjective characteristics of land-uses**

Since the land-uses in cities result in urbanization, diversity and expanse of them can be considered as an effective factor in strengthening the social spirit and daily activities in new urban development or new towns. Various experts believe that the development of recreational and service centers can contribute to urban development and the creation of a job. The extent of occupation and land uses extend urban life, so it uses to attract population to the cities. For this reason, the role of land uses in cities and new towns should be taken seriously, so that the urban centers, which lack identity and foundation of urban life, could be promoted to urbanization (Ebrahimzadeh and Negahban Marvi, 2004). This point may affect the issues of cities and in particular new towns that residents maybe not be interested more in staying there. Problems of land-uses cause a kind of depression and lack of motivation to do activities in the city.

Usually, the economic aspect has been a huge obstacle for the quantitative and qualitative development of land uses, especially in welfare, recreational, and sport services. Perhaps that is the reason that in some studies it is concluded that new urban centers should be built on a large scale so that they could be able to deal with the aspects required in new towns and urban new development according to the characteristics of contemporary life (Ghanavati et al., 2010).

Urban life is dependent on many land-uses due to the daily activities of residents, it causes diversities as well as competition between the same land-uses. This is a factor for the excitement of life and more activities, especially in cities. The concept of land use is related to the age group of cities and new towns, hence, young and middle-aged people have the highest urban activities. Since the area of land uses is determined based on specific uses per capita, therefore, the number of uses should be proportionate to prevent destructive and slow-growth effects of urban development in new urban environments or new towns.

Measuring land use

In this research, land use will be evaluated through the following indicators presented in table 2.3.7:

Table 2.3.7. Indicators of land-uses (based on the literature)

Indicators of measuring land use
the location of land uses in the city
the sufficient number of each type of land use in the whole city per capita
distribution pattern of land uses and their relationship

Accessibility

Accessibility network is an important issue in studying urban form (Peiser and Guan, 2018). Understanding urban accessibility is essential for transport and land use planning because it is one of the basic dimensions for economic, economic growth, and quality of life (Morales et al., 2017). The definition of accessibility depends on accessibility measures and indicators (van Wee et al., 2001). “Each city has developed its own unique spatial structure and transport system to provide access to people, goods, and information” (Rode et al., 2014). Different functions in the cities, movement and mobility, and connection between urban components within or outside of the cities are related to the accessibility network. Urban roads are considered as the fundamental factor of urban transportation; therefore, it is the basic factor of urban development, price of urban land, dynamic of urban economy, etc. (Shahali and Sanayi, 2010). It means that the basic principle to achieve accessibility is based on the physical concentration of people, services, economic activities, and exchange. Considering the issue, residential and workplace densities, the distribution of functions and degree of mixed-use, the level of centralization, and local level urban design are considered as the most defining characteristics (Rode et al., 2014). However, urban accessibility is distinguished into two categories: geographic accessibility and geometric or general accessibility. Geographic accessibility is defined as the opportunity at origin to reach a destination or given the impedance between both locations; geometric accessibility focuses on network centrality through topological, metric, and geometric properties of urban layouts (cited by Morales et al., 2017).

Measuring accessibility

There is a wide variety of accessibility measures. Ha et al. (2011) distinguished three main types of accessibility measures containing: infrastructure-based measures, activities-based measures (location-based and person-based measures), and utility-based measures (Ha et al., 2011).

Infrastructure-based measures focus on transport infrastructure characteristics, such as congestion levels (El-Geneidy et al., 2011), without studying how accessibility levels vary with different groups and land use patterns. Person-based and utility-based measures require an intensive data supply that is very difficult to obtain but can analyze accessibility at an individual’s level, such as counting the number of activities in which an individual can participate at a given time (Ha et al., 2011). Location-based measures are used in literature for their balance between required data and quality of results (El-Geneidy et al., 2011); this measure analyzes the accessibility of locations and assesses the spatial distribution of services or activities (Ha et al., 2011).

On the other hand, Morales et al. (2017) consider two methodological approaches due to the two concepts of geographic and geometric accessibility, which are location-based measurements and Space Syntax. They argued that location-based measurements are appropriate methods to analyze geographic accessibility, in turn, Space Syntax is a set of theories and methods with long-standing development whose purpose is to analyze geometric accessibility (Hillier et al., 1976; Morales et al., 2017; Webster, 2010). Although, “the availability of geographic data (e.g. land use, road and public transport network), the easiness of interpretation and applicability of geographic information system (GIS) have facilitated implementing location-based methods for transport planning purposes”, “the scarcity of official data and capacities for processing the same is still an important barrier” in some countries (Morales et al., 2017). The Space Syntax method is less data-intense than traditional location-based methods. Applying this method to analyze accessibility needs only a presentation of a road network. This approach by providing a complementary tool has tried to help planners in accessibility researches, especially, in data-scarce contents. The space Syntax method is explained further in chapter 4.

In general, the aim of studying accessibility is to find out the following indicators presented in table 2.3.8.

Table 2.3.8. Indicators of accessibility (based on the literature)

Indicators of measuring accessibility
connectivity of roads
local and global integration of roads network
local and global mean depth of roads

Indicators of urban form in this research

The following table shows the indicators of urban form in this research.

Table 2.3.9. Indicators of urban form

Indicators of Urban Form		
Indicators	**Attributes**	
density and population	• Population size • Population structure • Population density • Perceived overcrowding	• Gross density (neighborhood) • Gross density (city) • Net residential density (neighborhood) • Net residential density (city)
Housing	• Type of housing • Housing characteristic	
layout	• Main structure • Main access network • Hierarchy of physical division • Physical setting • activities	• phases • neighborhoods • phase centers • nodes • symbols
Land use	• health centers • shopping centers • educational units • green space	• location of each land use • distribution pattern of land uses • proportional amount of land uses per capita
Accessibility	• Access to health centers • Access to shopping centers • Access to educational units • Access to green space	• Connectivity • Integration (HH) • Integration (HH) R3 • Mean depth • Mean depth (R3)

2.4 Indicators of Quality of Urban Life, Urban Identity, and Urban Physical Form in this Research

To study the indicators of QOUL and UI based on the indicators of urban form, these indicators are categorized into the five categories of urban form, which are explained as follows and presented in table 2.4.1.

The studied indicators of **quality of urban life** are **subjective density**, which includes satisfaction with overcrowding in neighborhood and city, **housing** that contains the cost of housing (price to buy or rent), housing characteristic (age of building and number of households in the building), and satisfaction with: cost of housing (to buy or to rent), area of the dwelling unit, housing type, quality of the building, and the number of households in the building, **land use**, which consists of satisfaction with health centers (regular use or emergency use), satisfaction with shopping centers in neighborhood and city, satisfaction with educational units, and satisfaction with green space in neighborhood and city, **accessibility** that includes satisfaction with access to health centers, satisfaction with access to shopping centers, satisfaction with access to educational units, and satisfaction with access to green space, and mean depth of land uses, **layout**, which consists of satisfaction with the layout and **feeling about the city** that contains satisfaction with living in Andisheh new town and satisfaction with being a resident of Andisheh new town. The indicators of **Urban identity** are **overcrowding**, which includes perceived overcrowding in the neighborhood and city, **housing**, which consists of the number of households in the building, **land use**, which includes the availability of health centers, availability of shopping centers, availability of educational units, and availability of green space, **accessibility** that consists of satisfaction with access and satisfaction with the quality of paths, **layout**, which contains physical setting (satisfaction with urban access, satisfaction with urban structure, satisfaction with urban facilities, satisfaction with mixed land uses), meaning (memory, symbols, and signs, value, attraction, legibility), activities (relationship with neighbors, participation in events in the neighborhood, participation in events in the city), and **feeling about the city** that includes being a citizen of Andisheh, feeling about Andisheh, like Andisheh, and to stay and live in Andisheh, as well as the mutual relationship between them and the urban physical form of new towns, which have remarkable roles in residents' perception of the urban environment around them. The indicators of **urban physical form** are **objective density**, which includes gross density in neighborhood and city, net residential density in neighborhood and city, **housing**, which consists of housing type, area of the dwelling unit, and location of housing, **land use** that contains location, proportional amount, and distribution pattern of health centers, shopping centers, educational units, and green spaces, **accessibility** that includes connectivity, integration, and mean depth of health centers, shopping centers, educational units, and green space, and **layout**, which consists of location.

Table 2.4.1. indicators of QOUL, UI, and UPF in the present research

Indicators of this Research			
Indicators	**dimensions**		
	UPF	**QOUL**	**UI**
density and population	• Population size • Population structure • Population density • Perceived overcrowding	• Satisfaction with overcrowding (neighborhood) • Satisfaction with overcrowding (city)	• Perceived overcrowding (neighborhood) • Perceived overcrowding (city)

	• Gross density (neighborhood) • Gross density (city) • Net residential density (neighborhood) • Net residential density (city)		
Housing	• Type of housing • Housing characteristic	• Cost of housing (price to buy or rent) • Age of the building • Number of households in the building • Satisfaction with: - cost of housing (to buy or rent) - area of the dwelling unit - housing type - quality of the building - number of households in the building	• Number of households in the building
layout	• Main structure • Main access network • Hierarchy of physical division • Physical setting • Activities - Phases - Neighborhoods - phase centers - nodes - symbols	• satisfaction with the layout • satisfaction with living in this city • satisfaction with being a resident of this city	• Physical setting, satisfaction with: - urban access - urban structure - urban facilities - mixed land use • meaning: - memory - symbols and signs - value - attraction - legibility • activities: - relationship with neighbors - participation in events (neighborhood) - participation in events (city) • being a citizen of the city • feeling about the city • to stay and live in the city
Land use	• location of land uses: - health centers - shopping centers - educational units - green space • distribution pattern of land uses • proportional amount of land uses per capita	• satisfaction with: - health centers (regular/emergency) - shopping centers (neighborhood/ city) - educational units - green space (neighborhood/ city)	• availability of: - health centers (regular/emergency) - shopping centers (neighborhood/ city) - educational units - green space (neighborhood/ city)
Accessibility	• Access to health centers • Access to shopping centers	• satisfaction with access to: - health centers (regular/emergency)	• satisfaction with access • satisfaction with the quality of the paths

	• Access to educational units • Access to green space - Connectivity - Integration (HH) - Integration (HH) R3 - Mean depth - Mean depth (R3)	- shopping centers (neighborhood/ city) - educational units - green space (neighborhood/ city)	

To find out the dimensions of quality of urban life, urban identity, and urban physical form, which affect residents' feelings, a conceptual framework (see 2.5) is designed based on a wide range of literature reviews.

2.5 Conceptual framework of theoretical background

Theoretical background explains the existing knowledge to find out the issues. The proposed conceptual framework is a theoretical based structure to support the theory of research. The theoretical framework of this study represents the concepts that are related to research problems, indicators and dimensions of urban identity, quality of urban form, and physical form. These indicators are selected based on the literature review and considering the purpose of the research, the condition of the case study, and access to required data. As described before, the availability of data affects selecting the indicators of this research.

In order to investigate the relationship between dimensions and to survey the indicators, indicators of urban identity, quality of urban life, and urban form are integrated. Urban physical form is categorized in five based on its indicators, and each indicator of quality of urban life and urban identity is put in a related category. The conceptual framework represents the integrated indicators of the three dimensions of the present research. As it can be seen in this table, population, density, housing, land use, and accessibility are the main indicators, which are extracted from urban physical form, and other indicators of urban identity and quality of urban life are categorized based on these indicators.

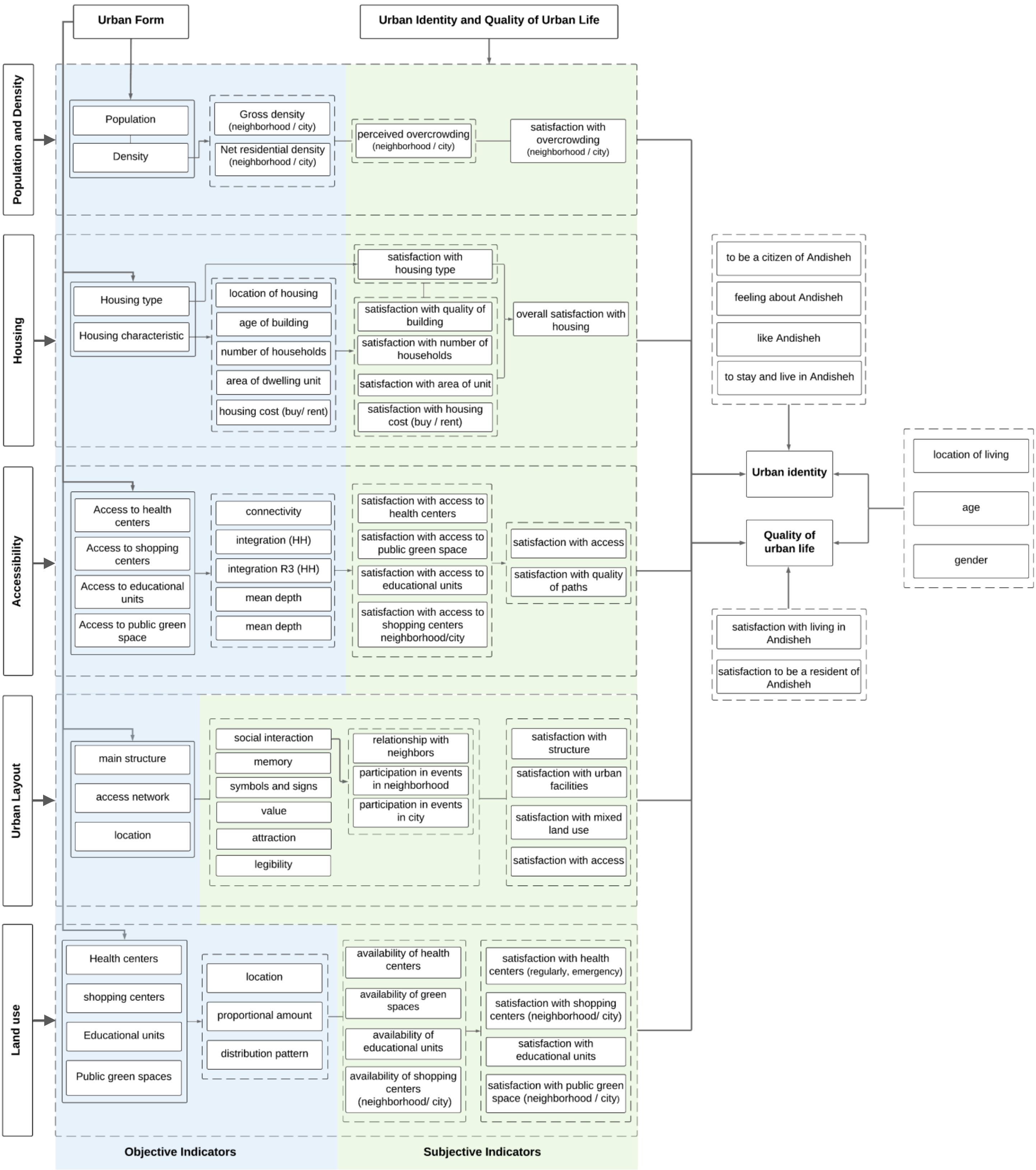


Figure 2.5.1. Conceptual framework

Chapter 3:

IRANIAN NEW TOWNS;

INTRODUCTION TO STUDY AREA: ANDISHEH NEW TOWN

3.1 New Towns of Iran

“New towns” have been built in most periods of history in most parts of the world since urbanization began (Ziari, 2006). Accommodation is the old, continuous, and basic issue of human. Population growth rate, uncontrolled urban expansion, and the non-standard environment, development of technology, changing manufacturing structure, assigning the most portion of gross production of communities to the industrial sector, reducing employment in the agricultural sector, urban population growth through immigration from agricultural centers to cities - especially, in developing countries such as Iran – explains the necessity to find solutions to establish and distribute population at the country.

Therefore, to solve the population issues, the government of Iran planned new towns with the main goal of attracting urban population surplus. To adjust the economic activity of the main city, regional development and use of natural resources as well as the optimum distribution of the population was also defined as other goals of new towns. Thus, these new towns were formed to help to solve the economic, social, and environmental problems of big cities (Ziari, 2013).

The social and cultural conditions of a new town as well as providing affordable housing with appropriate accessibility are the main concerns; it means the implemented plans should improve social and cultural improvement that emerge and grow in the new physical structure of the new town (Farhadikhah et al., 2016; Niyati, 2000; Taheri, 2013). To do this, the social situation of current status should be studied and described to do analysis and make suggestions.

The issue that should be mentioned is that the establishment of a city is not only a physical structure, but a city is a combination of its physical structure and its inhibitions. The link between residents of a city and their urban environment means the city (Habibi, 2006). These relations can create communication and identity of a community (Ziari, 2006). But the problem of new towns is the way of formation of their physical structure and lack of appropriate social-cultural structure that prevents the creation of a suitable environment for living or actively participating in the community (Ebrahimzadeh and Negahban Marvi, 2004). Therefore, the most important issue that new towns are faced with is the identity of residents and how they communicate and deal with the identity of place; that is because of the immigrant to these cities (Habibi, 2008). In other words, a sense of belonging to the city and their living place. In urban sociology, the city is not defined as just a place where many people live like a dormitory. In fact, an important component of the city is its collective identity and sense of belonging to the city and living place. The sense of belonging is associated with the collective identity. When there is a sense of belonging between residents, the collective identity is formed (Falahat, 2006; Moshiri et al., 2011; Varesi et al., 2012). Due to the importance of the component of the sense of belonging and urban identity, these issues should be given special attention while planning the new towns to enhance the quality of urban life too. A new town should not be just a dwelling or dormitory for its residents; people should consider themselves as citizens and not only residents. As a result of the strong emotional and social connections between residents, urban identity will also be formed.

3.1.1 The concept of new towns of Iran

The concept of “new town” is defined in two types of definitions:

In the first definition, a new town defines as any kind of community including villages or any other complexes that have been named recently by law or by political and strategic considerations as a city. Hence, the administration of the affairs of these cities assigned to the municipality of them after the establishment of the municipal organization. In the second definition, new towns are the planned communities that are consciously constructed in response to predetermined goals in the new located area to accommodate a certain amount of population. (Jangjou, 2006; Ziari, 2006)

Therefore as a general interpretation, two types of new towns can be mentioned:

1. Organic or spontaneous new towns
2. Pre-planned or constructed new towns

In this research, using the concept “new town” refers to the second definition, which means a planned and designed city. However, the official and legal definition of the new town according to the approval of construction of new towns of Iran is as follows:

“The new city is a place, within the area of which accommodation and social activity of more than 50’000 inhabitants or at least 10’000 residential units, in addition to the public, social and economic buildings and services needed for residents – outside the urban area and protected the privacy of existing cities - are predicted" (Habibi, 2006).

3.1.2 The history of new towns of Iran

The history of building new settlements and new towns in Iran began after the Macedonian conquest of Iran and Seleucid rule (330 – 250 BC); more than 400 new settlements were built in this period, influenced by the polis-state type (Habibi, 2007). New towns were constructed during the Sasanian Dynasty (224 – 641 AD) for military and agricultural purposes in a systematic administrative framework. This continued and neighborhood settlements were unified into integrated cities later (Madanipour, 2005). Persepolis, Bishapur, Soltaniye are some examples of these old new towns and Isfahan is a sample of an integrated new settlement with its neighborhood (Madanipour, 2005; Piran, 1991).

Figure 3.1.1. Bishapur; source: http://www.chtn.ir

Figure 3.1.2. Soltaniye; source: ttps://www.alaedin.travel

However, the new town in Iran in modern form has emerged in the 20th century. Since the 1920s, large groups of landlords, political leaders, heads of many nomads and tribes began to immigrant to big cities, especially to Tehran, and settled in them. This led to the further transfer of the economic surplus of rural areas to big cities, especially to Tehran; as a result, it increased the economic potential of big cities. On the other hand, it provided a ground to the emergence of a class in the urban community of Iran, which since then gained more economic and weaker political power in Iran. The presence of this class in cities, particularly in big cities and mainly in Tehran, led to the socio-economic and spatial growth of cities. (Hesamian, 1991)

The experience of Iran in creating new towns can be examined in two periods, before and after the Islamic Revolution (Nasiri, 2008):

New towns before the Islamic Revolution of Iran (1979)

In the pre-revolutionary period, new towns were constructed in different forms with various goals (Piran, 1991):

1. Industrial cities: Abadan, Andimeshk, Masjed Soleyman, Mahshahr, Puladshahr, Piranshahr, Bandar-e Shahpur, Aghajari, Haftgol, Zardno, Mes-e Sarcheshmeh, and industrial towns in Alborz, Saveh, Rasht, etc. (Ziari, 2013). These cities were planned to use resources in different regions of the country. These new towns were constructed to house employees of various companies and industries such as the oil industry in the south of Iran.

2. Political - military cities such as Zahedan and Noshahr. These types of cities like Zahedan have a rural core, but the rural core tissue merged in the main new tissue and over time it is removed (Ebrahimzadeh and Negahban Marvi, 2004).

3. Renovated cities after the earthquake, Quchan and Salman are such examples of this type (Saidnia and Mahdizadeh, 2003). These cities were built within the original location of the city before the earthquake.

4. Harbor cities: such as Bandar Ma’shour and Bandar Shapour (Emam Khomeini)

5. New towns such as Shahin-Shahr to settle population (Jangjou, 2006)

These new towns except industrial cities were often created as settlements and industrial complexes for government employees and industrial staff in new districts of existing cities near the industrial centers, which have been integrated with the main city as a neighborhood or residential area after the development of the main city. The most significant new town as a new settlement is Shahinshahr in Isfahan that has been constructed to absorb the overflow population of Isfahan in 1970. (Jangjou, 2006)

New cities built in the period between the two world wars are often based on a rural core, which is developed today and has a political and economic role in their region. Residential neighborhoods, which were constructed near the big cities in that period are now the main component of the city due to the development of these cities and they are distinguished from other parts of the city considering their urban configuration. (Molayi and Shakoori, 2016)

New towns after the Islamic Revolution of Iran (1979)

After the Islamic Revolution of Iran, urbanization expanded and the population of Iran increased, therefore big cities face many issues. Not only the urban population were raised but also the number of cities increased. Therefore the idea of the creation of new towns was developed and the construction of new towns was approved in 1986 to absorb and decentralize the population overflow of big or mother cities, and to respond to the needs of housing of low and middle-income groups (Akbarpour and Mirzajayi, 2010).

The main goals of new towns in this period are categorized as follows:

1. decentralization big cities improve the urban environment and rehabilitate poor area through a transfer of part of the population and existing industry
2. creating new opportunities for investment and housing resettlement in new locations to balance the special distribution of the population and existing industry to outside of the cities
3. planning a more suitable model for residence in big cities in the form of isolated suburbs (Jangjou, 2006).

To do so, the “New Towns Development Company” was established in 1988. Although, in the period after the Islamic Revolution of Iran, many experiences of other countries were studied and applied in designing and planning new towns, but many researchers consider that Iranian new towns are more influenced by English patterns in this field. The most important difference between the new towns before and after Islamic Revolution is their function because the aim of the new towns before the Islamic Revolution was a kind of economic functionalism and the goal of nowadays new towns is to attract population from big cities, so they are considered more satellite cities rather than industrial new towns (Ziari, 2006).

3.1.3 Classifications of new towns of Iran

New towns were being built over the decades at different levels. These cities can be categorized into six groups: (Jangjou, 2006; Ziari, 2006)

1. Cities that were built after natural disasters such as Salmas and Quchan

2. Cities or settlements created for the workers of the industrial complex such as Shushtarno, Sanat Naft Abadan, Mes-e Sarcheshmeh, Ariashahr (Fuladshahr)
3. Cities with a political or military role such as Yasuj, Noshahr, Piranshahr, Shahin-Shahr
4. Towns that were built with a capital of the private sector such as Tehran-Pars, Narmak, Jahan-Shahr, Mehrshahr (Karaj)
5. New urban innovations under the name of Haft-Bagh (Garden City)
6. Satellite new towns based on the law 108328 of the Cabinet of Ministers of Iran on 11.07.1985 to create employment centers, refinement of mother cities, preventing spontaneously settlements, providing housing for low-income families, and maintaining areas with ecological values

Urban development of the first, second, and third groups was mainly created by governmental funds, additionally, their design and implementation may have been accomplished confidentially. Therefore, their achievements have not improved the culture of Iranian urbanization, and governmental support failed to compete with the spontaneous organizations from the private and participatory sectors of the fourth group of cities mentioned above. Sometimes, the residential neighborhoods that were built for industrial workers such as Sanat Naft Abadan, are considered as the garden city because of open spaces and extensive courtyards separated by a hedge that is of course only superficial thinking. It should be mentioned that such an impression was made in western countries too, that large houses with plants and flowers, and with rural atmosphere considered as the garden city, while they are far from Howard's ideas. Finally, the political and military cities can be mentioned, which were built because of specific regional goals. (Nasiri, 2008; Piran, 1991)

In the classification above, the fourth group of the category is the sample of a positive attitude toward the garden city movement. Innovators of this type of urban development in Iran have instinctively felt Howard's social message, although they may not have heard the name of it. Tehran-Pars is a sample of this group, which was built in the 1940s in the eastern of Tehran by a construction organization of the private sector to provide housing for teachers. The urban development plan followed a simple grid pattern and provided relatively favorable urban and welfare services, which attracted many people from other parts of Tehran to use these welfare services. In this town, since most of the residents were teachers and had relatively equal income, therefore, a social balance was established in Tehran-Pars. The design of residential units was small and medium, which many residents wished to have such an independent home with a garden in a good and homogeneous social environment. Residential density in Tehran-Pars was about 40 residential units per hectare that are close to the concept of the garden city. However, a lack of public spaces and some urban services was considerable.

Another example of the fourth group is the settlements around Karaj; many of them were developed in the 1950s to inhabit the prosperous and affluent people of the urban community of Tehran in large plots. Some of them such as Mehrshahr are still regarded as dormitory settlements of Tehran. Such urban extensions can be considered as a garden village in the west and English urban culture. (Nasiri, 2008)

The fifth classification of new towns in the urban development planning system of Iran uses the attractive name of the garden city through separating plots in 1000-2000 m^2 to absorb high-income people. This type of new town is constructed in suburban areas of some cities like Shiraz and contains villas residential units. Although this distinction within the area of new towns justifies the creation of social balance and accommodation of different social classes households, but parceling of suburban lands in the area of new towns will ignore the rights of residents of these cities (new towns) to have urban public open spaces. However the environmental impacts of this type of urban development seem to be attractive with plants, trees, and flowers, but providing their urban services and facilities will create many problems and issues in the future, while they are affiliated with neither a mother city nor a new town. (Shahro Barnameh Consultants, 2001)

The sixth group includes new towns built after the Islamic Revolution. The goals mentioned in the approved plan of new towns indicate that the principles of the theory of garden city have been affected. However, something similar to European countries happened in Iran; that was the achievement of these goals were possible by governmental organizations and New Town Development Company, but with the people's capital. (Shahro Barnameh Consultants, 2001)

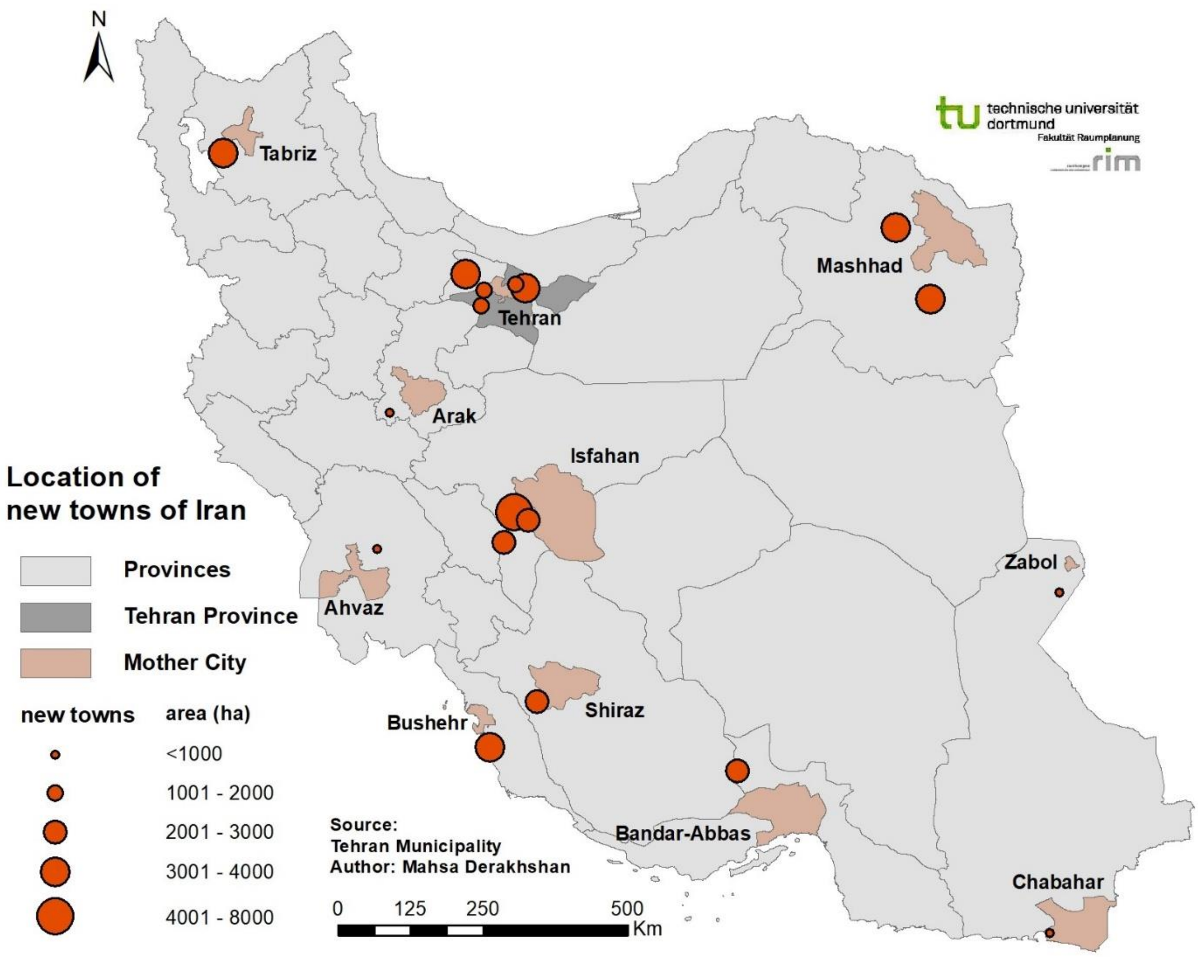


Figure 3.1.3. Location of new towns of Iran (sixth group) after the Islamic Revolution

Since the approval of the construction of new towns in 1986, the executive operation of 18 new towns has begun: Andisheh, Parand, Pardis, Hashtgerd, and Latyan in Tehran province, Golbahar and Binaloud in Khorasan province, Sahand, Mohajeran, Sadra, Alavi, Aalishahr, Fuladshahr (Puladshahr), Majlesi, Baharestan, Ramshar, Tis, and Ramin. The construction of four new towns including Kelardasht new town, Shirinshahr, Ivanki, and Siraf new town was approved by the Supreme Council of Urban Planning of Iran but they are not constructed.

The following table – table 3.1.1- represents the new towns (sixth group) after the Islamic Revolution of Iran:

Table 3.1.1. New towns of Iran (Sarrafi, 1990; new town Development Company, 1999)

New town		Mother city	Distance from mother-city (km)	Date of establishment	Predicted population (person)	Population in 2006	Area of new town (ha)	Date of approval of the comprehensive plan
1	Pardis	Tehran	25	29.07.1991	200,000	25,360	3814	13.07.1995
2	Hashtgerd	Tehran	65	14.05.1990	500,000	15,619	4000	19.07.1993
3	Andisheh	Tehran	30	27.02.1992	132,000	75,569	1495	30.11.1992
4	Parand	Tehran	40	12.06.1990	150,000	5,791	1700	31.08.1998

5	Latyan	Tehran	10	17.03.1993	-	-	1100	-
6	Majlesi	Isfahan	65	1989	140,000	2,659	3000	1993
7	Baharestan	Isfahan	15	1989	500,000	45,538	3000	1993
8	Puladshahr	Isfahan	25	1989	500,000	55,496	7700	1994
9	Sahand	Tabriz	20	1991	100,000	13,610	3148	1991
10	Sadra	Shiraz	15	1991	200,000	9,949	2040	1995
11	Golbahar	Mashhad	40	1990	430,000	6,889	4000	1993
12	Binaloud	Mashhad	45	1991	113,000	143	4000	2001
13	Aalishahr	Bushehr	24	1989	100,000	6,251	4000	1996
14	Mohajeran	Arak	28	1990	60,000	11,109	821	1997
15	Alavi	Bandar-Abbas	40	1990	100,000	120	3000	-
16	Ramin	Ahvaz	35	1990	120,000	-	1000	2004
17	Ramshar	Zabol	35	1991	65,000	40	1000	2000
18	Tis	Chabahar	30	1991	100,000	-	1000	-
					3,510,000	274,143	52213	

3.1.4 Population and necessity of the construction of new towns of Iran

The study of the urban population of the whole population of Iran from 1956 to 2006 indicates that the urban population of this country has increased by more than 30 percent in the last century. So the proportion of the rural and urban population has reversed in this period. The number of cities of Iran in 1956 was 199, which reached 1012 in 2006 and 1148 in 2016 based on the official census of these years.

This explosive and growing urbanization has caused many complications and problems in the lives of citizens. These problems particularly in developing or not developed countries have become more important. In these countries, there is a difference in income levels between the city and countryside, lack of appropriate planning in the principled distribution of facilities and resources between cities and their surroundings, not principled and non-logical attention to regional planning, and lack of attention to proper growth and development of cities has led to the emergence of unbalanced and disparate big cities regardless of the urban hierarchy system. Issues have caused many urban problems including an increase in population and high density of urbanization, different types of environmental pollution, the emergence of various social and cultural problems, increased false occupations and unemployment, the emergence of many spontaneous settlements, and other problems. (Dadashpour, 2002).

Considering these issues, to provide an appropriate establishment of the urban population due to the provision of urban services, to prevent the formation of urban slums, so the emergence of economic and cultural problems near the big cities, and to avoid uncontrolled development of metropolitans that were faced with social and economic issues and also significant problems in providing urban services, creation of "new towns" became necessary (Jangjou, 2006). New towns are considered as the main solution of big cities, which are designed and built with different perspectives and criteria in different parts of the world for various purposes. The construction of new towns in its special meaning and what now is considered goes back to the Industrial Revolution, which is pioneered by Ebenezer Howard in England (Ziari, 2006).

In this period, the population of big cities of Iran – such as Tehran, Isfahan, Shiraz, Mashhad, and Tabriz- were growing rapidly, therefore, creating new towns to organize the overflow of population and economic activities became necessary. (Talachian, 2005).

Examining the changes of urbanization in Iran, it is clear that the disruption of the Iranian urban system has been caused by the following factors (Hataminejad and Zamani, 2013):

1. A sharp increase in the rate of population growth over the years 1956 – 1986 (the population of Iran in this period increased 2.61)
2. Rapid urbanization in Iran, especially, between the years 1956- 1986 due to the village-urban immigration caused by land reform law and increasing dependence on oil revenues, was not in accordance with the capacity of urban development of the country.

The other reason that represents the necessity of the creation of new towns in Iran in the 1980s is the predicted population of 130,000,000 people in the whole country and 96,000,000 people in urban regions in 2021 (Ziari, 2013). Although the population of Iran in 1956 was 49,000,000, during the years 1986- 2011, due to the two factors that are reduced population growth rate and urban population growth rate, the predicted population and possible pressure to the urban network have been severely reduced.

3.1.5 The studies on new towns of Iran

In the research "*The necessity of preparation of national urbanization policy for the success of new cities in Iran*", Sarrafi (1990), discussed the specific issues and problems of new towns of Iran. Although establishing new satellite towns in Iran has been presented as a realistic solution and policy, but it has specific issues and cannot be a fundamental solution to urban problems. Therefore, along with creating new towns, it is necessary to prepare basic and long-term plans and at the head of them, national urbanization policies for the spatial development of the country. (Sarrafi, 1990)

Ghorbani (1997) evaluated the factors affecting the population of the Sahand new town in the research. Based on the research, the most significant reason for the slow process of population growth of Sahand is the decline in population growth in the urban region around it and Tabriz. Inconsistency in land development and housing development plans, failure to consolidate the economic foundations of the new town, geographical isolation and its impact on attracting population, the activity of housing cooperatives and their role in the process of absorbing population, and the issue of urban facilities and services are other reasons in decreasing the process of population growth of Sahand new town. (Ghorbani, 1997)

In another research entitled "*An analysis of urbanization and status of new towns of Iran*" the main reasons for a weak function of Iranian new towns are studied, which are:

- Uncertainty about the position of new towns in urban development policies
- The lack of financial compliance of new town development companies for their assigned tasks
- The lack of identity in new towns due to the lack of facilities, services, and features that enhance the sense of place (Ebrahimzadeh and Negahban Marvi, 2004)

Etemad (2007), studied "the differences between first aims and final results in creating new towns and the reasons". The differences are as follows:

- Due to the lack of employment in new towns, the function of these cities, especially in the early years is like a dormitory.
- Although in some of the new towns, primary services such as schools, clinics, etc. have been created, but due to the low population of the city, these services have not been reached the required population range to employ. On the other hand, providing higher-ranking services is also impossible for a few populations.
- Urban safety in new towns is not desirable due to the low population density and solitary urban spaces.

- The way of assignment of land in new towns based on its assignment to the “Housing Cooperative” has led to a lack of diversity in social classes.
- Urban spaces, in cases where the recommendation of the plan is applied, are relatively favorable, but in cases where the architecture is uncoordinated and disharmonic, and building materials are various and inadequate, urban spaces are not desirable. (Etemad, 2007)

Zebardast and Jahanshahloo in their research entitled “*Evaluating the function of Hashtgerd new town in absorbing population*” concluded that the lack of creating employment and forming services has aggravated the problems of new towns, including Hashtgerd new town. In other words, if enough occupation is not created, the population will not be attracted to new towns; so the necessary demographic level to form urban services will not be reached and will not be created. (Zebardast and Jahanshahloo, 2006)

In the study “*the evaluation of the function of new towns in absorbing population of metropolitan areas; case study: new towns around Tehran*”, Gharakhlou and Panahandekhah have concluded that the function of new towns indicates a relative failure of them to attract population. In the case of new towns around the metropolis of Tehran, Andisheh new town has been more successful in reaching the target population than the other three new towns: Parand, Pardis, and Hashtgerd. Locating in the area of employment and availability of educational and cultural facilities can be considered as the reason for the success of the Andisheh new town in absorbing the population. (Gharakhlou and Panahandekhah, 2009)

3.1.6 The evaluation of Iranian new town

Iranian new towns are evaluated in the planning system of Iran through their location, the physical attitude of the plan, population (observed and predicted population), services and industries in mother cities, diversity of residents’ social classes, governmental support, and providing affordable housing.

Absorbing population

Regarding the strategy and goals of creating new towns, it seems that new towns have not succeeded in achieving the defined goals, especially in attracting overflows of the population from mother cities that is the most important goal. The statistics show that the new towns have not reached their minimum population. Two new towns of Andisheh and Pardis, due to their location in the metropolitan area of Tehran, reached 37% of the predicted population in 2006 (Etemad, 1997).

As mentioned before, the theory of Garden City aims to create garden cities around the big cities, so that population and industry should be placed out of the big cities. In other words, Howard's opinion was by transferring industry to garden cities, the settlement will be also transferred. But by studying the situation of the Iranian new towns, it is clear that there is not any comprehensive plan to transfer industry from mother cities to new towns. Therefore, in this case, the realization of the predicted population of new towns is very difficult or even impossible (Ghorbani, 1997). Even if the realization of the predicted population has happened, the new town be more like a dormitory with daily travel for commuters; considering the distance between the new town and mother city, residents have to spend more money and time to reach their works (Sarrafi, 1990). It should be noted that due to the lack of an efficient public transportation system between the mother cities and new towns, living in these dormitories is conditional to have personal vehicles (Etemad, 1997). Since most of the applicants of the new towns are intermediate or low-income groups, the amount of families without personal vehicles is significant in these groups, so the attraction of new towns is influenced by the problem of public transportation. Therefore, as the distance between the new town and the mother city is closer, more people will be attracted to the new town. (Hataminejad and Zamani, 2013)

Predicted population

Uncertainty has always existed in predictions of economic, social, and human sciences and consequently in spatial planning. One of the main reasons for the failure of new towns in Iran is the prediction of population numbers and population groups in new towns. Almost in all of the planning of new towns, the composition of the settlement population in new towns is considered similar to the mother city or cities around it, while studies indicate that in new towns, young people are settled more, that is not similar to other cities (Etemad, 2007). Also, the amount of predicted population of new towns is usually based on mathematical models. But there are no rules and mathematical rules govern the changes in the population of all new towns of the country. Considering the inaccuracy of demographic predictions, predictions of expectations of residents of new towns have been also made within the framework of mathematical calculation, while uncertainty existed in predicting the number and composition of the population. (Hataminejad and Zamani, 2013; Ziari, 2013)

In such a situation, without any data about the details of the type of households, their needs, and desires, residential buildings in new towns have been constructed on a large scale. Moreover, the prediction of the economic situation and income of households was not possible, in some cases, the price of residential units was more than the ability of households to buy (Sarrafi, 1990). Other needed urban infrastructure and facilities in new towns are not created at all or most have been created long after the establishment of the population in new towns. Some of them have been created before the establishment of the population in these cities; due to the lack of population, they are abandoned without any use (Ghorbani, 1997).

It should be noted that prediction in developing countries is very difficult and certainty in prediction is impossible, due to the wide variety of economic, social, and political development.

Services and industries in mother cities

Another point in this regard is that in all mother cities of the country, a significant amount of occupational structure is devoted to the service sector. The transfer of services from mother cities to a new town is contrary to the idea of planning a new town, additionally, it leads to increased travel time and costs (Zebardast and Jahanshahloo, 2006). Therefore, it seems that considering the low amount of industrial jobs in mother cities of the whole country, the proposed population of more than 100,000 people is irrational and theoretically unreasonable (Hataminejad and Zamani, 2013). Moreover, due to the issue of the incompatibility of certain industries with each other, it is impossible to transfer all industrial activities of a mother city to a new town, because the environmental problems will create difficult conditions for residents of the new town. Therefore, to transfer the industries out of the mother city, several new towns should be created around it (Hosseinizade D. et al., 2012).

Diversity of residents' social classes

The other reason mentioned as the failure of towns is the lack of social-economic diversity between their inhabitants. Disregarding the various social and income groups in planning has led to a lack of economic diversity in new towns because accommodating low or middle-income groups in new towns is the aim of creating these cities. Moreover, the highest proportion of the population of new towns belongs to young people, which indicates the weakness of the social diversity of inhabitants. Middle-aged or old people have a sense of belonging to the mother city where they live, and since the formation of new towns is not proportionate with their lifestyle, they have not been attracted to new towns. (Hataminejad and Zamani, 2013)

Location of new towns

Another reason that has led to the failure of the new towns of Iran is the location of them. The study of the location of new towns indicates that most of these cities are located in areas with high population density. In such a situation, if the goals of the construction of new towns are achieved, there is a possibility of decentralizing the mother city, but actually, in the metropolitan area not only it does not reduce the centralization, it also increases the speed of centralization. (Sarrafi, 1990)

Concerning the location of the new town and its distance to the mother city, it should be stated that the distance from the mother city is determined by the type of the new town. Since most of the Iranian new towns are of the type of dormitory, distances more than 30- 40 kilometers are not reasonable. Therefore, the distances of new towns of Hashtgerd and Majlesi (65 kilometers to their mother cities) are not correct (Ghorbani, 1997). It should be noted that in the case of new towns within the distance of 30- 40 kilometers from the mother city, it is necessary to apply strategies to strengthen the public transportation system between the new town and the mother city to reduce the commuters' problem. This factor has contributed to the failure of the new towns in attracting the population (Hataminejad and Zamani, 2013). On the other hand, the excessive proximity of the new town to the mother city leads to an increase in the price of residential units and also the cost of building urban infrastructure. This factor can cause a lack of acceptance of low and middle-income groups of the community to move to new towns. (Gharakhlou and Panahandekhah, 2009)

In most countries around the world, the strategy of development of new towns that are constructed on vacant lands is to develop toward existing settlements. Therefore, if the aim of creating a new town is to reduce problems of the mother city, then the existing cities with the potential of development or centralization should be identified. This factor has been ignored in locating new towns in Iran. (Hataminejad and Zamani, 2013)

And the last point regarding the weakness of the location of new towns in Iran is not considering geographical and environmental conditions in locating new towns; the most important factor considered is the possibility of owning the land.

Governmental support

The lack of comprehensive support from the government and related institutions is another reason for the failure of the new towns of Iran. Since the very beginning of the construction of new towns, due to the lack of acceptance and even disagreement with this policy by some members of the Ministry of Housing and Urban Development, as well as the lack of cooperation of other relevant companies such as water and sewage, electricity, telecommunication, gas, and other companies in providing needs of inhabitants of new towns, made the attitude in the mind of the residents of metropolises or other mother cities that living in a mother city is better than living in new towns in any way and with all its problem, even they do not own their housing. The psychological impact of this issue has been obtained through questionnaires of a survey from people without housing in big cities and mother cities. (Hataminejad and Zamani, 2013)

Furthermore, if the construction of new towns, especially during the early years of construction, was faster, it would attract more immigrants as residents as well as investors; attracting immigrants and private investors would accelerate the development of new towns, therefore, reaching the predicted population. Unfortunately, the construction of new towns in Iran has been very slow in the early years. Considering that the development of new towns has been accelerated in recent years, it seems that the development of these cities will be faster if the national policies about urban development are not changed and the problems of these cities are resolved. (Sarrafi, 1990)

Moreover, the contradictory policies of urban development have been effective in the failure of new towns in population growth. In the Third Development Plan of Iran (2000-2004), new towns were severely restricted. As it was explicitly stated in the plan that the creation of new towns should be avoided except in specific cases. In 1990 – 2000, the policies to strengthen small and medium cities were also presented in academic assemblies and among national and regional policymakers. Also, the policy of the inner development of cities especially in deteriorated areas was expressed in this period.

These policies have resulted in competing policies for new towns and have led to the failure of new towns to attract population. (Hataminejad and Zamani, 2013)

Affordable housing

Another important reason for the economic failure of the Iranian new towns is the importance of housing in this country. Today, housing is a type of investment and an increase in income; so it has an economic concept. The best, most prosperous, fastest, and most reliable investment of the private sector is investing in land and housing (Etemad, 2007, 1997). Construction and purchase of housing can be an effective means to raise assets during inflation and the growth of prices. Housing is essential for economic stability and improvement of the lives of families since poverty and lack of economic provision are the main causes of social instability (Rafiee, 1989).

According to what has been explained above, the desire to buy housing in new towns is low, as the ascending process of land prices in new towns is slower than the process in metropolises and mother cities. Due to the bold role of land and housing traders and brokers, residential units created in new towns may have a large volume of sales, which indeed did not help in solving the effective demand in the field of land and housing construction (Ghorbani, 1997). It should be noted that most builders of residential units have less tendency to build residential units in new towns due to the higher profitability of building residential units in mother cities (metropolitan areas) in comparison with new towns. (Sarrafi, 1990)

The higher cost of providing materials and construction workers, lack of water, and electricity during construction of building in some of the new towns are factors that increase the cost of construction. Considering that these factors reduce the speed of construction of residential units, therefore, the period of engagement of financial resources in the project is increased; in general, the benefit generated by the construction of residential units in comparison with metropolitan areas is reduced. (Hataminejad and Zamani, 2013)

Physical attitude of plan

The next reason for the failure of new towns in Iran is the only physical attitude in preparation of plans and lack of attention to the needs of people by planners and consulting engineers. Planning of new towns of Iran is based on the non-native urban planning criteria and rigid and non-flexible urban design standards regardless of social, economic, and environmental factors. This issue can be due to the indicators, criteria, valuations, and relationships that only experts in urban planning, architecture, and civil engineering have been focusing on, regardless of people's needs and demands. Therefore, new towns of Iran face social, cultural, and identity problems. (Etemad, 2007; Hataminejad and Zamani, 2013)

Understanding urban issues as a complex system is not possible by one or two specialists and fields, but requires the cooperation and participation of experts in various fields of economics, demography, sociology, traffic and transportation, environment, geography architecture, urbanization, etc. it should be also noted that the final decision-makers are people and not urban planners.

3.1.7 Quality of urban life, urban identity, and physical form of Iranian new town

When it comes to a new town, it is expected to achieve a higher standard than existing cities in urban design and planning, selection of transportation systems, facilities, and urban infrastructure. Residents of a new town are moved from a metropolis, a big city, or even a small town in the region with a great hope into the new town, of course, they have more expectations than their previous situation in the field of housing, services, and in general, urban affairs (Etemad, 1997). On the one hand, the rate of absorption of the population in a new town is related to the people's beliefs, how people are welcomed, the degree of utility of urban services, and how the progress of the new town is (Nouri Kermani, 1995). On the other hand, it is not enough for a new town to absorb the population, but the most significant matter is that residents stay living in a new town. Meanwhile, the intention and desire to remain in a new town and the satisfaction with living in a new town are two main indicators (Rayis Dana, 1992); after settling down, the residents of new town apply for all services with the same quality and coherence of the services in mother cities (Kazemi, 1997).

That means, the applicants for land and housing in new towns do not want housing in any form, they expect a minimum of urban facilities, appropriate housing, public services, and acceptable welfare (Taleghani, 1999). Burby and Weiss believed that one of the factors that people feel satisfied with the choice of a new town is achieving the main goal that a family is seeking to reach by moving to that new town (Burby and

Weiss, 1976; cited by Mahdavinejad and Iranishad, 2013). In this regard, Michelle and Varney argued that in the planning of new towns it should be considered the fact that the construction of the towns lasts for at least 30 years. Of course, it is impossible to wait for the formation of a city all this time and it is not possible to compensate for the early dissatisfaction of inhabitants with long-term promises (Michelle and Varney, 1976; cited by (Zebardast and Jahanshahloo, 2006). It is not sufficient for new towns to attract the population only, it is most important to maintain the migrants in these cities. Therefore, the intention and desire to stay in new town and the degree of satisfaction with living in these cities are counted as significant indicators.

The authorities of French new town development have based their work on principles that are partly related to the issue of establishing interaction between community and environment over time, they emphasize that in urban planning studies the fact that the formation of new towns needs time should be considered. A new town is a living creature that must have all the necessary functional elements in itself to maintain its balance and growth. Each functional element should be multi-dimensional and must be realized from the beginning because the image that is formed in the public mind after living in a new town is an image that will be difficult to modify later. It is not enough to combine various functional elements in a new town there should be an interaction between functional elements to create a special dynamic system of cities. (Arbab and Azizi, 2009)

The goals of each new town determine the population, their purpose, and their reasons to migrate to the new town. In the new towns to attract population in order to solve the housing problems and reduce the density of metropolises, the reasons for the migration from mother city to new town could be mainly providing affordable housing or higher quality of housing (comparing with mother city), the close distance between work and residence, reducing time and cost of travel, better quality and living condition for the target population (Zebardast and Jahanshahloo, 2006).

If the reasons for migration to a new town are in line with its goals and plans, it will lead to the success of that new town. Shokouyi believes that the economic factor is a very important factor in making a decision when a residential area is chosen; it plays an important role not only in the price of land, home, and rent but also when it comes to choosing a place to live (Shokouyi, 2011).

In Kulberg's opinion, the first generation of residents are strangers in the new town; moreover, inappropriate and undesirable patterns of new towns and lack of identity highlight this issue. A person who does not know new towns or a stranger, who comes to a new town for the first time, finds these new towns boring, dismal, uniform, and monotonous. Although this description represents an old and outdated image, such an image can still be seen outside. (Kulberg, 2005)

Studies of the "European New Towns Platform (ENTP)" explained that a new town is like a child, so it needs time to grow normally. The authorities of the construction of new towns prepare some facilities for people at first levels, but people have the main role; they have the main role to develop their city and help it to grow. For some reason, residents need to do not lose their belonging and loyalty to a particular place. New towns offer opportunities that people can individually or in a group have a prospect of a better future. Indeed a city must be able to change, this change is necessary to influence people's imaginations and thoughts. Public spaces should be also considered in the plans of new towns, while places for social connection ought to be created as much as possible. New towns have to improve quality for their residents, to do so one solution is the participation of residents. Local and interactive attitudes present some solutions to provide the demands and requirements of residents of new towns properly. (European New Towns Platform (ENTP), 2002)

In the research about Pardis new town, Motadayen and Hojati argued about the lack of urban identity and the sense of belonging of inhabitants as one of the problems of new towns. As new towns are usually pre-planned and built on vacant land, they lack urban spirit, inhabitants are not interested in living there, so that the result is a city where its inhabitants, and even the city itself, are seeking their identity in the metropolis they are dependent on. From the perspective of the authors of the research, it is possible to solve the issues caused by lack of identity and accommodation using the existing capacity of the new town along with smart management of urban views and paying attention to identity symbols and an increasing sense of belonging of residents. Due to the lack of urban imagery, new towns are always like an unfinished construction workshop which causes inhabitants to feel more temporal. This research aims to analyze the main axis of the new town of Pardis as the most influential figure, which can form identity and characteristics for this city considering various aspects of aesthetics, identity, and function. (Motadayen and Hojatati, 2012)

Rabbani et al. (2010) investigated the factors that affect the social satisfaction of new towns through the cultural attitude of residents of Pardis new town as well as their expectation of services, these are studied as important factors that create a sense of belonging and urban identity. The emotional security of inhabitants is another factor that is related to their identity of place. In this research, data and information are collected through documents and questionnaires (with a sample size of 384 people using Cochran’s method). The result represents that urban social satisfaction varies according to the type of dwelling units, ethnicity, and level of education. Moreover, the variable of services and manufacturing activities has the most effect on the social satisfaction of Pardis. After that social, cultural, and geographical space and then the emotional and mental security of inhabitants affect urban social satisfaction, quality of life, and place identity in Pardis new town. (Rabbani Kh. et al., 2010)

In another research about new towns by Moshiri et al., the relationships between public spaces in Parand new town with the formation of place identity in urban spaces are investigated. Finding represents that the higher the amount of public spaces as an independent variable in Parand is, the more identity of inhabitants to Parand new town is. Asking residents indicates the low quality of urban spaces, unsafe streets, and parks due to lack of mixed land uses, lack of appropriate urban furniture, and lack of diversity in architecture makes Parand new town boring, spiritless, and non-dynamic. Inhabitants prefer to spend their time in their residential units rather than public spaces or outside of a new town (in their previous city as an example). In this research, 88% of inhabitants do not feel a sense of belonging to Parand new town. (Moshiri et al., 2011)

Varesi et al. studied the urban identity of residents of the new town of Fooladshahr. Findings show that there is a direct linkage between the duration of residence in Fooladshahr and the sense of belonging and urban identity of its residents. Also, people’s satisfaction with access to urban services increases their sense of belonging as well as urban identity (Varesi et al., 2012).

To evaluate the quality of urban life in new towns, Shamai and Shahsavar studied five categories: urban and residential environment, economic development, social development, security, and health; this research has been conducted through questionnaire analysis. In general, residents of Parand are satisfied with the quality of the urban environment by considering three physical, content, and functional indicators. Residents of Parand are more satisfied with the quality of spaces and buildings, shopping centers, social relations and security, and quality of housing; they are less satisfied with access and transportation, recreational services, living in Parand, and the cost of housing. (Shamai and Shahsavar, 2017)

The mental dimension of urban quality of life in Andisheh new town is studied by Farhadikhah et al. (2016) through 31 indicators of 6 dimensions of social, economic, physical, environmental, welfare – services, and urban facilities. Using questionnaires, the opinion of residents of Andisheh new town are asked and their satisfactions with indicators are evaluated. The findings indicate that residents of Andisheh new town are just satisfied with the distribution and diversity of shopping centers; moreover, the duration of their residence has not affected the quality of life. It represents that Andisheh new town is not successful in achieving its goal, however, the population of this city is more than the predicted population in its plan. The main reasons for that is the cheaper price of lands and residential units, proximity to the industrial area of the region of Tehran, and also proximity to Tehran metropolis are the reasons. Overall, the residents of Andisheh new town are not satisfied with indicators of quality of urban life in Andisheh new town. (Farhadikhah et al., 2016)

New towns in Iran, are a one-dimensional response to the issue of the surplus of population in which urban identity has been neglected since every space or place is a source of identity and identifies the groups in which they are placed (Rabbani Kh. et al., 2010)

Cities and urban spaces in the past have personality and identity, while what emerged in most of the new towns in public minds is a set of buildings, streets, and offices that the sense of belonging to these spaces becomes less and less frequent. In fact, in the contemporary era, and especially in recent years, building to build and not for life has left no opportunities for attention to important issues such as identity in urban planning (Shaterian et al., 2017).

Chapman argued that in many new towns, the creation of social and recreation facilities are commenced long after the construction of buildings, so it affects the sense of estrangement in residents. Considering that new towns are criticized because of the uniformity and simplicity in design and pattern, but their characteristics, qualities, and activities change at any time because the history of a place continues to evolve. (Chapman, 1996, cited by Arbab and Azizi, 2009)

Although humans make the identity of cities, cities also create an identity in their inhabitants by creating a unique collective identity (Karbalayi Nouri, 2006). The satisfaction humans receive from their surrounding physical environment and other people and affect them is the quality of urban life (Marans and Kweon, 2011). Two dimensions of objective and subjective can be considered for the concept of urban identity and quality of urban life; the objective dimension includes the appearance of the city and its building, its geographical coordinates, and natural or artificial attractions, indeed, it is related to the physical setting of new towns, and mental dimension includes the structure of social relationships and interactions, and the spaces that underlie these interactions or satisfaction with life condition. Not only place identity but also the quality of urban life is based on a combination of both dimensions. Differences in similarity and similarity despite differences. In a critique of Howard's theory of creating new towns in the United States, Jacobs believes that these cities have weakened social relations and created unequal and unconventional neighborhoods (Behzadfar and Barin, 2008; Karbalayi Nouri, 2006).

Habibi (2006) believes that considering the thoughts formed new towns and experiences from them – both on a global and Iranian scale – shows that how far those thoughts and these experiences have neglected attention to urban memorization and memorable urban spaces. Therefore, in many cases, these experiences are significant examples of the failure of modern thinking in creating a city. Chandigarh and Islam Abad are just two examples of such cities that have not been able to be remembered in their citizens' minds; there are many examples of cities without memories. In new towns, a person is more of a resident rather than a citizen. He settled in a city and has no memory of its past, the city also has no memory of itself because it is located somewhere that was an open space in nature before. By forming the new city, this open space is changed to a place; therefore, both the city and residents looking for an identity. It will not be possible unless the city experiences a generation, and this generation has also experienced the city. (Habibi, 2006)

Study definitions, views, and theories about the identity of a place, urban identity in new towns, and quality of urban life represent that identity is the result of interaction between environment and community regarding the time and quality of urban life is satisfaction with the interaction between urban environment as well as other people. These concepts are influenced by objective features and appearance of the environment, and also has root in subjective experiences such as memory, history, and social culture.

The weakness of the identity in an urban settlement leads to dissatisfaction with the situation, discontinuity, or absence of the formation of linkages and relationships of residents with their environment, consequently, with each other. Many researchers Kamrava (1992), Ebrahimzadeh and Negahban Marvi (2004), Narimani (2004), Behzadfar, and Barin (2008), Rabbani Kh. (2010), and Shaterian (2017) in their studies about new towns of Iran have mentioned the lack of attention to the identity of place (urban identity) affects the quality of life and leads as one factor of the failure of Iranian new towns. Therefore, despite the many problems of living in the mother cities or metropolitan cities, new towns with a very small population continue to live. In other words, new towns have become an obligatory residence for inhabitants, and inhabitants livening in new towns are waiting for an opportunity to leave these cities. (Behzadfar and Barin, 2008; Ebrahimzadeh and Negahban Marvi, 2004; Kamrava, 1992; Narimani, 2004; Rabbani Kh. et al., 2010; Shaterian et al., 2017)

3.2 Andisheh new town: the study area

Tehran metropolitan area is one of the most complex spatial systems in Iran. This region with an area of more than 18,000 km^2 has been expanded within a radius of 30 – 40 kilometers from the city of Tehran. It is encountered with major economic, social, and physical problems such as high residential and population density, environmental issues, destruction of agricultural lands and gardens, as well as major limitations of physical development because of uncontrolled migrations and growth of population centers, and informal and spontaneous settlements on the one hand, and climatic and geographical conditions such as the northern and eastern mountains and southern desert on the other hand. (Farhadikhah et al., 2016; Nasiri, 2008; Shokuhi, 2007)

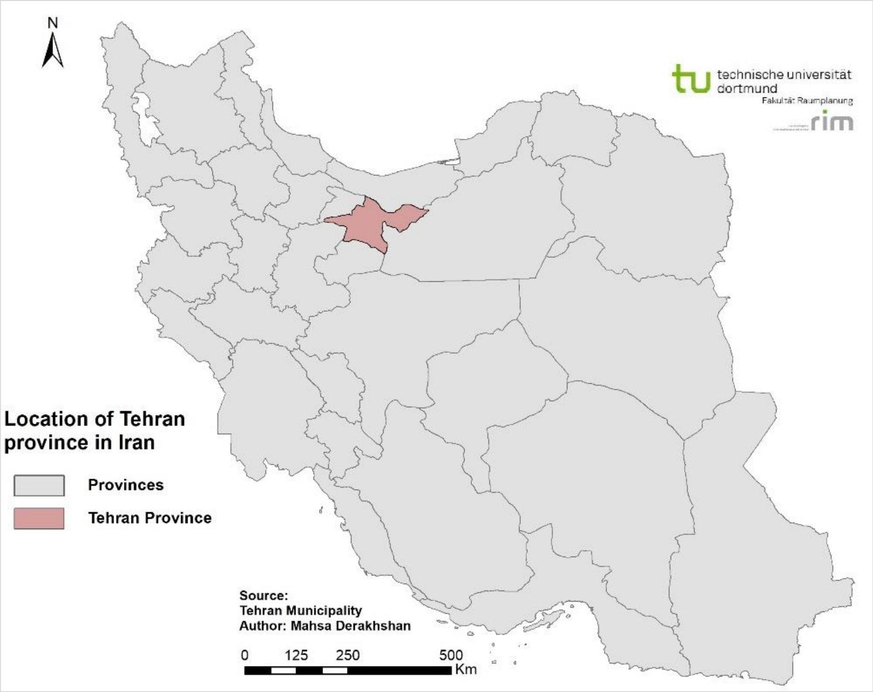


Figure 3.2.1. Location of Tehran province in Iran

To overcome the problems mentioned above, the construction of five new towns of Pardis, Hashtgerd, Andisheh, Parand, and Latyan around Tehran was suggested in the late 1980s and was approved by the Cabinet of Iran, considering two main goals of reducing the population and activities of Tehran and appropriate distribution of population and activities in other cities (Nasiri, 2008). Latyan new town is not constructed.

Table 3.2.1. New towns around Tehran (Sarrafi, 1990; new town Development Company, 1999)

New town	Mother- city	Distance from mother-city (km)	Date of establishment	Predicted population (person)	Population in 2006	Area of new town (ha)	Date of approval of the comprehensive plan
Pardis	Tehran	25	29.07.1991	200,000	25,360	3814	13.07.1995
Hashtgerd	Tehran	65	14.05.1990	500,000	15,619	4000	19.07.1993
Andisheh	Tehran	30	27.02.1992	100,000	75569	1495	30.11.1992
Parand	Tehran	40	12.06.1990	150,000	5,791	1700	31.08.1998
Latyan	Tehran	10	17.03.1993	-	-	1100	-

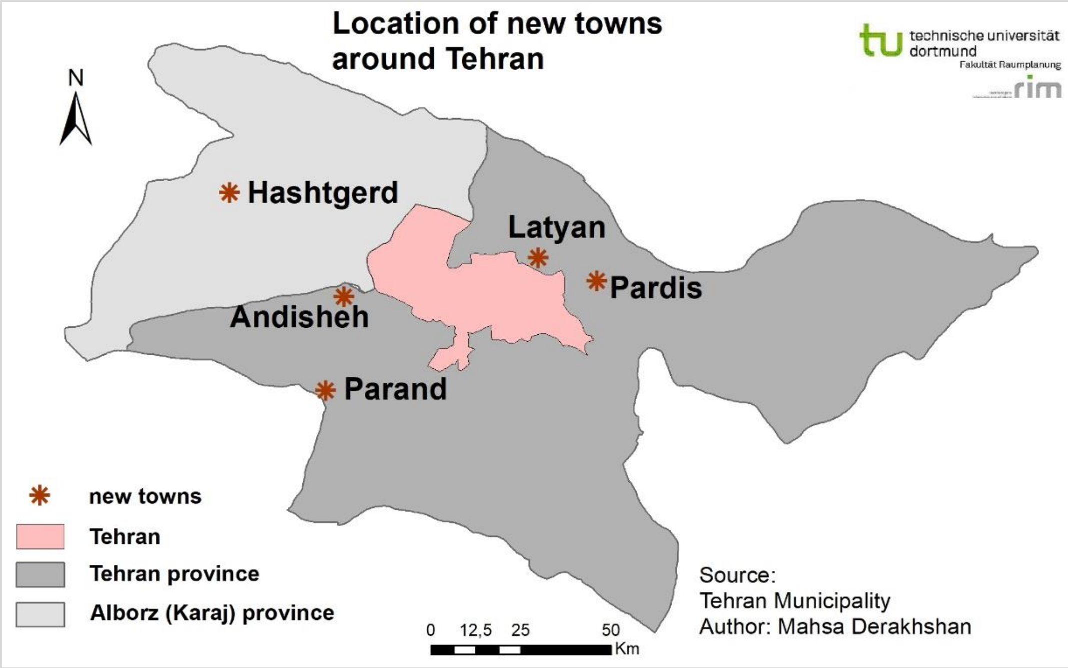


Figure 3.2.2. Location of new towns around Tehran

3.2.1 The goals of the creation of Andisheh new town

The goals of creation of Andisheh new town are (*Comprehensive Plan of Andisheh new town*, 1995):

1. To absorb the population overflow of the urban region of Tehran and to prevent the developing informal and spontaneous settlements
2. To give the opportunity to organize Tehran and Karaj cities
3. To establish an economy of city based on higher education services and desirable industries of the region
4. To maintain the ecological balance of the city and the region, to protect the natural characteristics of the region as much as possible
5. To create an appropriate environment
6. To separate land uses on one side and to mix them properly
7. To make the work, housing, and urban services close to each other
8. To optimize the use of infrastructure

Some researches are conducted to evaluate the achievement of the first goal. The studies indicate that Andisheh new town is successful in absorbing the population, but the population is not necessarily from the urban region of Tehran.

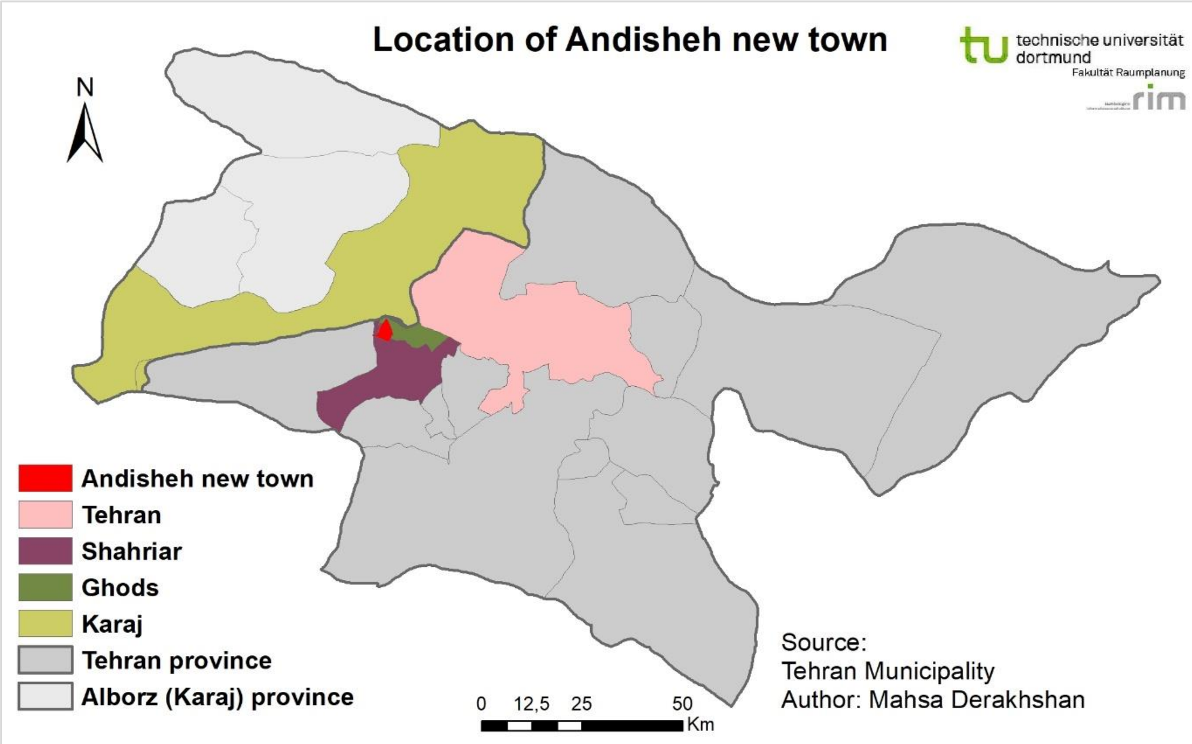


Figure 3.2.3. Location of Andisheh new town in the region

3.2.2 Geography of Andisheh new town

Andisheh new town with an area of 1495 hectares in a triangular shape is located at a distance of about 30 kilometers from the western and southwestern of Tehran, 3 kilometers from northwestern of Shahriar, 7 kilometers from the southeastern of Karaj. The land of Andisheh new town is limited to Karaj River from the east to the development area of Karaj from the west, to Karaj-Shahriar road from the south, to lands of Haftjuy from the north. Andisheh new town has potential features such as proximity to the industrial area west of Tehran as well as agricultural lands of south and west of Karaj city. (*Comprehensive Plan of Andisheh new town*, 1995; Farhadikhah et al., 2016; Khazayinejad and Seifedini, 2012)

The maximum height of topography is about 1236 meters from sea level in northwestern and the minimum height is 1170 meters from sea level in eastern of Andisheh. The land of Andisheh new town is a flat surface with an average slope of

1% from the North-West to South-East. The soil texture is sandy and agricultural potential is limited there. Andisheh new town has an appropriate climate situation with an average temperature of 21.5 – 25 °C in summer and 20 –25.8 °C in winter with an average humidity of 58-67%. (*Comprehensive Plan of Andisheh new town*, 1995)

The study of airflow shows that the prevailing winds in this new town are from west to southwest, which causes was prohibition in the establishment or development of some land uses or activities in the west of the city. This region is considered a semi-arid climate region and the amount of rainfall is low in this area due to the Alborz mountain range, which prevents the penetration of the clouds. This area has geologically, general conditions of the Central Alborz. (Niyati, 2000)

The relative proximity of Andisheh new town to the Montazer-Ghaem Power Plant is one of the advantages relating to infrastructure (Ghanavati et al., 2010). Supplying water for this city is through drilling deep wells that can provide water to up to 100,000 population (Niyati, 2000). According to the latest demographical data by the Statistical Center of Iran in 2017, the population of Andisheh is 116062, so it indicates the issue of water supply currently. In the comprehensive plan of this city, household sewage is disposed of through wells absorption, additionally, construction of sewage treatment was also planned in the eastern part of the Karaj River, which has not been constructed yet. About 75% of the water consumption per capita becomes sewage. Due to the high volume, underground water will be irreparably damaged. The depth of underground water is more than 100 meters, but the power of soil penetration is high in this area.

Figure 3.2.4. The location of Montazer Ghaem Power Plant near Andisheh new town

Shokuhi (2007) assessed the environmental impacts of this area; based on his research creating housing and public welfare caused environmental impacts on the region such as destruction of land cover, an increase of particles in the air, noise pollution, soil chemical pollution, pollution caused by Montazer Ghaem power plant into the cities, and transferring soil pollution into the cities, etc. Because of the intense permeability of water (so sewage) into the soil of this region, underground water is at risk of serious damage. There is also a possibility of demolition of buildings since this area is on the earthquake line. (Shokuhi, 2007)

Location of Andisheh

The location of Andisheh new town is approved by the Ministry of Housing and Urban Development. The effective indicators in locating Andisheh new town are (*Comprehensive Plan of Andisheh new town*, 1995):

1. Physical indicator: location and measure of the land, topography, slope, drainage, climate and weather condition, geographical condition
2. Economic indicator: pattern of division of land and ownership, price of land, demand for land, distribution of occupation, a system of land taxes, level of income, evaluation of housing, and demands
3. Social indicator: population characteristics, distribution of population, educational facilities, social facilities
4. Access to highways: highway network, road network, transportation system, proximity to urban centers
5. Indicator of the balance of infrastructures: governmental system, policies of land-taxes, zoning rules, the pattern of community leadership
6. Indicator of proximity to welfare facilities: communication, energy sources, water supply, sewage system
7. Indicator of environmental effects: air pollution, waste disposal, noise pollution, landscape of ecological system (Ghanavati et al., 2010)
8. Defensive indicator to locate at the strategic depth and focal center of the country, and being surrounded by mountains and deserts (Rajayirizi et al., 2015)

Access of Andisheh

Andisheh new town has suitable access because of the existence of appropriate communication networks such as the freeway, Tehran- Qazvin road, Shariar-Eshtehard road, Tehran- Robat Karim road (from the south), as well as Tehran- Karaj railway route from the north. (Nasiri, 2008)

The formation of the texture of a city is directly related to its network (roads) so that the type of each texture is also affected by the formation of streets within the city. In the past, the pattern of the network in a city was more influenced by urban texture and its development, however, today the urban texture is influenced by the development of the network. (Gharakhlou and Aziz Asiyayi, 2005)

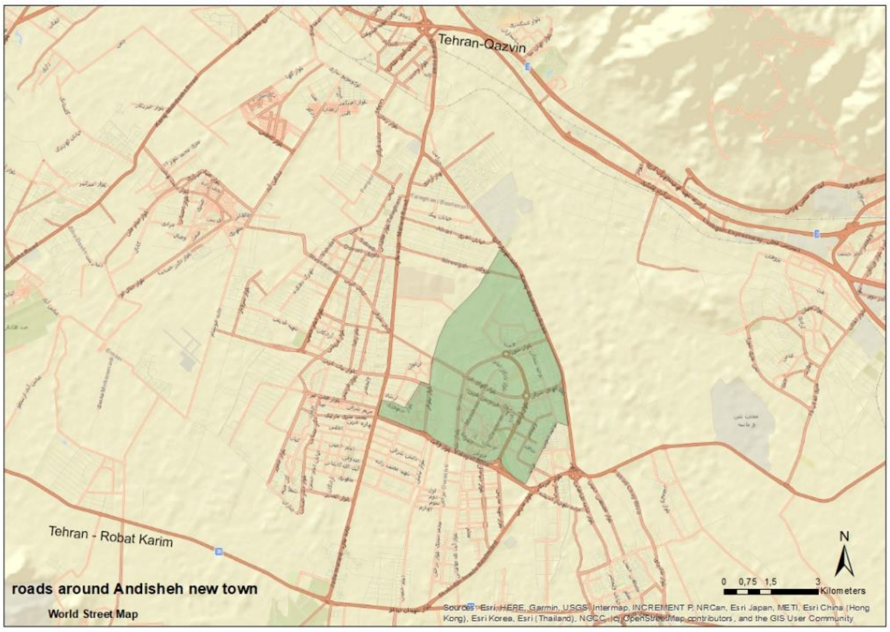


Figure 3.2.5. The roads around Andisheh new town

In the plan of Andisheh new town, a fast communication network is designed in four geographical directions that make the transfer of passengers and goods easier and also reduces the distance between work and housing. The main regional communication of Andisheh new town with Tehran, Karaj, and Shahriar is through highways and roads. (*Comprehensive Plan of Andisheh new town*, 1995)

Physical formation process of Andisheh

The construction in this city is implemented in five urban areas which are named phases. The construction of Andisheh new town started with **phase three** (Phase 3).

Phase 1: The plan and construction of this phase are beginning before the Islamic Revolution of Iran and is completed after that, but this phase is under the supervision of the municipality of Shahriar. Indeed, Phase 1 is not considered as part of Andisheh new town.

Phase 2: The plan of this phase has begun in the area of 117 hectares since 1991. Its plots have been assigned to applicants in two types of villa and apartments since 1992. Villas are detached or semi-detached houses with one or two floors and the apartments are four-floor apartments. This phase was considered a part of the municipality of Shahriar till 2017. Now it is a part of Andisheh new town.

Phase 3: This phase is planned in a land with an area of 368 hectares in 1991 and is assigned to applicants at various stages based on approved land uses, and only after a decade was completed, but construction is continued in other phases. (*Comprehensive Plan of Andisheh new town*, 1995; Nasiri, 2008) This phase includes two-floor houses, four- and eight-floor apartments.

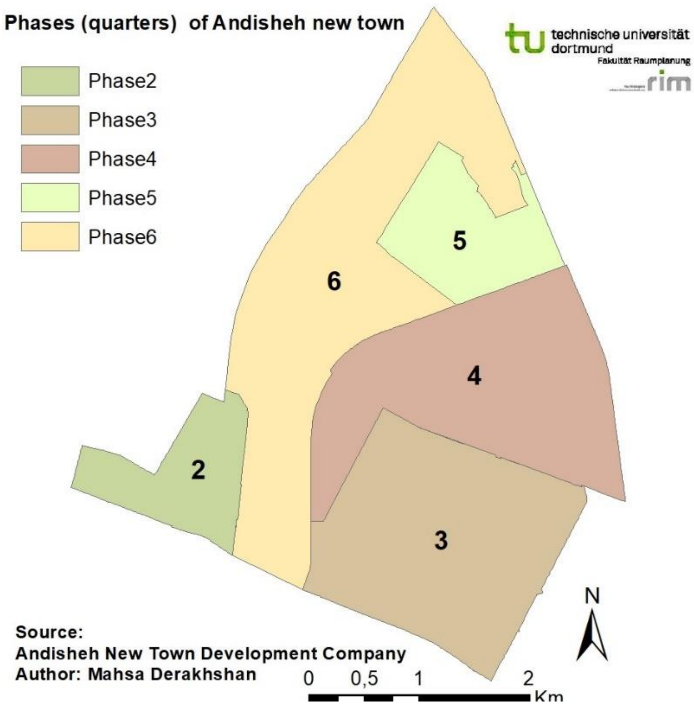


Figure 3.2.6. Phases of Andisheh new town

Phase 4: The area of this phase is 362 hectares and has been assigned to the applicant since 1996 (*Comprehensive Plan of Andisheh new town*, 1995). Residential construction is constructed as two-floor houses (villas) and eight-floor apartments by cultural, administrative, and labor cooperatives (Nasiri, 2008).

Phase 5: This phase with an area of 135 hectares is located in the northern part of the city, 58 hectares of it are built by the Housing Company of Jafariyeh and the construction is being completed by the Ministry of Defense's housing cooperative. (*Detailed Plan of Andisheh New Town*, 2003; Nasiri, 2008). It contains two-, four-, and eight-floor apartments.

Phase 6: In addition to the phases of urban development above, the sixth phase of Andisheh new town is currently being constructed. This phase has a total area of 500 hectares, it is located as a continuous strip in the west of this city; most of its lands are owned by the private sector or Relief Committee (Teimouri and Keivan, 2011).

Along with the construction of residential buildings in Andisheh new town, a wide range of services including commercial, cultural, educational, healthcare, religious and recreational centers such as parks, cinemas, and sport-halls have been created (Nasiri, 2008).

3.2.3 Social and Economic of Andisheh

Given the goal of attracting the population in Andisheh new town, three periods of planning are considered in its comprehensive plan.

Table 3.2.2. The periods of planning and predicted population of Andisheh new town - source: comprehensive plan of Andisheh new town (1995)

plan	years	period	Predicted population
Short- term	1991-1996	5 years	25,000
Middle-term	1991-2006	15 years	60,000
Long-term	1991-2016	25 years	100,000

According to the statics of the Statistical Center of Iran the population of Andisheh new town in 2006- 2007 was 75,619 people and in 2017 is 116062, which means the plan has been ahead in comparison with the predicted population. Therefore, it seems that Andisheh new town has been able to achieve success in attracting the population overflow of the regional area of Tehran. (*Report of Andisheh new town*, 2019)

According to Etemad (2007), the two most important factors in attracting the population in new towns are the cheaper price of land and housing, and suitable and diverse jobs (Etemad, 2007). Based on Khazayinejad and Sefedini (2012), it is happened in Andisheh because of the first factor; studies show that the average price in Tehran is almost twice the price of land and housing in Andisheh. Therefore, this factor can be considered as one of the most significant factors that have been effective in attracting the population (Khazayinejad and Seifedini, 2012).

Additionally, Andisheh new town has considerable access to cities in the region. The proximity of Andisheh to Tehran metropolis and Karaj, and Shahriar are the most important factors to attract population. These multiple accesses give this city a potential opportunity in times of crisis and have strengthened its security and defensive index (Hosseini Amini et al., 2013).

In new towns, it is significant to attract and settle the population and provide services and urban facilities after starting residential construction, because the more accommodation and attraction of the population is, the development of the new town is more favorable. From this point of view, Andisheh is succeeded to attract the appropriate population (Ebrahimzadeh and Negahban Marvi, 2004).

Economy of Andisheh new town

Since there are not any economic problems beforehand in new towns, so the urban economy in the new towns is based on the type of economic structure that should be created in these cities. The economic development of Andisheh new town aims to balance the distribution of population in the region by absorbing the overflow population of Tehran and urban regions, and also to maintain the natural environment. In a comprehensive plan of Andisheh new town is stated that these aims economically, can be an appropriate pattern to create job opportunities for the unemployed population and to respond to residential needs. Economic- functional role of Andisheh new town is influenced by the economic role of Tehran and Karaj. This city is more like a dormitory, although it is written in its plan that the inhabitants of this city would be occupied in service and industrial sectors, and also in research and academic institutions within or near Andisheh new town; so that the employees of manufacturing units and governmental offices around Tehran and Karaj could work there and reside in Andisheh. (*Comprehensive Plan of Andisheh new town*, 1995)

In terms of land ownership, most of the lands of Andisheh new town belong to Andisheh New Town Development Company. Housing Investment Company, Imam Khomeini Relief Committee, and private lands are the other landowners of Andisheh new town (Ghanavati et al., 2010).

In terms of housing demands, the labor cooperatives include 48.1 %, and the employee cooperatives 50.7% of the applicants. Housing marketing is a key factor in determining the location of new towns including Andisheh new town, which is most affected by the proximity to big cities (Ziari, 2013). Therefore, most inhabitants of Andisheh are employees and workers.

Regarding tax as an economic factor, in the Andisheh new town, like in other cities of Iran, the landowner has to pay the only type of tax, which is an urban tax based on the low. The landowner is also obliged to pay the annual fees (public cost) to the municipality concerning the land use of his property.

Due to the location of Andisheh new town, its land is located in the central location of Tehran, Karaj, and Shahriar. According to Rajayirizi et al., the higher cost of housing in Tehran and then in Karaj, the impossibility of developing Shahriar because of arable land has caused the population of these three cities to refer to Andisheh new town to provide residential land. Therefore, not only housing has grown, but demand and pieces have also increased (Rajayirizi et al., 2015). Indeed, housing marketing in this city is influenced by these big cities.

3.2.4 Land use of Andisheh new town

According to the data of Andisheh New Town Development Company, and the map of land uses, Farhadikhah et al. (2016), studied the land uses of Andisheh based on the amount, type, capitation, and the ratio of each land use per capita to the standard capitation. The capitations are calculated based on the population of Andisheh in 2011 that is 97808 people. In the table below, the status of each land use is represented. (Farhadikhah et al., 2016)

Table 3.2.3. Land uses of Andisheh new town- source: Farhadikhah et al., 2015

	land-use type	area (hectare)	amount	existing capitation (m^2)	standard capitation (m^2)	situation
1	residential	373.35	9705	38.17	40	appropriate
2	educational	37.28	83	3.81	2 – 5	appropriate
3	healthcare	5.09	21	0.52	1 - 1.5	inappropriate
4	commercial	10.74	190	1.10	2.5	inappropriate
5	green space	40.28	111	4.12	7 - 12	inappropriate
6	religious	2.38	10	0.24	0.2 – 0.5	appropriate
7	cultural	5.19	19	0.53	0.4 - 0.75	appropriate
8	sport	22.16	22	2.27	1 – 1.5	appropriate
9	recreational	4.76	11	0.49	0.1 – 1.5	inappropriate

10	industrial	3.38	56	0.35	6 – 8	inappropriate
11	administrative	9.38	38	0.96	0.75 – 1	appropriate
12	military	0.47	3	0.05	0.75 – 1	inappropriate
13	urban facilities	0.43	26	0.04	1 – 2	inappropriate
14	Mixed land use	3/86	11	0.40	-	-
15	parking	3.80	20	0.39	-	-
16	without land use	49.07	210	5.02	-	-

Therefore, the findings of the research indicate that healthcare, commercial, green space, recreational, industrial, military, and urban facilities are inappropriate according to the standard capitation, and educational, religious, cultural, sport and administrative land uses are appropriate.

It should be noted that the spatial standards of land use are the amount of land space required for urban activities and functions. Spatial standards are the scales for measuring the quality of the components of a city or physical organization. These standards are between a minimum and a maximum.

The capitation of land use in Iran is defined as the amount of land that is allocated to each person of the whole population of that area. It means, the per capita of each land use is calculated by dividing the land area by the population of that area Considering the factors influencing the determination of land use per capita, city size, and therefore the role of the population can be considered as one of the key factors in determining the per capita land use. (Azizi, 2001; Ziari, 2013)

There is no confirmed correlation between per capita amount and land value in studies. It is notable to mention that in Iran, the standards of capitation of urban land uses have been provided by the Supreme Council of Urban Planning and Architecture of Iran.

Based on this statement, Iranian cities are classified into 4 groups considering their population and for each group, different land uses per capita are stated (Table 3.2.4).

Table 3.2.4. the standard capitation of land uses in Iranian cities – source: Supreme Council of Urban Planning and Architecture of Iran, 2010

capitation of land uses	**Cities** classification of cities based on their population			
Land uses	p1 < 50000	50000 < p < 250000	250000 < p < 1000000	1000000 < p
residential	per capita ≤50 m²	per capita ≤40 m²	per capita ≤25 m²	per capita ≤25 m²
health service	1≤ per capita ≤ 1.5 m²	1≤ per capita ≤ 1.5 m²	1≤ per capita ≤ 2 m²	1≤ per capita ≤ 2.5 m²
commercial	per capita ≤2 m²	per capita ≤2.5 m²	per capita ≤3 m²	per capita ≤3.5 m²
park	8 m² ≤ per capita (7 – 12 m²)			
educational	2 ≤ per capita ≤ 5			

Today, because of the form of the buildings people who lived in cities need urban green spaces more than before, therefore, urban green spaces within or around the city are under the intense pressure of the population's use. This may lead to the destruction of them. Then, in this regard, Shokuhi discussed the complexity of the need of green spaces per capita while many factors are affected them; such as the amount and extent of existing green space, needed green space, ecological need to green space, social need to green space, and environmental pollution (Ghanavati et al., 2010; Shokuhi, 2007). The green space of Andisheh new town is defined as 12 m^2 per capita in the comprehensive plan, and the standard amount of green space per capita is 7-12 m^2. The area allocated to local, urban, and regional green space, and green belts in Andisheh is presented in the following table:

Table 3.2.5. The amount of green space of Andisheh new town - source: Comprehensive Plan of Andisheh new town (1997)

level	**local**	**urban**	**regional**	**Green belt**
square meter	1552	205500	238050	170775
total (m^2)	769575			

In addition to the amount of quantity of each land use in Andisheh new town that can be measured using population and the area of it, and can be compared with the standards, the important issue is whether these land uses are satisfactory to the people who live in this city. It is notable to find out if the residents have access to the land uses easily. It is possible that the amount of land use is standard, but residents are not satisfied with that land use or access to it and go to another city to meet their needs. Or people are satisfied with land use that is inappropriate in terms of quantity. Therefore, it is significant to ask the residents how satisfied they are with the land uses and access to them, as well as the quality of those land uses, which are evaluated in chapter 5.

Chapter 4:

RESEARCH METHODS

The case study approach has been applied in various fields such as psychology, sociology, medicine, economies, urbanism, and the like (Yin, 2013). This research follows a case study approach considering the nature of this study and adopting Yin's definition of a case study to study issues within contextual conditions. Yin defines case study from a social point of view as an imperial research that examines a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003). According to Yin (1994), case study approach is the most effective approach to do descriptive or exploratory research; a case study approach is consist of five components that are research questions, study propositions, units of study and analysis, the connection between data and propositions, and the criteria for interpreting the findings (Creswell, 2003). This approach includes 6 steps and supports both qualitative and quantitative methods (Yin, 2003).

The method used in this research is based on both qualitative and quantitative research considering questions, objects, subjects, and limitations of the research. Moreover, this research case study approach utilizes various types of data collection, observation, information, and tools to analyze.

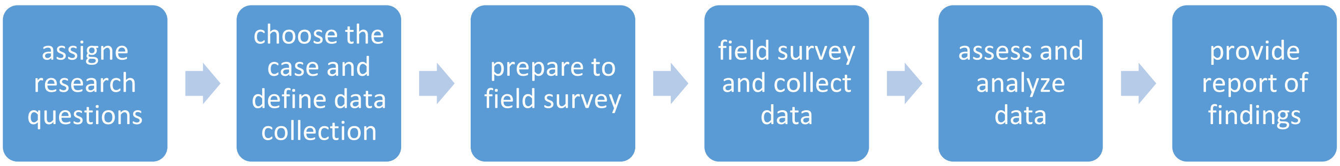


Figure 4.1. Six steps of case study approach by Yin

Case study research is considered for both single-and multiple-case studies, so it is appropriate to this research with a single-case study (Yin, 2013). A single case study approach has the advantage that there is no complexity to select and reduce variables in comparison with a multiple case study approach (Stoecker, 1991).

This research involves descriptive, analytical, and explorative research. Descriptive research is applied to recognize data about the quality of urban life, urban identity, and urban form in Iranian new towns. The collected data through field surveys are both quantitative and qualitative. Two types of s closed-ended (quantitative questions) and open-ended (qualitative questions) questionnaires were distributed to residents of Andisheh new town. In the first 100 questionnaires, the open-ended questions were not filled by respondents. Therefore, the format of the questionnaire was changed to a closed-ended questionnaire. Through interviews, urban experts and decision-makers who work at the Municipality of Andisheh New Town, New Town Development Company, and Andisheh New Town Development Company have been discussed about the qualitative questions.

GIS analysis (ArcMap) is used to geocoding data and convert the data from questionnaires to geodatabase data considering the location of respondents of questionnaires. To summarize and analyze data, a statistical tool (SPSS) is utilized. Furthermore, Structural Equation Modelling is applied to analyze the relationships between dimensions and indicators through various tests. In this study, not only features of quality of urban life, urban identity, and urban form are described, but also the relationship between them are analyzed and investigated; therefore, descriptive research is used for both quantitative and qualitative data, afterward analytical research is accomplished

Indeed, measuring the indicators and dimensions which affect QOUL, UI, and UF in new towns and finding out the relationship between these different indicators and dimensions are the main goals of this research.

The chosen case study should express fundamental and strong examples of the issues; in other words, the case study should be exemplary (Yin, 2003). The research intends to explore situations in which the studied phenomenon has “no clear, single set of outcomes”, therefore this study is exploratory (Yin, 2013).

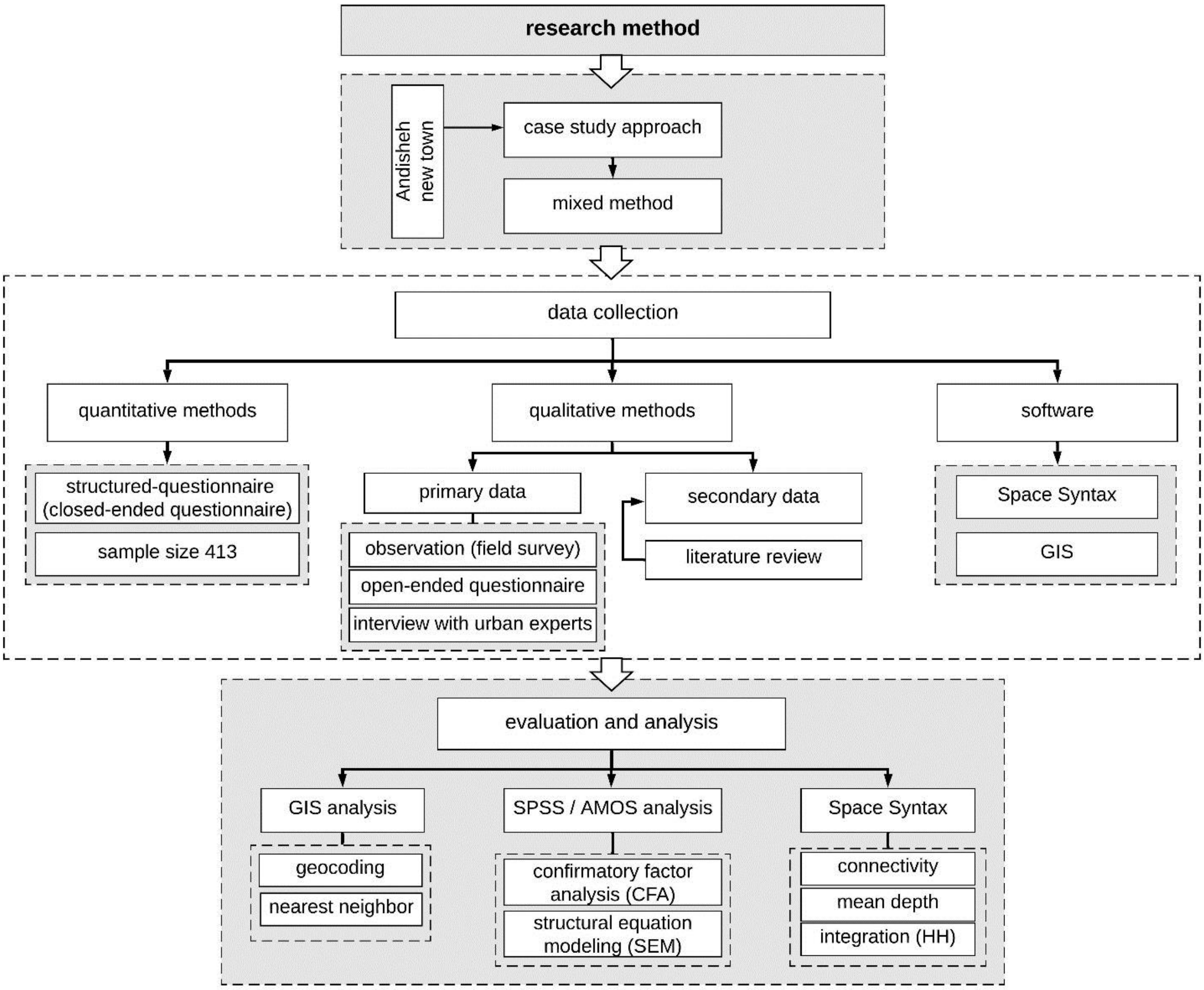


Figure 4.2. Research methods

The case study of this research is Andisheh new town; this city is selected because of the aspects of a new town, which is claimed to have a good quality of urban life, it is also claimed in various plans of Andisheh new town that there is more attention to aspects of urban identity in Andisheh new town in compare with other Iranian new towns. Furthermore, the selected case study is considered as a successful new town in absorbing population, therefore this research aims to figure out whether its residents are satisfied with living in a new town.

4.1 Methods for Data Collection

The collection of data in the case study research depends on different sources including direct observation, interviews, documents, statistics, and archival records (Yin, 2003). Therefore, multiple resources are used in this research to collect comprehensive data. The collection of survey data in this research has been conducted through a structured questionnaire administered to a sample of residents of Andisheh new town, from the census data, and also from the secondary data source.

Required data and information such as shapefiles and statistical data have been collected from the Municipality of Andisheh new town, New Town Development Company, and Statistical Center of Iran. Moreover, based on the literature (secondary data), observation, and field survey with residents, experts, and decision-makers have been done. To collect qualitative and quantitative data 450 people in Andisheh new town took part in the research, through them 413 respondents filled out the questionnaires. Besides, 13 experts and decision-makers of the Municipality of Andisheh new town, New Town Development Company, and Andisheh New Town Development Company have participated in the interview separately.

4.1.1 Secondary data

Secondary data is collected through a literature review and the available data that has been collected by other researchers for other goals. Therefore, the first part of this research is reviewing literature related to the quality of urban life, urban identity, and urban form, which is the principal way of data collection; accordingly, information and literature review about definitions, indicators, dimensions and characteristics of mentioned factors have been examined in this part.

Furthermore, the shapefiles include the environmental data file contains land use information: green spaces and parks, educational centers, shopping centers, health centers, residential blocks, open spaces, streets and roads are obtained from the Municipality of Andisheh new town and New Town Development company. Census data covers the size and structure of the population of blocks, neighborhoods, quarters, and the whole city is also collected from the Statistical Center of Iran.

4.1.2 Primary data

Primary data of this research has been collected through field survey involving observations, documents including documents and photos, contacts with residents, and interviews with experts and decision-makers applying both qualitative and quantitative methods by filling out the questionnaires or discussing the issues. It should be noted that the significant approach to collect primary data of this research is through the questionnaire to find out the dimensions of quality of urban life and urban identity based on the urban physical form.

4.1.3 Collecting data through questionnaire

The questionnaire of this research is a combination of closed- and opened- ended questions includes 80 questions totally (see the complete questionnaire in the appendix). The closed-ended questionnaire is used in quantitative research. Respondents should select their answers by selecting checkboxes. Their answers can be analyzed through statistical tools. The open-ended questionnaire is applied in the qualitative study; as there are not any predefined choices, there would be different answers; therefore, analyzing data from this type is more complicated.

The type of structured questionnaire of this research is mainly closed-ended, which follows a set format (5-point scale) with five checkboxes to select, which are ranked from 1 to 5 which can be analyzed through SPSS. The questionnaires include questions about the dimensions of quality of urban life, urban identity, and urban form which can be classified into five categories of population and density, housing, land use, accessibility, and layout. Furthermore, the questionnaire includes some open-ended questions to define the addresses (locations) of respondents, the most commonly used streets and land-uses by them, places or spaces regarding the sense of place (urban identity), and the most important issues about Andisheh new town from their point of view.

The location of respondents are asked to geocode these points through GIS to earn a spatial map of addresses of residents in the whole city and also to gather environmental conditions related to the places where people live. The data collected from the questionnaires are transferred to the database of ArcGIS and analyzed using SPSS, AMOS, and ArcGIS (ArcMap).

The content of questionnaires was determined first by the researcher, then it is perused by two exports in urban and regional sociology and urban planning (an academic expert of TU Dortmund and a decision-maker in the Municipality of Andisheh new town).

The first question asked about **the addresses of the respondents**. The objective conditions refer to the characteristics of places and subjective domains refer to individuals. These two entities of study have to be combined to use the objective characteristics of the environment and subjective measures of individuals. Based on the households' addresses, each survey respondent can be recognized by a distant place. It is possible by geocoding and using GIS as is explained in 4.2.2. The respondents' locations can be linked to other spatial information and also to other geocoded information. Therefore, the use of GIS integrates survey data with objective spatial information. (Marans and Stimson, 2011)

The second part of the questionnaire asked about the general information of respondents including **the duration of living in Andisheh**. According to Azizi and Arbab (2013), urban identity in new urban development is formed as a result of continuous interaction between residents and their residents' location over time. The findings of the research indicate the direct correlation between the duration of residence in Hashtgerd new town and the formation of urban identity (Azizi and Arbab, 2013). On the other hand, the length of residency has been found to have a positive relation to housing satisfaction, so it affects the quality of urban life (Lee and Park, 2006). As one of the main goals of this research is to evaluate the effect of time on QOUL and UI in this new town, this question is asked.

The **3**rd to **11**th questions, as well as the **49**th to **55**th questions of the questionnaire, are designed to measure the **housing**. In many studies, housing is an important factor that is related to the quality of life (Boyer and Savageau, 1981; Campbell et al., 1976; Lee and Park, 2006; Mohammad Sufian, 1993). A person's overall quality of life is influenced by the housing domain as a significant indicator (Lee and Park, 2006). Housing quality can be defined as the level of satisfaction with the specific house within a chosen residential, physical and social environment, as well as its specific housing attributes lead to urban identity (Lazenby, 1988). Various housing-related factors, as well as characteristics of the residents, have been found to affect housing satisfaction. Studies have found household size is negatively related to housing satisfaction (Diaz-Serrano, 2009; Lee and Park, 2006; Mohit and Azim, 2012). Protassenko (1997) represents monthly income as a factor that impacts quality of life. Because housing assigned most of a household's income, the price of renting or buying a dwelling is significant. Households with higher incomes are more likely to be satisfied with their housing because they have the financial means to possess a better home (Lee and Park, 2006). Therefore, housing costs including the price of rent are an objective measurement that determines the quality of life. Moreover, the characteristics of housing and other buildings in urban settlements can have an important bearing on everyday living (Nabil and Mardaljevic, 2005). It has already been noted that residents living in low-density detached dwellings with large gardens will have a distinct experience of the urban environment from high-rise city center apartment dwellers (Dempsey et al., 2010).

Although it was expected that information about the housing type and housing characteristics including the age of the building, area of the dwelling unit, the number of households in the building, and price of the housing should be in the spatial data, the questions about these factors are asked respondents to collect information from the questionnaire because of the lack of data. On the other hand, it will make it possible to find the connection between these indicators and other subjective or objective indicators.

The questions are assumed to be the predictors of the domains of housing regarding urban form, quality of urban life, and urban identity are summarized in table 4.1.

Questions **12** to **14**, as well as questions **56** to **60**, are about **social interaction** and **satisfaction with social interaction**. Social interaction is one of the significant factors that contribute to urban identity even though places with high identity create social interaction and cohesion easier. The connection links people and urban places together, enables people to define themselves and individual identity, encourages them to share experiences with others, and stimulates them to form a community (Czepcznski, 2011). The impact of identity relies upon both environmental events and social importance allocated to specific identities. Places provide opportunities for the experience between people and the urban environment to take place over time, and they have a past and future that connects people. To measure social interaction, three levels of city, neighborhood, and building are considered.

The **15**th and **16**th questions are about the **perceived overcrowding** and the **61**st and **62**nd questions are about the **satisfaction with overcrowding**. Population density may provide an objective measure, but it is also assessed subjectively; it is a social interpretation of individual characteristics and so may differ from resident to resident (Dempsey et al., 2010). Since subjective domains can be perceived differently by different people, objective data may not necessarily reflect what makes a person happy with the community (Rabianski, 2007). Therefore, these questions are about the perceived overcrowding. The questions are expressed to enable the researcher to find the relationship between objective and subjective indicators of density, as well as the urban form.

Questions **17** to **35** are designed to measure **accessibility** (access to land uses), **path characteristics**, **land uses** (health centers, educational units, shopping center, and public green spaces); and questions 63 to 79 are outlined to evaluate the **satisfaction with access, land uses, and quality of paths and land uses**.

The respondents are asked to define which street they use more and the most important characteristic of this street. The reason is as more as a street is used by a resident indicates that the resident feels more safety and comfort in this street, and also the residents' sense of place and attachment to this street has been improved (Mirmoghtadayi, 2009). Moreover, path characteristic is an element of forming urban identity (Aly, 2011; Lynch, 1960; Ujang, 2012). Studies of place attachment represent that when a person has the sense of a place or urban space he has that place or space in his mind with special characteristics (Ahmadi, 2000). The next questions are about land uses that residents refer more, the streets they use to reach there and the important characteristics of that street. The reason to ask about the street and its specific characteristics are explained above. Additionally, according to the model Campbell et al. (1976) that conceptualized quality of life, the degree to which each domain explained the quality of life should be measured. They found that domain satisfactions were associated with people's assessments and perceptions of domain attributes, which in turn were influenced by the objective attributes themselves (cited by Lee, 2008). The following questions are expressed in the questionnaire to collect the information about which land uses (and their location) are mentioned by residents; on the other hand, to gather data about accessibility, streets, and characteristics, as one of the expected roles of accessibility measures is a contribution to the evaluation of location efficiency from the viewpoint of land-use (Doi, et al., 2008). It should be noted that the answers to these questions can be compared together to find the relationship between different domains and objective and subjective indicators.

Questions **36** to **48** are designed to measure the elements of **urban identity**. People understand and interpret their urban environment through their sense which builds feeling and emotion; the most significant determinant of the urban identity is the local urban context that is formed by all elements of the physical and natural elements (Aly, 2011). Basic elements of the urban identity of a place are the physical setting, the activity, and the meaning (Montgomery, 1998). Meaning is associated with an individual's internal psychological and social processes (Stedman, 2002) that generate perception and memory. Additionally, urban identity is determined not only by the physical components but also by the meaning and association developed between people and places (Ujang, 2012). Place attachment is defined as the development of an effective link between people or individuals and specific places (Hidalgo and Hernandez, 2001). Therefore, to measure the residents' attachment to place, sense of place, memory, and feeling identity regarding Andisheh new town the questions are outlined.

As it is explained above, questions **47** to **79** define **how people are satisfied** with various variables. The objective measurement determines the quality of urban life using objective measures of environmental factors. However, since the quality of urban life can mean different things to different people, objective data may not necessarily reflect what makes a person happy within his or her community (Rabianski, 2007). Various determinants are significant to individual satisfaction regarding its surrounded environment ranging from housing, demographic, to socio-economic variables. The subjective evaluation attributes are deemed more important in explaining satisfaction (Abu Bakar, et al., 2016). As Residents' satisfaction with their neighborhood and community has been shown to play an important role in predicting satisfaction with the quality of life and sense of belonging that leads to urban identity, the last 33 questions are measured in terms of satisfaction with each component using a 5-point scale ("1"= very satisfied, "5" = very dissatisfied). A summary of the questionnaire content is shown in the following table:

Table 4.1. The summary of the questionnaire of the field survey (2017 and 2018)

<table>
<tr><td colspan="9">location:
(address of respondents)</td></tr>
<tr><td colspan="2">general information of respondents:</td><td colspan="7">- age
- gender
- duration of living in Andisheh</td></tr>
<tr><td colspan="4">in ranking questions:
1 indicates very satisfied (or very much) and 5 very dissatisfied (or very low)</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>housing</td><td>- type of building
- number of floors
- age of building
- number of households</td><td>satisfaction with:</td><td>- type of building
- number of floors
- age of building
- number of households</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

	- Area of dwelling unit price (rent/buy)		- Area of dwelling unit - price (rent/buy)					
layout	- relationship with neighbors - participation in events (neighborhood/city) - legibility - symbol - memory - attraction	satisfaction with:	- relationship with neighbors - participation in events (neighborhood/city) - legibility - symbol - memory - attraction					
density and population	- perceived overcrowding (neighborhood/city)	satisfaction with:	- perceived overcrowding (neighborhood/city)					
accessibility	- the most used street and its special feature - streets used to access: health centers, green spaces, educational units, shopping centers	satisfaction with:	- the most used street and its special feature - streets used to access: health centers, green spaces, educational units, shopping centers					
land use	- availability of: health centers, green spaces, educational units, shopping centers (in neighborhood/city)	satisfaction with:	- availability of: health centers, green spaces, educational units, shopping centers (in neighborhood/city)					
feeling about	- the city - living in the city - stay in the city - being a citizen of Andisheh	satisfaction with:	- being in the city - living in the city - being a citizen of Andisheh					
further explanation of the related issues								

4.1.4 Interview with experts

Face-to-face interviews with 13 experts and decision-makers of Andisheh New Town have been conducted to examine urban identity and quality of urban life from the point of view of the urban experts:

- Andisheh New Town Development Company (Andisheh): 4 experts
- New Town Development Company (Tehran): 2 experts
- Andisheh New Town Municipality (Andisheh): 5 experts
- Real estate agencies (Andisheh): 2 experts

The interview focused on the following issues:

- The important issues of urban identity in Andisheh new town, as well as the most obvious character or lack of it

- Quality of urban life in Andisheh new town and the way to improve it considering four land uses: healthcare facilities, educational centers, daily needs, shopping centers, and green spaces and parks. And access to these centers

- The role of the structure of Andisheh in urban identity and urban quality of life.

- Suggestions to improve urban identity and quality of urban life through current situation considering the structure of Andisheh new town

Table 4.2. The interview information of the research – source: researcher

Interview information		
Type of the interview: **Expert interview** Interviewer: Mahsa Derakshan		
Andisheh New Town Municipality (Andisheh)		http://www.andishehcity.ir
interviewer	Dr. Elham Dehghan- Mehrjouyi	Director of planning and development of Andisheh new town Ph.D. degree of urban planning at the university of Shahriar
	M.Sc. Fatemeh Motaghi	Associate director of planning and development of Andisheh new town Master degree of architecture
	Ing. Mehdi Bayat	Associate director of housing planning Andisheh new town Bachelor of urban and regional planning
	Ing. Behrooz Rahnama	Associate director of the detailed plan of Andisheh new town
	M.Sc. Hamid Rahimi	Head of urban green space and park of Andisheh new town
Real estate agencies (Andisheh)		
interviewer	Saeed Mohamdhoseinkhah	Manager of Andisheh real estate agency
	Rasool Torabi	Manager of Negarestan real estate agency
New Town Development Company (Tehran)		http://ntoir.gov.ir
interviewer	Dr. Mohsen Majzoob	Head of housing planning of new towns Ph.D. degree of urban and regional planning
	Ing. Mahsa Mirmiran	Associate director of development Master degree of urban planning
Andisheh New Town Development Company (Andisheh)		http://andisheh-ntoir.gov.ir
interviewer	Ing. Khaled Kheiri	Associate head of Andisheh New Town Development Company
	Ing. Ebrahim Dastoor-Nikoo	Director of planning and urban development
	M.Sc. Sare Nemati	Associate director of planning and urban development Master degree of architecture & urban design
	M.Sc. Babak Kiamoghadam	

In the first interview with Dr. Dehghan-Mehrjoiyi, she started the conversation by pointing out that there is no sense of place, and residents of this new town have no sense of belonging to this city. Although shopping centers, educational centers, and green spaces are at a standard level, they need to improve. She believes that illegal land-use changes on a local scale decrease the quality of life. This interview took about 50 minutes and she offered some suggestions to enhance the quality of urban life in this city. Ms. Motaghi believes that modern shopping centers of Andisheh have a great effect on people's sense of place, but residents don't have any sense to each other. The lack of health centers damages the quality of the urban life of this city. This interview took about 30. Considering Bayat's point of view, the unique structure of Andisheh new town makes sense of place and urban identity for residents. Although it may seem that this city has a uniform shape, which affects place identity, the neighborhoods and phases have their unique characteristics that are clear for the residents. People are also satisfied with the quality of urban life. This interview was about 45 minutes and his suggestions are about the urban elements. Based on Rahnama's opinion, we should wait and give time to Andisheh, because residents' sense of place is growing. Rahimi mentioned the great influence of green spaces on people's feeling of quality of life. These two interviews were done at the same time and took about 40 minutes.

The next two interviews have conducted with two real estate agencies of Andisheh new town, these agencies are private, so they would not like to discuss the issues. Based on each interview which took about 20 minutes, the designed plan of streets and structure make Andisheh new town more attractive to those traditional cities around it. The amount of affordable housing is the most important reason to attract people to this city.

In Dr. Majzoob's opinion – as the head of housing planning in new towns of the whole country -; the low diversity of Andisheh new town, easy accessibility in this city, and separated neighborhoods based on the building types have improved the urban identity of Andisheh new town. Moreover, the quality of urban life seems to be acceptable, because there are appropriate accesses to different places, width streets, various types of housing, and planned land uses. Contrariwise, Mirmiran's opinion is that residents of Andisheh have to live there because they have to. There is no sense of belonging and maybe there are unsatisfied with their life situation, but because of the suitable price of housing to buy or rent, they live and stay in Andisheh new town.

The experts of Andisheh new town Development Company try to enhance the sense of place as well as the quality of urban life through various plans. Ing. Kheiri described Andisheh new town as a well-known city in the region, because of the public participation of residents. In his opinion, the problem is public spaces that are not completed yet. What affects the quality of urban life in Andisheh is absence of provided physical spaces, because this city is still growing and is not completed. In Ing. Dastoor-Nikoo's opinion, all of the residents of Andisheh new town are satisfied with the quality of urban life and all of them feel urban identity. The interview took more than two hours and the discussion was about his decisiveness about the quality of urban life and urban identity in this city; based on his colleague M.Sc. Nemati, Andisheh is an ongoing city and it could earn some features of urban identity but it is not completed. Many people live in Andisheh new town till they reach enough salary, then they would move to another city. Kiamoghadam considered safety, calmness, accessibility, and participation of residents as the most important features of urban identity and quality of urban life in Andisheh new town.

4.1.5 Sample size

$$n = \frac{\frac{z^2pq}{d^2}}{1+\frac{1}{N}\left(\frac{z^2pq}{d^2}-1\right)}$$

d= 0.05 (error of 5%)

The representative sample size is calculated based on the population of the case study through Morgan's table, which is based on Cochran's formula. The population of Andisheh new town in 2017 was 116062, therefore, the result represents 380 samples. So 400 questionnaires were distributed among the people contain a mixture of genders and age groups of residents of Andisheh new town. The number of 368 acceptable filled questionnaires have been returned to the researcher. To achieve a sufficient number of samples, in the next field survey, 50 questionnaires considering the population of each quarter of the case study were distributed again and through them, 45 acceptable questionnaires were filled out by the residents. Finally, the representative sample size of this research is through 413 questionnaires: Phase 2: 66 acceptable questionnaires, Phase 3: 145 acceptable questionnaires, Phase 4: 124 acceptable questionnaires, Phase 5: 43 acceptable questionnaires, and Phase 6: 7 acceptable questionnaires.

4.1.6 Limits in Collecting Data

The issue of selecting appropriate measures includes the limitation in sources of statistical data from the governmental company which are either available at particular levels or not available or not accessible.

Although the census data is for 2017, the researcher could not have it since 2019. The only column of the excel file (2017) was the number of population in each statistical block. The statistical data achieved in 2019 includes the number of population of each statistical block in the attribute table of GIS, moreover, population structure based on the age and gender in Excel. So it limits calculating population structure through GIS.

Another limitation of this study was the deficiency of geodata and shapefile, which should be used. For instance, the neighborhoods of Andisheh new town were not specified on the shapefiles of GIS, therefore, CAD maps, as well as Analog maps from the Municipality of Andisheh new town and Andisheh new town Development Company, were used to determine the neighborhoods in GIS by the researcher.

Additionally, the limitation of data played a significant role to decide how indicators would be measured. Some data were expected to be analyzed using available statistical data or geodata, but as this data was not either available or not possible to access, the data were collected through the questionnaires and finally analyzed on this basis.

4.2 Analysis Methods

As this research is a case study research, it is necessary to combine different research methods to respond to the research questions (Yin, 2018). So, it is a form of explanatory, qualitative, and quantitative study, most of it is based on literature review and quantitative methods. Additionally, questionnaires, GIS, and Space Syntax have been also applied to indicate some more documents. The five methods are combined in various ways to achieve more reliable research results.

The mixed-method approach combines quantitative data through surveys and numeric data, and qualitative findings via observation (questionnaire), communication, and interviews with respondents, as well as explaining the process of combination. The integration of these data collection methods in research has many advantages for researchers by confirming data analysis through triangulation, analyzing issues from different viewpoints, and establishing new lines to provide a new vision (Rossman and Wilson, 1991).

The present research aims to focus on investigating the relationship between two aspects of subjective and objective dimensions of quality of urban life, urban identity, and urban physical form of Andisheh new town. It is significant to select an appropriate research method. The methods to realize the quality of urban life and urban identity include both qualitative and quantitative methods such as questionnaire, Space Syntax theory, geocoding, mapping, and analyzing collected data through GIS, Space Syntax, statistical method, SPSS, as the studied aspects are too wide.

The research method applied in this research is selected to examine the theories of quality of urban life, urban identity, urban form, their indicators, and the relationships between various indicators in the new town.

The indicators of quality of urban life, urban identity, and urban physical form are explained in chapter 2 (see 2.4). Based on a broad range of literature reviews, the conceptual framework of this research is designed (see 2.5) to investigate the subjective and objective dimensions of QOUL, UI, and UPF, which affect residents' feelings.

As it is mentioned in chapter 1 (introduction), this research aims to answer the research questions through the application of scientific procedures to achieve research goals.

The five mentioned types of research methods are explained as follow**:**

- **Literature review**

The main goal of the literature review of this research is to provide a theoretical background and to find out the indicators, which are in common with each dimension and they are different in studying each dimension at the same time.

- **Questionnaire**

To survey the case study area, direct observation is essential, since it is a fundamental need for the researcher to find a general perception of the city and its major problem.

While filling out the questionnaires, the respondents refuse to answer the open-ended questions, but the informal conversation with them has been accomplished about their opinion of their neighborhood, the new town, and how much they feel well by living in a new town. Moreover, most of the photos that are seen in the research are taken during field surveys by the researcher.

- **Qualitative method**

The qualitative approach provides results in an objective and non-quantitative form (Kothari, 2004), therefore, the data collected through the qualitative method is presented in a text rather than a number. The qualitative study aims to obtain fundamental knowledge of the case study, including the role and opinion of urban experts regarding urban identity and quality of urban life.

- **Quantitative method**

The quantitative method is based on statistical tools and numerical modeling to collect and analyze data (Azizi, 2001). This method is used to collect numeric and statistical data, besides, data collected through a closed-ended questionnaire has been geocoded using GIS (ArcMap) and examined through GIS (ArcMap) and statistical analysis (SPSS, AMOS).

- **Space syntax, GIS, and statistical method**

To recognize the spatial configuration and to analyze the accessibility of selected land uses including public green spaces, educational units, healthcare centers, and shopping centers, the Space Syntax Theory is employed by measuring the value of connectivity, integration, and mean depth affected by the built environment.

GIS has been applied to geocode the addresses of the respondents and creating a set of geodatabases containing all the questions of questionnaires. GIS has been also used to illustrate maps, especially, to represent each question and to show the location of land uses including health centers, shopping centers, education units, and green space. The method of Nearest Neighbor has been done through GIS to represent spatial scattering of land uses distributed in a specific district.

Data collected through questionnaires and geocoded in GIS has been examined through SPSS and AMOS. Factor analysis (exploratory factor analysis) has been done using SPSS. AMOS is an added SPSS module, which has been especially used for Structural Equation Modelling, path analysis, and confirmatory factor analysis. The SEM is applied to find out the relationship between indicators of urban identity, quality of urban life, and urban physical form, as well as, the correlation between the mentioned three dimensions.

4.2.1 Space Syntax to analyze spatial accessibility to land uses

To do Space Syntax analysis three analytical tools of Depthmap are used to find out first how many immediate neighboring streets are directly connected to the streets surrounding the selected land uses, secondly how easy it is for residents to reach the streets around the land uses, and finally how deep a land use is to reach; in other words, how many changes in direction is necessary for a resident to get to another space. By measuring the connectivity, integration, and mean depth of the selected land uses this research question.

Space Syntax Theory

The first studies on the basic method of space syntax analysis and introduction to this analytical method were presented by Hillier and Hanson in Bartlett School of Architecture at University College London and published in 1984. The main goal of the study was to describe the various spatial orders that are existed and are produced through settlement patterns and building forms in diverse societies. (Hillier et al., 1976)

The essential idea of the Space Syntax method has been developed from a tool that simulates the social effects to a method that remains space configuration and determines spatial space to figure out how the entire city affects its users. (Dettlaff, 2014)

The basic principle of Space Syntax theory is that space is used by human societies as an essential resource organizing themselves.

Based on this theory space plays the main role in social and cultural events. Even though space is shaped through social, cultural, and economic processes, it is generally considered as a basis for social and cultural activities as far as its form is almost ignored (Makrí and Folkesson, 1999). The emphasis of Space Syntax theory is that, in a deep understanding of urban spaces, the role of each urban space and its character on a small scale is less important than its role in combination with other elements of the city and its character in a large scale and whole urban system. (Hillier et al., 1993)

In this regard, the main idea of this theory is based on spatial configuration and consists of the relationships between elements of the whole system.

The elements are human societies and spaces that contain all various forms of the structure of inhabited space such as buildings, settlements, cities, and landscapes. The relationship between society and space is not just to map one domain onto the other, but also there is a mutual modification that can modify and restructure the other; for example, the activity of creating boundaries to configure space is one of these dynamic aspects. (Bafna, 2003)

Human societies ⟺ Space: buildings, settlements, cities, landscapes

On this point, Hillier believes that the spatial and social forms follow such a close relationship that spatial configuration can define many social patterns such as land use distribution, movement, urban crime, locating immigrants, etc.

Based on the theory of Space Syntax, the difference between the space-as-form and societies-as-content is denied. To do so, “the space of inhabitation is configured- a term that space syntax recognizes as an act of turning the continuous space into a connected set of discrete units.” The configured space lets the available social structure be represented onto itself. Specific relationships of visibility and access can be appeared among the component spaces because of the distinction of boundaries, so probable “patterns of movement and encounter within the population being housed” are generated. “The effect is directly on both society and spatial configuration.” (Bafna, 2003)

This methodology refers to Kevin Lynch’s mental maps and originated from his way of thinking about space from the people's perspective, not from the bird’s perspective. (Dettlaff, 2014)

The fundamentals of space syntax theory

The basic object of analysis using space syntax in the form of plans of urban fabric or building floor plans is space configuration.

Space Configuration

“Spatial configuration means relations between spaces which take into account other relations, and so in effect relations between all the various spaces of a system.” Actually, the interrelation between the spaces – among the parts which make up the whole - that form the spatial layout is a configuration of space (Hillier and Vaughan, 2007). In urban planning studies, the relation between people and space is found at the level of the configuration of space; spatial configuration is investigated through the relationship between spaces rather than the characteristic of individual space (Hillier et al., 1976; Klarqvist, 1993). In a more professional language, Hillier illustrates the meaning of spatial configuration in which the relationship between spaces is important.

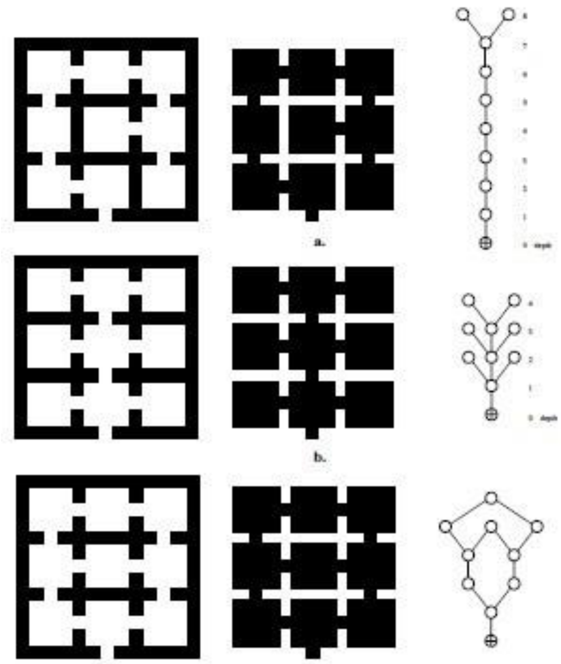


Figure 4.2.1. an example to understand spatial configuration (Hillier, 2007, p. 21)

In this simple example (figure 4.2.1) three courtyard buildings, that are the same in the basic structures, cell divisions, placing of the cells, and the number of the entrances, are illustrated. The only difference is the relation between spaces and the location of entrances. But this is enough for these three buildings to find fundamental differences in configurations and spatial patterns (Hillier, 2007; Tarashi, 2015). These fundamental differences are evident when their impact on human activities and their experiences in spaces will be studied. The pattern of each building's space is presented by a graph in the third column in figure 1. Each node represents space and each edge of the graph shows the relation between two spaces, therefore each graph illustrates the relationship between the spaces in buildings. In this example Hillier represents the concept of a configuration of space and explains that this viewpoint of space as a graph can be used to understand social behaviors that are usually qualitative; so through graph analysis, a qualitative phenomenon can be analyzed quantitatively. (Hillier, 2007)

To understand the concept of configuration in the Space Syntax method, Hillier and Vaughan represent the concept of spatial configuration. Like grammar, the space syntax method is used to arrange spatial elements and analyze them. Through observation of the way, people move in spaces, where to locate its special functions can be predicted. It is valuable to find out the relationship between the users and the space to predict how spatial configuration will form the user experience (Hillier and Vaughan, 2007). What is Space Syntax? Space Syntax is about applying configurational measures to the patterns of various geometric elements that are created by buildings and cities. (Abbaszadegan, 2008) Depends on investigating what aspect of functionality and human spatiality is necessary for analysis, elements that are points, lines, convex spaces, and isovists can be chosen. (Hillier and Vaughan, 2007)

In this regard, Space Syntax is expanded based on two basic assumptions. The first assumption is that space is considered as an essential characteristic of the activity and its inseparable factor. In this way, movement occurs in lines and social interactions in convex spaces, and also visual fields of people are defined by movement and changing their viewing angle.

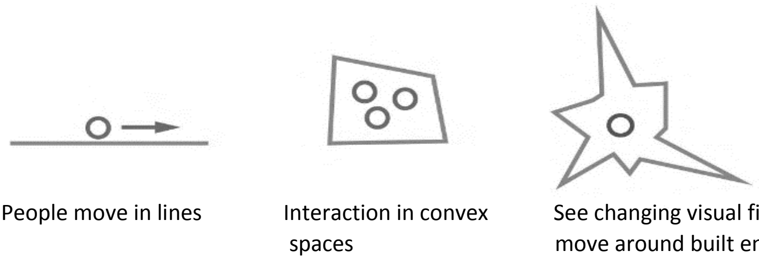


Figure 4.2.2. Space as an inherent characteristic of activities and its inseparable (Hillier and Vaughan, 2007, p. 3)

The second assumption in this method is that the character of individual space in shaping people's behavior is not important as the relation between spaces; as it is explained before this relationship is configuration. In the next step, Space Syntax analyzes the pattern of the combination of spaces and the relationship between them through graph analysis (figure 4.3.2). Space Syntax indicators are the results of this analysis.

Understanding the spatial layout of the space is undertaken through Space Syntax measures and indicators. Most of these indicators have physical and social meanings and each of them has theoretical fundamentals. Many of the recent studies on Space Syntax has been conducted to measure the importance of the indicators and to compare the relation between real physical measures and the results of the Space Syntax analysis. The most significant measures of the Space Syntax applied in this research are as follows.

Connectivity

Connectivity is one of the main measures of Space Syntax Theory which evaluates the number of neighbor axes directly connected to a specific space. It measures the number of immediate neighbors of an axis (Dettlaff, 2014). Therefore a space such as a street that is connected by many other streets has high connectivity, so more people use it. It means the more the street is connected, the higher the connectivity is and more people choose it to reach their destination. Connectivity as an indicator is studied in this research.

Depth, mean depth

Depth between two spaces is defined as the smallest number of syntactic steps in a graph that are needed to reach one space from another (Klarqvist, 1993). It is the number of changes in the direction of the moving person when moving from one point to another, or from one line to another in the axial map.

Depth is calculated in two ways: the “total depth” and the “mean depth”. “Total depth” is the depth of a line from the starting line. “Mean depth” is the mean of the depths of the given line from every other line. The spaces that have a long distance from the main street have higher depth. The logic of Space Syntax is that the spaces which are hard to reach and have higher depth, have low traffic; because people have to move more in deep spaces, therefore the spaces that are more in depths are away from everyday life. (Tarashi, 2015)

Integration

“Integration” that is calculated based on the mean depth, is another significant concept of Space Syntax Theory; it is also called availability (Dettlaff, 2014; Hillier, 2009; Hillier et al., 1976; Madanipour, 1996). “Integration” is the linear depth of a line from every other line of the system. It is a variable that refers to how a space is connected with other spaces in surroundings by reflecting the mean depth of each line of the system from other spaces or lines; therefore spaces have lower depth value are more integrated. This indicator can be used to investigate the potential of gathering in a space since it is directly linked to the presence of people in a specific location. So it is led to finding out of the relationships between users and urban spaces. The results of all of the studies conducted show a relationship between the integration of the space and the presence of users in it. The axial system leads people into the most integrated spaces in the system. More integration of the space means more people will be in it. On the contrary, less integration means less user presence. Accordingly, integration is called accessibility by Space Syntax researchers. Less user presence means more uncontrolled space, so in such spaces the quality of life and sense of urban identity is decreased. (Dettlaff, 2014; Hillier, 2009; Hillier et al., 1976; Madanipour, 2005)

Local integration

The measure of “local integration” presents the scale of the users’ movement. “Its calculation takes into account the elements of the degree of distant depth equal to 3. The distance can also be taken as a ray anchored at the starting point of about 1250 m. for local integration measurements shall be taken at a distance of up 5 syntactic steps.” (Dettlaff, 2014; Hillier et al., 1976)

The Space Syntax software: UCL Depthmap

“Depthmap embodies a theory of the city, as well as being a method for analyzing the city” (Hillier et al., 2012). The UCL Depthmap software is a set of spatial network analyses software designed at UCL to analyze the social processes of spatial configuration and what between these elements is in the built environment. It is applied in various scales from building through small cities to whole cities or states to produce a map of open space elements, connect them using some relationship and prepare graph analysis that presents integration and connectivity of a given system. (UCL, 2016)

Figure 4.2.3. Linear representation of a curved path

To apply Depthmap analysis an axial map should be created, to do so the possible smallest number of the longest lines of movement in space that is a line of sight should be drawn. These lines must encompass the whole space to present all the feasibilities for movements. In the final axial map, the main data become axial lines and nodes of intersecting axial lines.

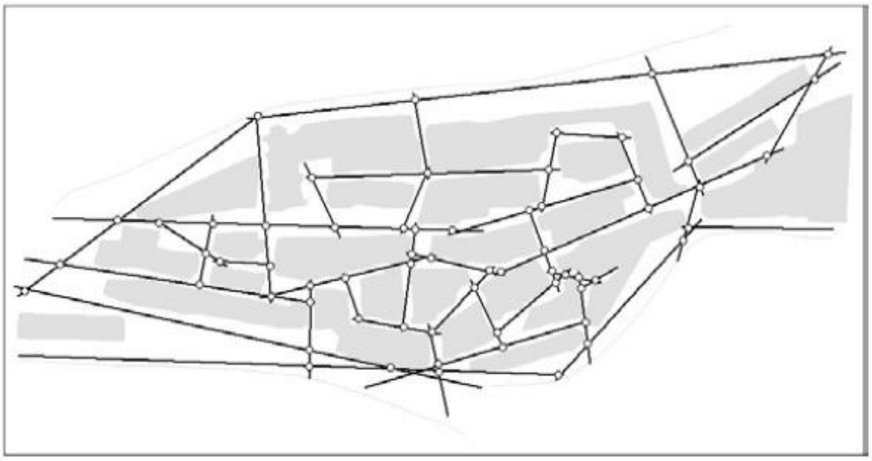


Figure 4.2.4. Relations between Points (o Junctions) and Lines (- Streets) (Hillier and Hanson, 1984)

Since the early years of using the Space Syntax method, an axial map is drawn by hand in AutoCAD software. Although in recent years it is possible to extract the axial map using the map of central lines of roads in ArcGIS, but the traditional method to prepare an axial map is still very common. Until now, no algorithm has been developed to create the fewest lines map automatically.

The outcomes of maps are the most significant results of applying Depthmap. These maps present the distribution of different spatial values including Space Syntax measures such as integration, connectivity, and depth in the whole city.

For instance, the above maps represent the pattern of spatial integration. The lines that are colored in red have more integration, as the range of color of lines becomes closer to blue, they have less integration to the whole city. It means the highest level of integration is red, orange, and then yellow, and the lower levels of integration are green and then blue. This map has different applications; it shows the degree of connections of streets with other streets in the overall urban system.

4.2.2 GIS method to geocoding addresses and analyze the spatial distribution pattern of land uses

GIS has been applied in this research for two purposes. Firstly, to geocode and represent the addresses of respondents who have filled out the questionnaires. Secondly, to illustrate maps, especially, represent each question and to represent the location of land uses including health centers, shopping centers, education units, and green space. Furthermore, the method of Nearest Neighbor has been done through GIS to present spatial scattering of land uses distributed in a specific district.

Geocoding data through GIS

GIS methodology can be used to link objective information about environments with subjective indicators of the urban environment efficiently by taking advantage of readily available geographic information and linking it to residential locations of survey

Figure 4.2.5. analyzing urban space

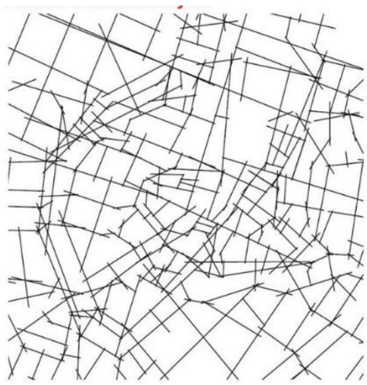


Figure 4.2.6. axial network analysis

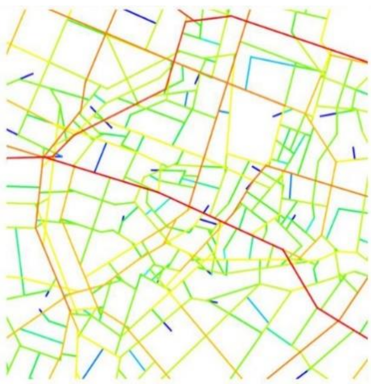


Figure 4.2.7. spatial hierarchy in the axial network – Spatial accessibility

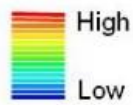


Figure 4.2.8. the color hierarchy is used to represent the value of Space Syntax

The warm colors on the top indicate high values and the cold colors in the bottom show low values of Space Syntax

Source: Stonor, 2011

respondents (McCrea et al., 2011). Therefore, GIS has been applied to locate the respondents of questionnaires based on their addresses. Through geocoding, a set of the geodatabase, which relates the locations of respondents to not only objective spatial information such as the location of shopping centers, educational centers, health centers, and public green spaces (as the case of the study of McCrea et al,

2011) but also subjective information containing all of the questions of questionnaires has been created. So, this method makes it possible to locate the response of each respondent for all of the questions of the questionnaire.

The second method is taken in this study, is developed by McCrea et al. (2006 and 2011) to link objective and subjective measures of the environment using a geographic information system (GIS). (McCrea et al., 2011, 2006)

Spatial distribution pattern of land uses through the Nearest Neighbor

The method of Nearest Neighbor is used to represent spatial scattering of phenomena distributed in a specific district. This method produces an indicator named RN, which continues from 0- 2.15. The amount of this indicator shows the spatial distribution pattern of phenomena or elements in the case study. Based on the formula of this method, if the indicator of RN is between 0 to 0.5 the distribution pattern is clustered, if it is between 0.5 to 1.15, so the distribution pattern is random, and if it is between 1.15 to 2.15, the distribution pattern is regular or dispersed. This statistical analysis is based on the following steps (Ali Akbari and Emadeddin, 2012; Hosseini J. and Sobhani, 2016; Qtiashat et al., 2018):

1- The real distance between each land use and the nearest land use (similar land use)

2- Measuring Observed Value by dividing summation of the total distances to several measurements

$$D_{obs} = \frac{\sum Distance}{number\ of\ measuements}$$

3- Measuring Average Value to assess the random distribution

$$D_{Ran} = 0.5\ (\sqrt{\frac{A}{N}})$$

A= the area of the region (km^2)

N= the number of distributed land uses (it should be calculated for each land use separately)

4- RN (nearest neighbor) is calculated through the following formula:

$$RN = \frac{D\ obs}{D\ Ran}$$

In this research, RN is calculated through ArcGIS 10.2 using spatial statistics tools. The calculations of this method are explained by Esri (Environmental Systems Research Institute)[1] as follows ("How Average Nearest Neighbor works—Help | ArcGIS Desktop," n.d.):

The Average Nearest Neighbor ratio is given as:

$$ANN = \frac{\bar{D}_O}{\bar{D}_E} \tag{1}$$

where $\bar{D}_O$ is the observed mean distance between each feature and its nearest neighbor:

$$\bar{D}_O = \frac{\sum_{i=1}^{n} d_i}{n} \tag{2}$$

and $\bar{D}_E$ is the expected mean distance for the features given in a random pattern:

$$\bar{D}_E = \frac{0.5}{\sqrt{n/A}} \tag{3}$$

In the above equations, d_i equals the distance between feature i and it's nearest neighboring feature, n corresponds to the total number of features, and A is the area of a minimum enclosing rectangle around all features, or it's a user-specified Area value.

The average nearest neighbor z-score for the statistic is calculated as:

$$z = \frac{\bar{D}_O - \bar{D}_E}{SE} \tag{4}$$

where:

$$SE = \frac{0.26136}{\sqrt{n^2/A}} \tag{5}$$

4.2.3 Statistical methods (SPSS and AMOS) to analyze data through structural equation modeling (SEM)

Statistical methods, which range from descriptive to inferential to multivariate statistics, have been developed to help researchers to find out and interpret issues of interest in many fields of studies (Khine et al., 2013). Structural equation modeling (SEM) is one such method.

Structural equation modeling

Factor analysis, path analysis, structural equation modeling, and related multivariate statistical methods are based on maximum likelihood or generalized least squares estimation developed for covariance structure models (Bentler and Bonett, 1980).

[1]. an international supplier of geographic information system (GIS) software, web GIS and geo-database management applications

Structural equation modeling is a very general and strong multivariate analysis technique of the multivariate regression family (Hojati, 2017). The SEM family of techniques has its origins in regression analyses of observed variables and factor analysis of latent variables (Kline, 2016). It is a comprehensive statistical method to analyze multivariate data involving complex relationships between and among observed and latent variables (Hoyle, 1995). More precisely, it is an extension of the "general linear model" that allows the researcher to test a set of regression equations simultaneously. Structural equation modeling combines the methods of factor analysis, focal correlation, and multivariate regression. It evaluates directional and non-directional relations between a set of observed and latent variables (Hojati, 2017)

Multivariate analysis is one of the most powerful and appropriate methods of analysis in behavioral and social science research. As the nature of such issues is multivariate, therefore, it cannot be analyzed through the bivariate method (an independent variable with a dependent variable is considered each time) (Kalantari, 2014). Multivariate analysis refers to a series of methods of analysis that their main feature is simultaneous analysis of k independents variable and n dependent variable (Hoyle, 1995). Sometimes, it is called *covariance structural analysis*, *causal modeling*, and also *LISREL*; but its dominant term is *structural equation modeling* or SEM. (Hojati, 2017)

According to Kline (1998), SEM is applied to find out the patterns of correlation/ covariance between a set of variables and to clarify as much of their variance as possible with the model specified (cited by Suhr, 2006). This method can test the acceptability of theoretical models in particular communities using correlation, non-experimental and experimental data. SEM provides *estimates of model parameters* (path coefficient and error terms) as well as several indicators for the *goodness of fit.* Moreover, using empirical data provides the opportunity to test the developed models as a whole, and through indicators offered to the researcher, it guides the researcher to improve the model.

Based on Carvalho and Chima (2014), structural equation modeling is a very powerful analytical tool with many advantages over the techniques. For example, SEM has the great ability to use several indicator variables simultaneously to define each construct in the model, which leads to more validity of measurement model (Carvalho and Chima, 2014).

Types of the models in structural equation modeling

Structural equation modeling can be used to analyze different types of models such as regression models, path analysis, confirmatory factor analysis models, second-order factor models, MIMIC models (models with multiple indices and multiple causes), multilevel models, multiple group models, etc. (Kalantari, 2014)

Path Analysis

Sewall Wright developed *path analysis* as a way to study the direct and indirect cause-and-effect relationships between variables. It should be noticed that path analysis is not applied to discover causes, but, it is used in models that are based on theoretical knowledge. Path analysis is an important analytical tool for testing theories that researchers can use to determine pattern agreement of correlations derived from a set of observations with a certain model. (Hojati, 2017; MacCallum and Austin, 2000)

Route Model

A route model is a diagram that relates independent, intermediate, and dependent variables. One-way arrows represent causality between exogenous or intermediate variables and dependents variables. Arrows also connect error expressions with their own endogenous variables. Two-way arrows indicate the correlation between pairs of exogenous variables. (Heidarali, 2010)

Path Coefficient

The path coefficient is a standard regression coefficient (beta) that shows the direct effect of an independent variable on a dependent variable in the path model (Hojati, 2017). Thus, when the model has two or more causal variables, the path coefficients are partial regression coefficients that measure the effect of one variable on another variable by controlling the other variables in the model. Route estimates can be assessed by *least squares* or *maximum likelihood regression*. (Kalantari, 2014)

Direct and indirect effects

The path coefficient can be used to analyze the correlation between two variables into direct and indirect effects. Indicators effect require *mediator variables*.

Structural Equation Modeling Approaches

Generally, to estimate model parameters in structural equation modeling (SEM), there are two types: covariance-based approach and variance-based approach or partial least square. In this research, the first approach – covariance-based approach is applied.

Covariance-based Approach

The covariance-based method, known as the first generation of structural equation modeling, is highly dependent on large sample size, therefore, the more normal data, and the better fit (Schumacker and Lomax, 2011). The covariance-based method attempts to minimize the difference between the sample covariance and what the theoretical model predicts (Kalantari, 2014). LISREL, MPLUS, EQS, and AMOS software use covariance-based approaches in their multivariate analysis. Since the nature of these issues has multiple variables and these variables have more complex relationships, they cannot be investigated in a way that the relationship between one variable with a dependent variable is examined. The covariance-based method is more suitable for developing the theories. (Heidarali, 2010; Hojati, 2017)

The concepts of modeling of covariance-based structural equation

Two main concepts in statistical analysis, in particular in structural equation modeling, are latent variables and observed variables. Latent variables are variables that are not directly measured but are measured through a number of observed variables. Latent variables are placed in an ellipse in the model. The observed variable is a variable that plays the role of a reagent in the measurement model. Each observed variable in the model has a measurement error. Observed variables are places in a rectangle in the model. The researcher expects that fitting data to the model to be based on the acceptable scientific criteria due to the efforts in formulating the theoretical model and data collection.

Exogenous variables: Variables that are not influenced by other variables in the model (Carvalho and Chima, 2014)

Endogenous Variables: Variable caused by other variables in the model (Carvalho and Chima, 2014)

Observed (measured) variable: Observed variable is a variable obtained by direct observation and acts as an index to measure a hidden variable. The path diagram, it is marked with a rectangle. (Heidarali, 2010; Hojati, 2017; Kalantari, 2014; Suhr, 2006)

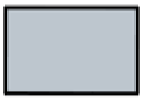


Figure 4.2.9. The observed (measured) variable in the path diagram

Hidden (latent) variable: Variables that are not directly visible. Hidden or latent variables are examined by linking to measurable (observed) variables and marked with circles or ellipses in the path diagram. (Heidarali, 2010; Hojati, 2017; Kalantari, 2014)

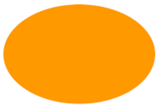


Figure 4.2.10. The latent (unmeasured) variable in the path diagram

Latent variables are equivalent to common factors in factor analysis and can be viewed as being free of the error of measurement (Suhr, 2006).

- Variable labels
  independent → predictor → exogenous (external) → affect other variables in the model
  dependent → criterion → endogenous (internal) → effects of other variables → can be represented as causes of other endogenous variables
  latent variable → factor → construct
  the observed variable → measured variable → manifest variable → indicator → generally considered endogenous
  (Suhr, 2006)

Residual error: Residual errors represent the random error of observed variables as well as latent variables that do not fit within closed lines. (Heidarali, 2010; Hojati, 2017)

The lines drawn to the observed variables indicate measurement errors.

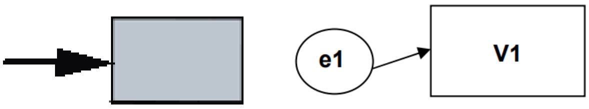


Figure 4.2.11. Residual error of observed variable, error (e1) associated with a measured variable (V1) (Suhr, 2006; Hojati, 2017)

Lines drawn to latent variables indicate missing variances.

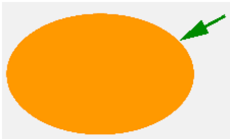


Figure 4.2.12. Residual error of latent variable (Hojati, 2017)

It should be noted that, in structural equation modeling, straight lines (single-headed arrows) are used to represent the causal relationships or the effect of one variable on another (factor loading).

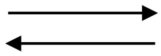


Figure 4.2.13. direct relationship (Suhr, 2006; Hojati, 2017)

Curve lines (double-headed arrows) are used to indicate correlations.

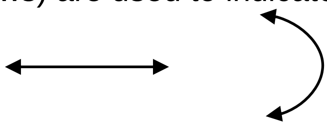


Figure 4.2.14. Covariance or correlation (Suhr, 2006; Hojati, 2017)

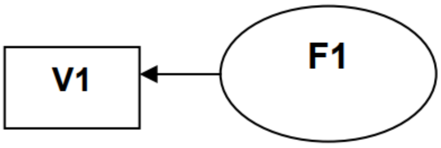


Figure 4.2.15. Path coefficient for regression of a latent variable (F1) on an observed variable (V1) (Suhr, 2006)

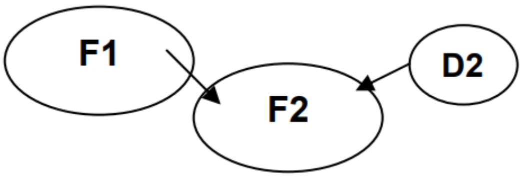


Figure 4.2.16. Path coefficient for regression of one latent variable (F1) onto another latent variable (F2), residual error (D2) in the prediction of F2 by F1 (Suhr, 2006)

Parameters: Parameters include two types of fixed and free parameters. Fixed parameters are not estimated from data and their value is fixed to zero or one. However, free parameters are estimated from the data.

General structural equation modeling

This model combines two models, a measurement model and a structural model in which both relationships between hidden (latent) variables with observed variables (measurement model) and relationships between hidden (latent) variables (structural model) are considered. (Heidarali, 2010; Kalantari, 2014; Suhr, 2006)

General structural equation models include unobservable exogenous and endogenous variables in addition to the disturbances (error terms). Evaluation of model fit indices leads to the analysis of the general structural equation model to explain the relationship among the latent variables defined by the confirmatory factor models or measurement models as correlations, means, and standard deviations among the latent variables should be reported (Carvalho and Chima, 2014).

Measurement Model

The measurement model defines the relationships between latent and observed variables (components of a latent variable). The measurement model has two types:

- Measurement model X: it illustrates the relationships between the independent latent variable and its observed variables.

- Measurement model Y: it shows the relationships between the dependent latent variable and its associated observed variables.

The measurement model prescribes latent variables, e.g., confirmatory factor analysis (Suhr, 2006). The process of validating the measurement model through confirmatory factor analysis (CFA) allows assessment of the research questions by determining whether the observed variables are indeed good indicators of the latent variables (Carvalho and Chima, 2014). Therefore, separate confirmatory factor models should apply for each set of observed variables hypothesized to indicate their respective latent variables. The observed variables should be diagrammed (for example in AMOS) and linked to an SPSS data file to test if the indicator variables are acceptable in defining the latent variable (Carvalho and Chima, 2014; Schumacker and Lomax, 2011). The CFA of this research through factor analysis is presented in the attachment.

According to Bentler (1990), the process of validating the measurement model needs evaluating each cluster of observed variables separately to fit the hypothesized CFA model. The statistical test uses the most popular procedures for evaluating the measurement model: Chi-square (x^2), Goodness-of-Fit Index (GFI). Chi-square should be divided by degrees of freedom (chi-square/df) and model fit statistics should be close to the $p < 0.05$ level of significance. The model fit statistics for the measurement models should be represented in a separate table (Carvalho and Chima, 2014; Coughlan et al., 2008).

Structural Model

The structural model specifies the relationships between hidden (latent) variables and observed variables that are not indicators of latent variables (Hojati, 2017; Suhr, 2006). The structural model evaluates the relationships between latent variables, which should be derived from measured variables. However, the measurement model represents the relationships between measure variables and latent variables. The **structural equation modeling** approach examines the structural relationships among theoretical factors by analyzing the structural model and the measurement model separately (Schumacker and Lomax, 2011). The analysis process is accomplished primarily through path analysis with latent variables of the acceptable model. The statistics literature represents a lower chi-square to df ratio (X^2/df) and the values above 0.90 of the Adjusted Goodness of Fit Index indicate a better model fit (Carvalho and Chima, 2014; Ghasemi, 2014).

The general model of structural equations follow the rules:

1. Every ellipse in the structural equation modeling represents a latent variable.
2. Every rectangle in the structural equation modeling represents an observed variable.
3. There is an arrow from each latent variable (ellipse) to each observed variable (rectangle) that represents factor loading that is equal to the path coefficient.
4. Any numerical value associated with rectangles indicates an estimation error.

Acceptable criteria to approve the theoretical model should be done using the goodness of fit indicators. These tests show how much the designed model by a researcher is supported based on the real observed data; as these indicators increase, the data support the theoretical model strongly.

The strength of the relationship between the factor (latent variable) and the observed variable is represented by the factor loading. The higher the factor loading of an index (related to a certain structure), the greater effect of the index in explaining that structure. Also, if the factor loading of an index is negative, it indicates the negative effect of that index on explaining the relevant structure. If the factor loading of an index is more than 0.6 (regardless of being positive or negative), it is considered as high factor loading and if it is more than 0.3, it is considered as relatively high factor loading. Factor loading less than 0.3 can be ignored.

An example of a general structural equation modeling

The relationship between three latent (hidden) variables A, B, and C are examined as follows (Hojati, 2017):

- The latent variable A is the independent variable that affects both endogenous hidden variables B and C.
- Three observed variables (index) X1, X2, and X3 were used to measure variable A.
- Three observed variables (index) Y1, Y2, and Y3 were used to measure variable B.
- Three observed variables (index) Y4, Y5, and Y6 were used to measure latent variable C.
- The path coefficient between the two dependent latent variables is represented with β and the path coefficient between the dependent and independent latent variables is shown with γ.
- The relationship between each latent variable and its associated observed variables is denoted by the letter λ, which is called the factor loading.

- ε represents the error (residuals) for the endogenous observed variable
- δ represents the error (residuals) for the exogenous observed variable
- ζ represents the error variance (residuals) for the endogenous latent variable

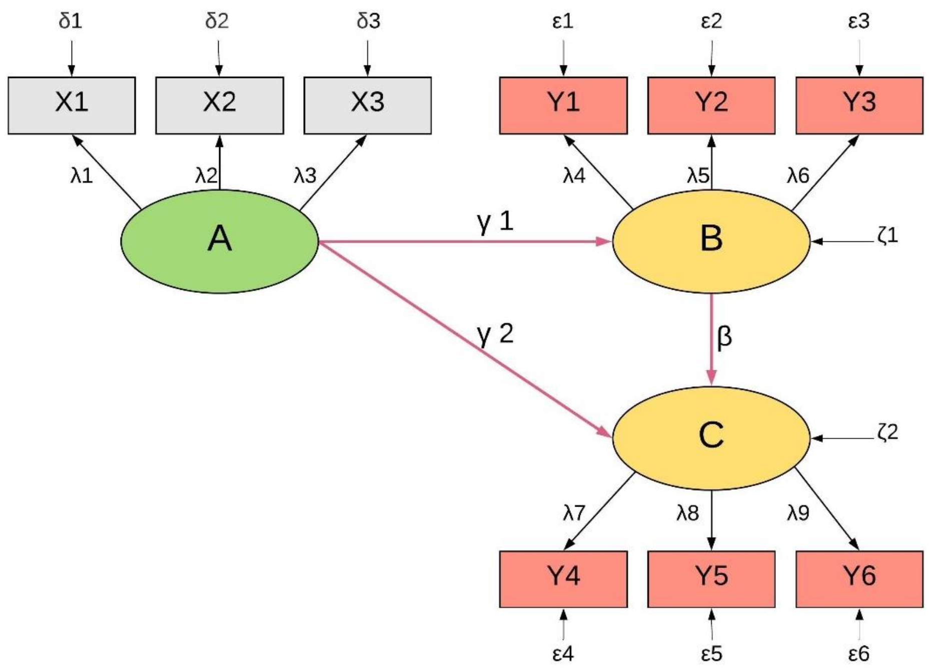


Figure 4.2.17. An example of a general model of structural equation modeling based on symbols (Hojati, 2017)

Steps of structural equation modeling

Step 1: Model specification

Modeling is based on the theory. To develop the model, the number of latent (hidden) variables of the model, the number of observed variables, the relationships between the latent and related observed variables, the pattern of relationship between the latent variables and model constraints are determined (Hojati, 2017; Khine et al., 2013). This step is the process of formally stating a model by determining which parameters are to be fixed or free (Carvalho and Chima, 2014).

- Number of variables in modeling

The number of variables depends on the subject of research, the purpose of research, and the possibility of measuring the variables. In general, the more complex the model, the more difficult it is to obtain a model fit. It should be also noticed that the greater the number of variables in a model, the larger the sample size should be. Although there are no definite rules for determining the number of variables of the model, some researchers argue that the model should not include more than 20 variables, i.e. 1 or 2 variables as latent variables, and each variable is assigned 1 to 3 indexes. (Heidarali, 2010; Hojati, 2017; Raminmehr and Charstad, 2013)

Step 2: Model identification

Model identification means if it is possible to obtain a unique, single solution for every free parameter from the observed data. Based on this definition there are three types of models: (Carvalho and Chima, 2014; Hojati, 2017; Suhr, 2006)

Under-identified models: A single estimate for each parameter is impossible. Or, in other words, if a single, unique value cannot be obtained from the observed data for one or more free parameters. For instance, considering the equation x + y = 5 as an example, the value (solution) for y is dependent on the value (solution) of x. When there are more unknowns (x and y) than the number of equations (1), the model is under-identified.

Just-identified models: A single value can be estimated for each free parameter. In other words, if for each free parameter a value can be obtained through one and only one manipulation of the observed data. For example, with two equations, x + y = 5 and 2x + y = 8, a unique solution can be obtained.

Over-identified models: Models that have more than one answer for each parameter. That is, the number of model parameters is lower than the observations. In other words, if a value for one or more free parameters can be obtained in multiple ways from the observed data. For instance, x + y = 5, 2x + y = 8, and x + 2y=9, there is no exact solution.

- Rules for model identification:

The number of parameters to be estimated (free parameters, q) should not exceed the number of variances and covariances of the sample, it must be equal or smaller than the number of non-redundant elements in the sample covariance matrix. If the number of observed (measured) variables in the covariance matrix are p, then the following formula can estimate the total number of possible variances and covariances. (Hojati, 2017; Kalantari, 2014; Suhr, 2006)

Total number of variances and covariances of the sample = p* $= p\ (p + 1)/\ 2$

$$q =< p^*$$

The model, which is completely determined, is not scientifically desirable. Because its degree of freedom (df) is zero and cannot be rejected. Practically, researchers should analyze the over-identified models that have a positive degree of freedom. Models that are not determined need to be re-formulated. (Hojati, 2017)

When df is positive, all q parameters can be estimated, df = (p*-q) (Suhr, 2006)

Step 3: Model estimation

The purpose of estimation is to obtain numerical values for the unknown (free) parameters (Suhr, 2006). Model estimation involves techniques used to estimate the parameters of the model. The estimation of parameters is repeated until the model be converged in a final set of estimated parameters. (Ghasemi, 2014)

- Model estimation methods:

Maximum Likelihood (ML): is the most common method, which is independent of the data scale. This method can be used if the observed variables are normal and linear and there are more than 100 cases (Hojati, 2017). Considering the current set of observations, the methods of ML find the parameters of the model that are most consistent with these observations (Carvalho and Chima, 2014).

Generalized Least Squares (GLS): the results are similar to the ML method and can be applied with smaller sample size.

(Unweighted Least Squares (ULS): it is appropriate when all observed variables are measured with a single scale.

Weighted Least Squares (WLS) and **Diagonal weighted Least Squares (DWLS)**: they are not dependent on the assumption of normality. They require a very large sample size (more than 1000).

Step 4: Evaluation of model fit

An important part of the estimation process is evaluating the model fit. Model fit is to what extent a model fits with the sample data. Fit indices are used for this purpose.

If the model fit is acceptable, the estimation of parameters is examined. It means the results of the measurement and structure of the model are evaluated. The ratio of estimation of each parameter to its standard error is represented by ***t***. A parameter is acceptable or meaningful when the value of ***t*** be greater than or equal to 1.96. Therefore, the indices are accurate enough to measure the latent structures of the research.

The next step is to test the hypothesized model statistically to determine the extent to which the proposed model is consists of the sample data, which includes the fit of the model as a whole and the fit of individual parameters (Carvalho and Chima, 2014; Coughlan et al., 2008).

- General Model Fit Tests

Fit indices determine how well a priori model fits the sample data (McDonald and Ho, 2002; cited by Hooper et al., 2008). Although various types of tests, called fitting indices, are being developed, there is still no general agreement on even one optimal test. Decisions about fitting a model are based on several indicators, not one. Therefore, to evaluate the model fit, it is necessary to report a variety of indicators; because, different indices reflect various aspects of model fit. Some of these indices are presented in the following table.

An adjustment of the hypothesized model is conducted by examining the goodness-of-fit indices to improve the model based on theoretical justification as the model is re-specified The adjustment process can provide new insights regarding the relationship between observed and latent variables (Carvalho and Chima, 2014).

Chi-square is the traditional measure for evaluating the overall model fit. Chi-square statistic is a “badness of Fit” index, smaller values indicate better fit (Kline, 2016). A good model fit would provide an insignificant result at a 0.05 threshold (Barrett, 2007; cited by Hooper et al., 2008). Due to the Chi-square’s sensitivity to sample size, it is not easy to gain a good sense of fit only from the X^2 value (Carvalho and Chima, 2014; Hooper et al., 2008). To minimize the impact of sample size on the model chi-square, Wheaton et al (1977) suggest relative/normed chi-square (X^2/df) with the recommendation of an acceptable ratio range from as high as 5.0 (Hooper et al., 2008).

The next fit statistic is the **root mean square error of approximation (RMSEA)**. The RMSEA indicates how well the model, with unknown but optimally chosen parameter estimates, would fit the model covariance matrix. According to MacCallum et al (1996), the advantage of the RMSEA is its ability for a confidence interval to be calculated around its value; moreover, based on McQuitty (2004), the known distribution of RMSEA allows the null hypothesis (poor fit) to be tested more precisely (cited by Hooper et al., 2008).

The goodness of Fit Index (GFI) is an alternative to the chi-square test and calculates the proportion of variance that is accounted for by the estimated population covariance (Hooper et al., 2008). If the Goodness of Fit Index (GFI) is larger than 0.9 it reflects a good overall degree of fit and values below 0.9 suggest that the model can be improved (Habibi and Adounvar, 2005). To reduce the sensitivity of this index, the **AGFI** is defined. AGFI is the **Adjusted Goodness of Fit Index**, which considers the degrees of freedom available for testing the model. Values above 0.9 are acceptable, representing the model fits the data well.

Incremental fit indices or **relative fit indices** are indices, which compare the chi-square value to a baseline model. For these models, the null hypothesis is that all variables are uncorrelated (McDonald and Ho, 2002). The first index is the **Normed Fit Index (NFI)** that evaluates the model by comparing the X^2 value of the model to the X^2 of the null model. This index is sensitive to sample size and underestimates fit for sample size less than 200; therefore, the issue is solved through **Non-Normed Fit Index (NNFI)**, which is also known as the **Tucker-Lewis Index (TLI)** and prefers simpler models. Because of the non-normed nature of NNFI, its value can be above 1.0 that can be difficult to interpret (Hooper et al., 2008; McDonald and Ho, 2002). **Comparative Fit Index (CFI)**, which is defined by Bentler (1990), is a revised form of the NFI that works well even the sample size is small. Like NFI, CFI assumes that all latent variables are uncorrelated and compares the sample covariance matrix with this null model (Hooper et al., 2008; Kline, 2016). In fact, for comparative fit, CFI, and TLI, which indicate the relative lack of fit of a specified model versus the baseline model, are widely used (Teo, 2010).

Table 4.3. Indices and standard of fit indices in SEM (Hoyle, 1995; Hu and Bentler, 1999, Suhr, 2006, Hooper et al, 2008; Hair et al., 2010; Hair, 2014; Teo, 2010; Awang, 2012)

fit index		description	range	recommendation
RMSEA	Root Mean Square Error of Approximation	Is related to residual in the model	from 0 to 1 (a smaller value indicates better model fit)	<0.05 good <0.08 acceptable <1.00 average >1.00 weak
X^2/df	Chi-Square/degree of freedom	the impact of sample size on the chi-square model is minimized	there is no consensus regarding an acceptable ratio for this statistic; recommendation: from 2 to 5	<5.00 (Or < 3)
GFI	Goodness of Fit index	has an upward bias with large samples	From 0 to 1	> 0.90 satisfactory fit > 0.80 good fit
AGFI	adjusted Goodness of Fit index	Is independent of sample size	From 0 to 1	> 0.90 acceptable
CFI	Comparative Fit index	Is equal to the discrepancy function adjusted for sample size	From 0 to 1 (a larger value indicates better model fit)	≥ 0.90 satisfactory fit closer to 1.0 indicates a good fit
NFI	Normed Fit Index	Is sensitive to sample size	From 0 to 1	> 0.90 satisfactory fit > 0.80 good fit
TLI (or NNFI)	Tucker-Lewis Index (or Non-normed Fit Index)	Compensates for the effect of model complexity	Can fall outside the 0-1 range	>0.95 acceptable fit
IFI	Incremental Fit Index	A group of indices that do not use the chi-square in its raw form but compare the chi-square value to a baseline model)	From 0 to 1	> 0.90 satisfactory fit < 5.0 acceptable

The final modified model with acceptable model fit statistics should be used for testing the hypotheses related to the statistical significance of the structure coefficient or path in the model. An important assessment of the structure coefficient, standard error, t-value, and **p-value will indicate if the null hypothesis should be accepted or rejected** (Carvalho and Chima, 2014)**.**

If the model fit is acceptable, the parameter estimates are examined. The ratio of each parameter estimate to its standard error is distributed as a z statistic and is significant at the 0.05 level if its value exceeds 1.96 and at the 0.01 level if its value exceeds 2.56 (Hoyle, 1995).

If an initial model represents statistical indices that are not acceptable, specification searches are conducted where modification indices may suggest adding an additional path in the existing model (Carvalho and Chima, 2014). If an unacceptable model fit is found, the model could be revised when the modifications are meaningful. The model modification involves adjusting a specified and estimated model by either freeing parameters that were fixed or fixing free parameters (Hoyle, 1995). The process may be repeated until a final model shows acceptable fit statistics.

Step 5: Model modification

This is the process of making model adjustments through specification searches (Carvalho and Chima, 2014). If the model is poorly fitted, using the information from program output, some changes are made to the model as the last step.

The choice of AMOS as a software to do SEM

LISREL and AMOS are the most famous software that is applied to analyze SEM. Several other software such as EQS, Mplus, and SEPATH are also available. LISREL used to be the first choice of researchers, however, AMOS software is a user-friendly statistical package, which does not need a computing code approach like LISREL. Therefore, it helps researchers focus more on the research issues rather than learning the complexity of the software. Furthermore, AMOS is being sold by IBM with SPSS as a package. (Hair Jr. et al., 2014)

Analyze of AMOS

Applying AMOS, SEM is analyzed through path analysis. This method examines the pattern of relationships among several variables, while the probable causal relationships between them are neither confirmed nor rejected (Hojati, 2017). If two or more predetermined causal hypotheses can be represented in a path graph, the relative value of the path coefficient may indicate which one is better supported by the data (Farshchi, 2019). Researchers can measure the direct and indirect effects of one variable on another variable and compare their values through path analysis and SEM. Furthermore, the correlation between two variables is analyzed through simple and complex paths, some of these paths have a mainly indirect effect on the meaning, and other paths may lack this feature (Kalantari, 2014). The value of correlation between the two variables must be equal to the sum of the simple and complex paths that correlate those two variables (Farshchi, 2019).

The strength of the relationship between the factor (latent variable) and the observed variable is presented by factor loading. The value of factor loading ranges between 0 to 1. If the factor loading is less than 0.3, the correlation is considered weak, therefore, the correlation should be ignored. The factor loading between 0.3 to 0.6 is acceptable if the value is more than 0.6, it shows a very satisfactory correlation (Klein, 1994).

The factor loading is shown in figure λ. In factor analysis, variables that measure a latent variable (factor) should have a high value of factor loading with that factor and a low value of factor loading with other factors.

T-test is used to examine the significance of the relationship between variables. Since the significance is examined at the error level of 0.05, the correlation is not significant if the factor loading of observed variables through the t-value is lower than 1.96. (Habibi and Adounvar, 2005)

Chapter 5:

ANALYSIS AND FINDINGS

This research explores the relationships between urban form, quality of urban life, and urban identity in Andisheh new town, focusing on density, housing, land use, layout, and accessibility. To evaluate how these variables have been correctly identified to define urban form, quality of urban life, and urban identity, factor analysis has been used. Factor analysis is used to identify the components to perform structural equation analysis. In this chapter, first, the construct validity to identify the components of UF, QOUL, and UI is explained through SPSS using KMO and Bartlett's test of sphericity, then, the validity and reliability of the questionnaire are evaluated through the CFA of UF, UI, and QOUL (using AMOS to do SEM). Afterward, the indicators of the present research are analyzed.

To achieve a better understanding of each measure, the analyses are categorized into five parts based on the indicators. The research method used in this study is both qualitative and quantitative methods; it includes a case study approach and qualitative and quantitative descriptive methods.

In each part, first, the indicators of urban physical form are analyzed using ArcGIS based on the data. Secondly, the related indicators of urban identity and quality of urban life are analyzed through questionnaires and geocoding the locations of respondents by ArcGIS using descriptive analysis and SPSS analysis. Finally, the relationships between the indicators of each measure are analyzed through the structural equation model.

5.1 Construct Validity and reliability of the questionnaire

It is very important to evaluate how a theoretical model represents the observed data. Therefore, as it is explained before (see chapter 4) factor analysis is applied to do CFA and EFA. One of the most common use of factor analysis is construct validity. The standard process of research is to specify an EFA model first to estimate an initial pool of items, then to use a CFA framework to provide a more rigorous evaluation of how a theoretical model represents the observed data. Therefore, the number of latent variables that best represent the constructs of the relationship between the observed items and latent variables can be determined through this process. (Gallagher and Brown, 2013)

Factor analysis is used to evaluate the construct validity of the measurement tool (questionnaire) and the suitability of the psychometric criteria of the questionnaires, which are important assumptions of structural equation modeling (SEM). The validity and reliability of the questionnaires should be checked using confirmatory factor analysis (CFA) to select good measures for the questionnaires, the results will be described in the following part.

Additionally, structural equation modeling (SEM) is used to test the research hypotheses. As described in chapter 4, structural equation modeling is a strong tool that helps the researchers to formulate the foundations and theoretical framework of the research in the form of a measurement and structural model (Hojati, 2017). Moreover, using empirical data provides the opportunity to test the model as a whole and guides the researcher to improve and refine the designated model through the indicators that are provided through SEM (Sheykhi, 2019). What makes structural equation modeling strong is its high accuracy methodologically and being very close to the real conditions of social life practically. Methodologically, it is very precise because it treats latent variables as structures that there are errors in their measurement; practically, it is close to the reality of social life because it enables data analysis in a multivariable environment (Farshchi, 2019; Kalantari, 2014; Suhr, 2006).

Indeed, structural equation modeling can be considered as a general method, which helps the researcher to organize the research from theoretical studies to the analysis of empirical data in a multivariate format. Modeling helps the researcher to examine the theoretical model consisting of various components in general and in part; whether the collected data supports a whole sample of the theoretical model.

When the correlation between variables is identified, a statistical significance test should be performed. In this research, RMSEA, the ratio of the chi-squared test (χ^2 test) to degrees of freedom (CMIN/df, which is the minimum discrepancy divided by its degrees of freedom), GFI, AGFI, CFI, NFI, TLI (NNFI), and IFIare used to evaluate the goodness of fit of the whole model.

Identifying the components of the research: Urban Form

To identify the components of urban form, exploratory factor analysis (EFA) on components using principal components and varimax rotation is done. Factor analysis is a type of statistical method, which is used to present a set of variables considering a smaller amount of hypothetical variables. In other words, in factor analysis a large number of variables are expressed according to a small number of dimensions or structures. This structure is named factor. (Sheykhi, 2019)

Based on the results of factor analysis through SPSS, the questionnaire of this research is consist of 40 items and it is summarized in 5 factors:

- **Density**
- **Housing**
- **Accessibility**
- **Land use**
- **Layout**

To ensure data validity and to verify the accuracy of sampling before factor analysis, Kaiser- Meyer – Olkin (KMO) criterion through SPSS is used. This method calculates the data correlation coefficient. The larger the KMO represents the more appropriate data for analysis. The KMO value is between 0 and 1, and the results above 0.6 are appropriate for analysis. The Bartlett Test of Sphericity also shows that the variables are correlated and the results of factor analysis are reliable. According to the results, the KMO value of sampling quality is 0.830, which is acceptable, and considering the significance of the Bartlett Test ($P\text{-value} < 0.05$) the conditions for factor analysis are established.

The KMO value should be higher than 0.5% and the Bartlett spherical value should be significant with a p-value less than 0.5% (Miljko, 2017)

Table 5.1.1. Validity and accuracy test of sampling of urban form through KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.830
Bartlett's Test of Sphericity	Approx. Chi-Square	7159.634
	df	66
	Sig. (p-value)	.000

The rotated component matrix of factor loading on extracted factors of urban form is represented in the attachment (see attachment, table A).

Confirmatory factor analysis of Urban Form

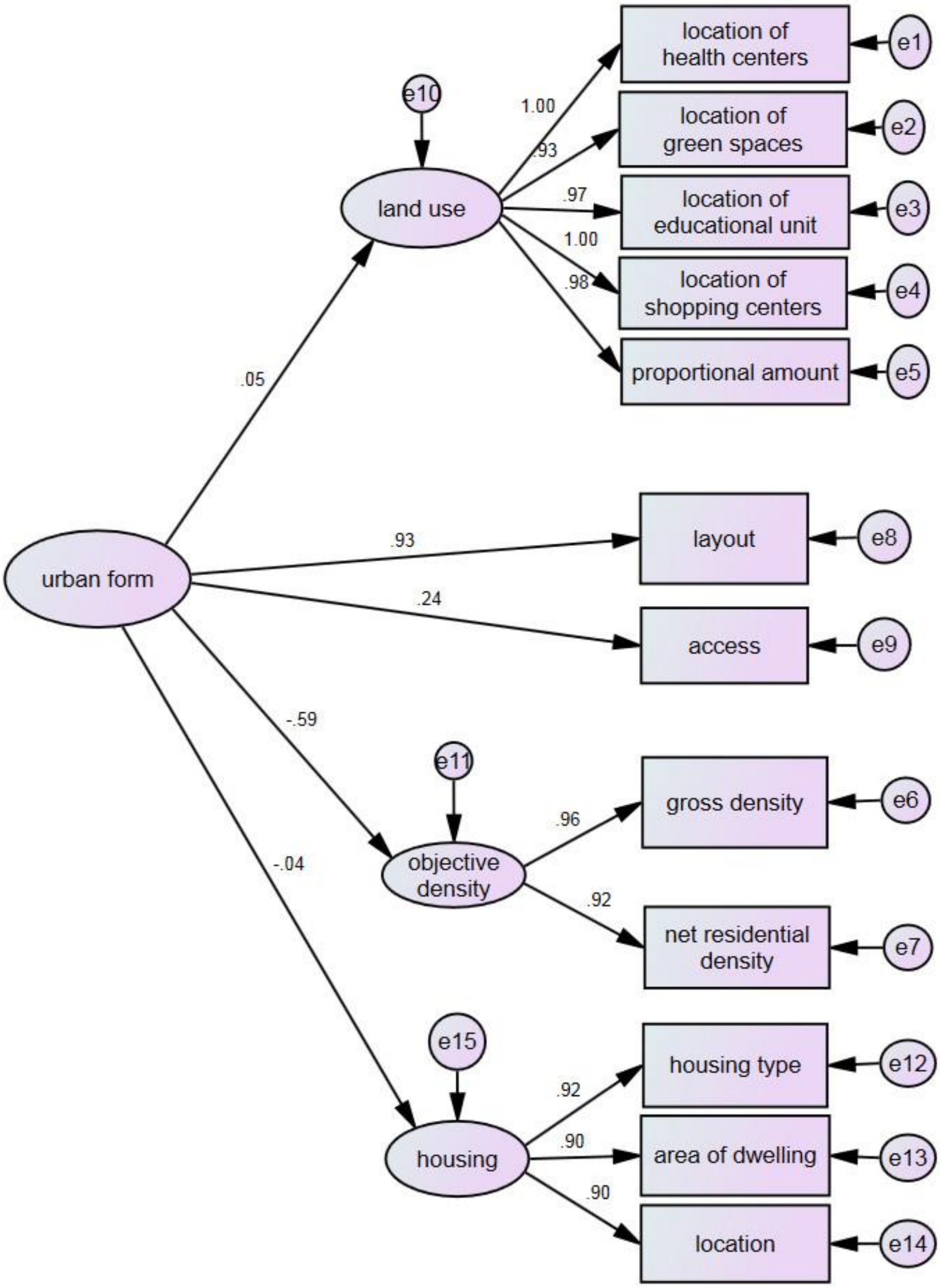


Figure 5.1.1. Confirmatory factor analysis of urban form to analyze conceptual model using AMOS[1]

The results of fitting with the model are shown in the following table. According to the presented indicators, the model has an appropriate fitting.

[1] . The table of regression weights of this model is presented in the attachment, table B.

As it is illustrated in the model 5.1.1, urban form includes 5 variables: 3 latent and 2 observed variables. The latent variable of land use, includes locations of land uses, and proportional amount of each land use that are summarized in the model. The second latent variable is housing, which includes the location of housing, housing type, and area of the dwelling unit. The latent variable of objective density is the third variable, which includes gross density and net residential density in the neighborhood. It should be noted that gross density and net residential density in the city are deleted from the model, because due to the repetitive numbers in the columns of these variables, they made an error. The first observed variable is layout, Access is the second observed variable. The values of access include the amount of connectivity, integration (HH), and integration (HH) R3 are calculated using Space Syntax, and the values are entered in the model as a column named access.

Table 5.1.2. The indicators of model fit of urban form

The indices of model fit		
index	Recommendation	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.062
Chi-Square/degree of freedom	< 3	2.590
goodness of fit index (GFI)	≥0.90	0.949
adjusted goodness of fit index (AGFI)	≥0.90	0.921
comparative fit index (CFI)	≥0.90	0.989
normed fit index (NFI)	≥0.90	0.982
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.985
incremental fit index (IFI)	≥0.90	0.989

Identifying the components of the research: Quality of Urban Life

To identify the components of quality of urban life, factor analysis on components through principal components and varimax rotation are used. According to the results of factor analysis, 28 sub-components (questions) related to variables are summarized in 6 factors:

- **Satisfaction with overcrowding**
- **Accessibility**
- **Satisfaction with layout**
- **Land use**
- **Housing**
- **Satisfaction with whole city**

To ensure data validity and to verify the accuracy of sampling before factor analysis, Kaiser- Meyer – Olkin (KMO) criterion through SPSS is used. This method calculates the data correlation coefficient. The larger the KMO represents the more appropriate data for analysis. The KMO value is between 0 and 1, and the results above 0.6 are appropriate for analysis. The Bartlett Test of Sphericity also shows that the variables are correlated and the results of factor analysis are reliable. According to the results, the KMO value of sampling quality is 0.784, which is acceptable, and considering the significance of the Bartlett Test (P-value < 0.05) factor analysis is possible.

Table 5.1.3. Validity and accuracy test of sampling of quality of urban life through KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.784
Bartlett's Test of Sphericity	Approx. Chi-Square	4235.498
	df	120
	Sig. (p-value)	.000

The rotated matrix of factor loading on extracted factors of the quality of urban life is represented in the attachment (see attachment, table C).

The important issue, which should be noted is that **housing** and **land use** are two latent variables that include other latent variables. Therefore, EFA and CFA should be applied to these two variables of QOUL.

- Land use

According to the factor analysis, this factor includes 6 items of sub-components that are categorized as 2 latent variables and 2 observed variables (figure 5.1.3 illustrates the model). The first latent variable is satisfaction with health center that includes health centers in regular use and emergence use, and the second latent variable is satisfaction with green space that includes green space in neighborhood and city. The two observed variables are satisfaction with shopping centers and satisfaction with educational units that are directly from questionnaires.

To identify the components of the factor of land use, the KMO and Bartlett's Test of Sphericity is applied. According to the results, the KMO value of sampling quality is 0.612, which is acceptable (that is more than 0.6). Also, considering the significance of Bartlett's Test of Sphericity (P-value <0.05), the conditions for factor analysis are established. The rotated matrix of factor loading on extracted factors of the land use (quality of urban life) is represented in the attachment (see attachment, table D).

Table 5.1.4. Validity and accuracy test of sampling of factor of land use (quality of urban life) through KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.612
Bartlett's Test of Sphericity	Approx. Chi-Square	825.078
	df	15
	Sig. (p-value)	.000

- housing

According to the factor analysis, this factor includes 11 items of the sub-components that are categorized into 2 latent variables: housing characteristics and housing satisfaction. Housing characteristics (figure 5.1.4) includes 5 sub-components and satisfaction (figure 5.1.5) includes 6 sub-components.

The KMO and Bartlett's Test of Sphericity is used also to identify the components of the factor housing, according to the results, the KMO value of sampling quality is 0.711, which is acceptable (that is more than 0.6). Also, considering the significance of Bartlett's Test of Sphericity (P-value <0.05), factor analysis is possible. The rotated matrix of factor loading on extracted factors of the land use (quality of urban life) is represented in the attachment (see attachment, table G).

Table 5.1.5. Validity and accuracy test of sampling of factor of housing (quality of urban life) through KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.711
Bartlett's Test of Sphericity	Approx. Chi-Square	1640.071
	df	55
	Sig. (p-value)	.000

The confirmatory factor analysis (CFA) of quality of urban life, as well as land use and housing, are illustrated in the next part.

Confirmatory factor analysis of quality of urban life

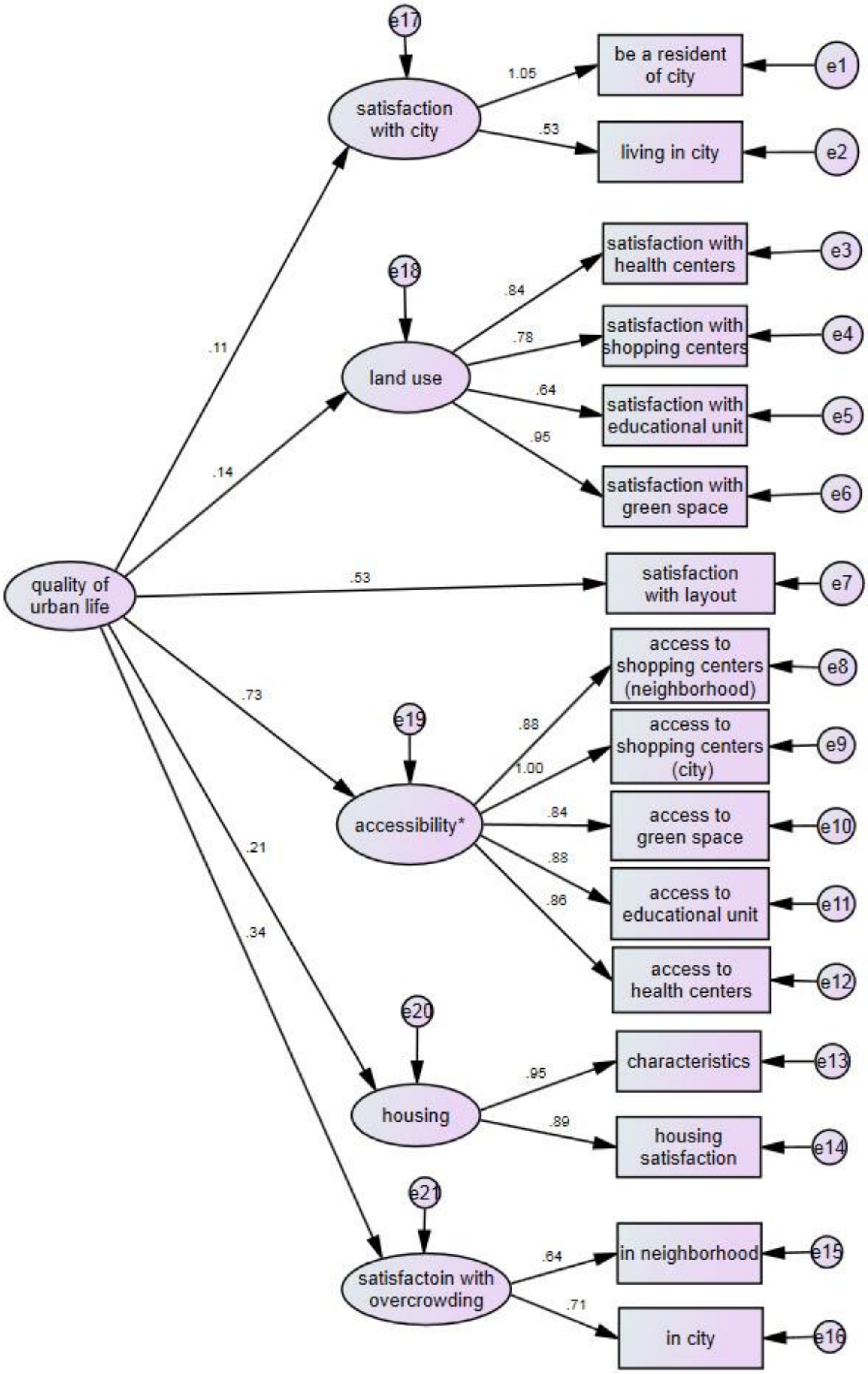


Figure 5.1.2. Confirmatory factor analysis of quality of urban life to analyze conceptual model using AMOS[2]

[2] . the table of regression weights of this model is presented in the attachment, table F.

The results of model fitting are represented in the following table. Based on the presented indices, the model has a good fit. Furthermore, according to the results in the figure above and the significance of factor loading, the indicators of satisfaction with overcrowding, housing, satisfaction with layout, land use, and satisfaction with the city describe the latent variable of quality of urban life well.

Table 5.1.6. The indicators of model fit of QOUL

The indices of model fit		
index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.049
Chi-Square/degree of freedom	< 3	1.979
goodness of fit index (GFI)	≥0.90	0.944
adjusted goodness of fit index (AGFI)	≥0.90	0.924
comparative fit index (CFI)	≥0.90	0.977
normed fit index (NFI)	≥0.90	0.954
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.972
incremental fit index (IFI)	≥0.90	0.977

Confirmatory factor analysis of land use (QOUL)

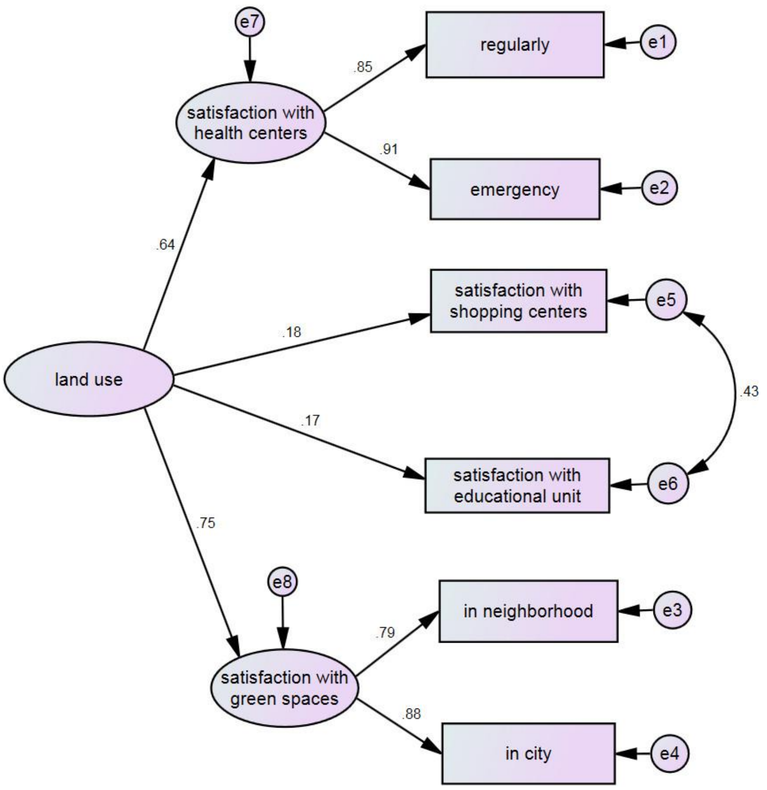


Figure 5.1.3. Confirmatory factor analysis of land use to analyze conceptual model using AMOS[3]

[3] . the table of regression weights of this model is presented in the attachment, table G.

As it is described above, the latent variable of land use includes 2 latent variables and 2 observed variables. The results of model fitting are represented in the following table. Based on the presented indices, the model has a good fit. Moreover, according to the results in the figure above, and the significance of factor loading, the indicators describe the latent variable of land use well.

Table 5.1.7. The indicators of model fit of land use

The indices of model fit		
index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.00
Chi-Square/degree of freedom	< 3	0.356
goodness of fit index (GFI)	≥0.90	0.998
adjusted goodness of fit index (AGFI)	≥0.90	0.994
comparative fit index (CFI)	≥0.90	1.00
normed fit index (NFI)	≥0.90	0.997
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	1.012
incremental fit index (IFI)	≥0.90	1.005

Confirmatory factor analysis of housing (QOUL)

The latent variable of housing includes 2 latent variables of housing1 and satisfaction (as it is described in 5.1.3). The confirmatory factor analysis for both variables has been done and presented as follows.

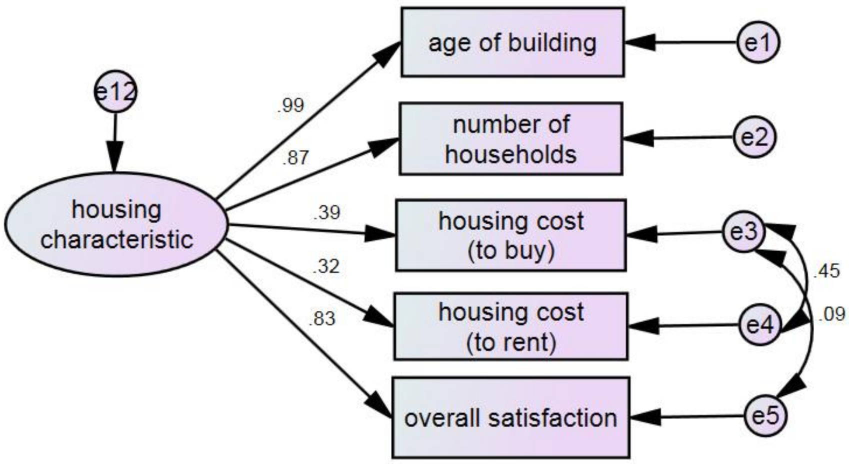


Figure 5.1.4. Confirmatory factor analysis of housing characteristic to analyze conceptual model using AMOS[4]

The results of model fitting are represented in the following table. Based on the presented indices, the model has a good fit. Moreover, based on the results in the figure above and the significance of factor loading, the indicators describe the latent variable of housing1 well.

[4] . the table of regression weights of this model is presented in the attachment, table H.

Table 5.1.8. The indicators of model fit of housing1 (housing/ QOUL)

The indices of model fit		
index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.082
Chi-Square/degree of freedom	< 3	2.7
goodness of fit index (GFI)	≥0.90	0.986
adjusted goodness of fit index (AGFI)	≥0.90	0.946
comparative fit index (CFI)	≥0.90	0.991
normed fit index (NFI)	≥0.90	0.987
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.976
incremental fit index (IFI)	≥0.90	0.991

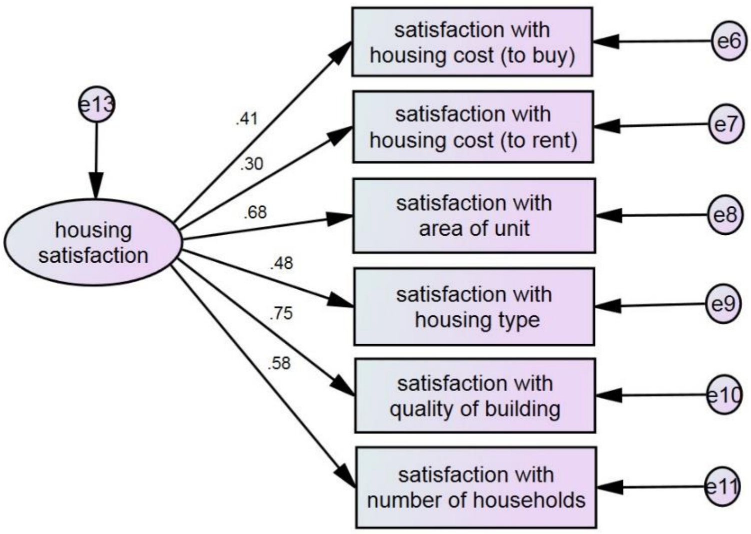


Figure 5.1.5. Confirmatory factor analysis of housing satisfaction to analyze conceptual model using AMOS[5]

The results of model fitting are represented in the following table. Based on the presented indices, the model has a good fit. Moreover, based on the results in the figure above and the significance of factor loading, the indicators describe the latent variable of satisfaction well.

Table 5.1.9. The indicators of model fit of satisfaction (housing/ QOUL)

The indices of model fit		
index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.059
Chi-Square/degree of freedom	< 3	2.44
goodness of fit index (GFI)	≥0.90	0.984
adjusted goodness of fit index (AGFI)	≥0.90	0.962
comparative fit index (CFI)	≥0.90	0.967
normed fit index (NFI)	≥0.90	0.946
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.945
incremental fit index (IFI)	≥0.90	0.967

[5] . the table of regression weights of this model is presented in the attachment, table I.

Identifying the components of the research: Urban Identity

To identify the components of urban identity, factor analysis on components through principal components and varimax rotation is used. According to the results of Factor Analysis, 25 sub-components (questions) are summarized in 6 factors:

- **Perceived overcrowding**
- **Housing**
- **Accessibility**
- **Layout**
- **Availability of land use**
- **Feeling about city**

To ensure data validity and to verify the accuracy of sampling before factor analysis, Kaiser- Meyer – Olkin (KMO) criterion through SPSS is used. This method calculates the data correlation coefficient. The larger the KMO represents the more appropriate data for analysis. The KMO value is between 0 and 1, and the results above 0.6 are appropriate for analysis. The Bartlett Test of Sphericity also shows that the variables are correlated and the results of factor analysis are reliable. According to the results, the KMO value of sampling quality is 0.687, which is acceptable, and considering the significance of the Bartlett Test (P-value < 0.05) factor analysis is possible.

Table 5.1.10. Validity and accuracy test of sampling of urban identity through KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.687
Bartlett's Test of Sphericity	Approx. Chi-Square	*2350.436*
	df	*120*
	Sig. (p-value)	*.000*

The rotated matrix of factor loading on extracted factors of the urban identity is represented in the attachment (see attachment, table J).

The significant issue that should be noted is that **layout** is a latent variable that includes other latent variables. Therefore, EFA and CFA should be applied to this variable of UI.

- **Layout**

According to the factor analysis, this factor includes 12 items of the sub-components that are categorized into 3 latent variables: physical setting, meaning, and activities. Physical setting includes 4 sub-components, meaning includes 5 sub-components, and activity includes 3 sub-components.

To identify the components of the factor of layout, the KMO and Bartlett's Test is applied. According to the results, the KMO value of the sampling quality is 0.639, which is acceptable (more than 0.6). Moreover, considering the significance of Bartlett's Test of Sphericity (P-value <0.05), factor analysis is possible. The rotated matrix of factor loading on extracted factors of the layout is represented in the attachment (see attachment, table K).

Table 5.1.11. Validity and accuracy test of sampling of layout (urban identity) through KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.639
Bartlett's Test of Sphericity	Approx. Chi-Square	*2363.894*
	df	*66*
	Sig. (p-value)	*.000*

Confirmatory factor analysis of urban identity

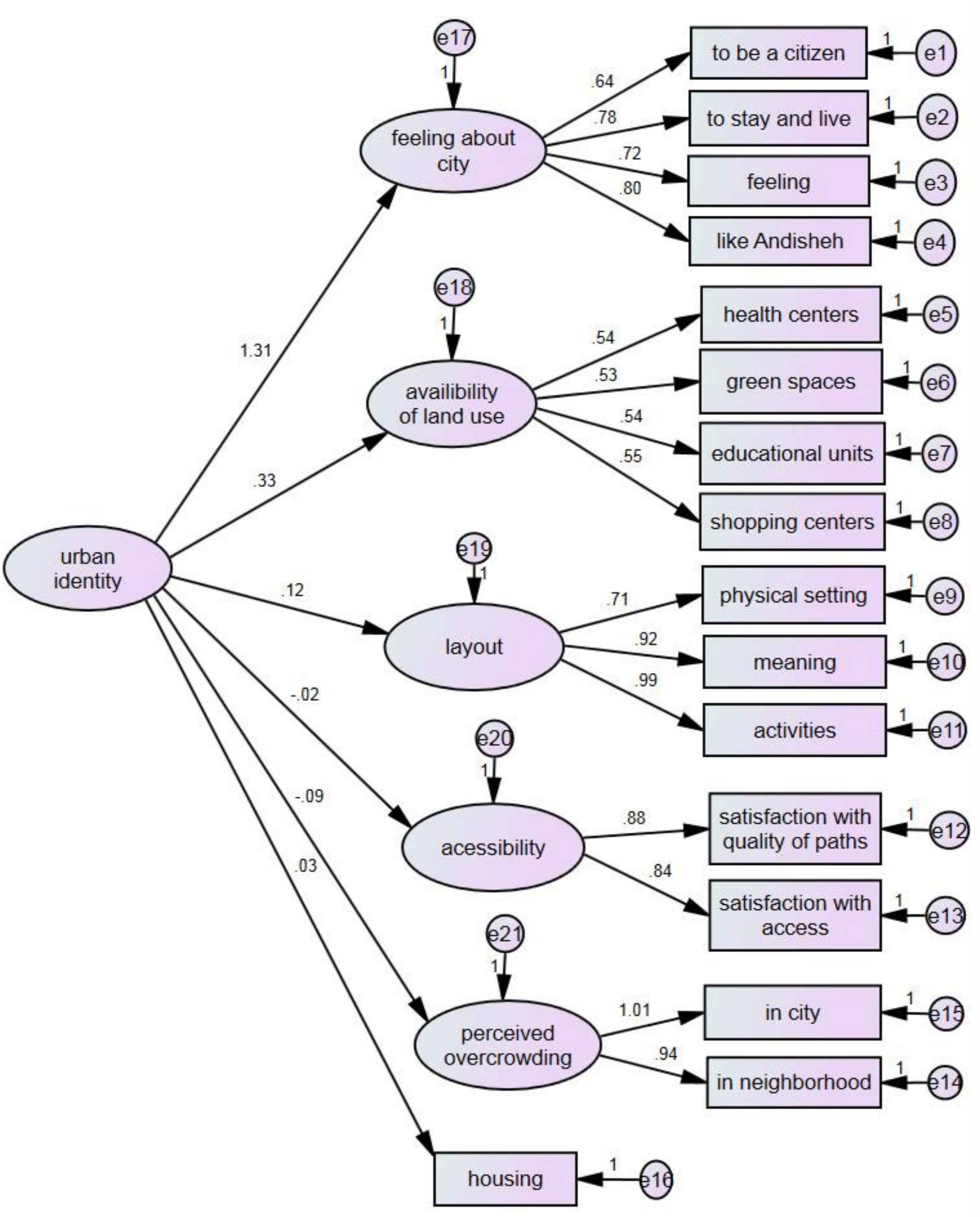


Figure 5.1.6. Confirmatory factor analysis of urban identity to analyze conceptual model using AMOS[6]

The results of model fitting are represented in the following table. Based on the presented indices, the model has a good fit.

[6] . the table of regression weights of this model is presented in the attachment, table L.

Table 5.1.12. The indicators of model fit of urban identity

The indices of model fit		
index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.043
Chi-Square/degree of freedom	< 3	1.747
goodness of fit index (GFI)	≥0.90	0.947
adjusted goodness of fit index (AGFI)	≥0.90	0.927
comparative fit index (CFI)	≥0.90	0.976
normed fit index (NFI)	≥0.90	0.946
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.971
incremental fit index (IFI)	≥0.90	0.976

Confirmatory factor analysis of layout

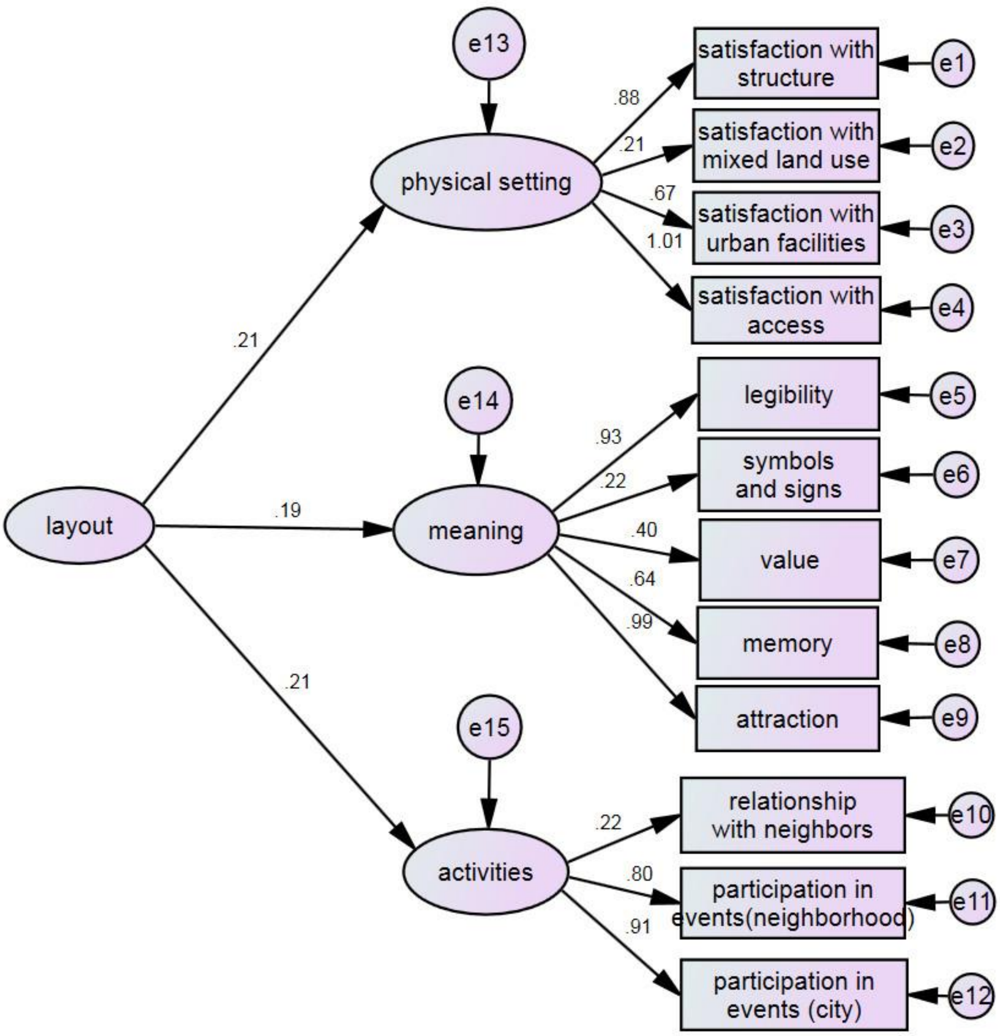


Figure 5.1.7. Confirmatory factor analysis of layout to analyze conceptual model using AMOS[7]

The results of the model fitting are shown in the following table. Considering the represented indices, the model has a good fit.

[7] . the table of regression weights of this model is presented in the attachment, table M.

Table 5.1.13. The indicators of model fit of layout

The indices of model fit		
index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.077
Chi-Square/degree of freedom	< 3	2.341
goodness of fit index (GFI)	≥0.90	0.934
adjusted goodness of fit index (AGFI)	≥0.90	0.903
comparative fit index (CFI)	≥0.90	0.945
normed fit index (NFI)	≥0.90	0.924
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.932
incremental fit index (IFI)	≥0.90	0.945

In the second part of this chapter, the indicators of each variable are evaluated.

5.2 Analysis of Population and Density of Andisheh new town

To analyze the population and density of the case study, objective measures from demographic characteristics and census data, moreover, subjective measures extracted from the questionnaires are used. In this part, descriptive analysis is applied to study indicators of population, which are descriptive statistics. The GIS method is taken to link objective information with subjective indicators by linking the residential locations of survey respondents. SPSS analysis and the structural equation model (SEM) through AMOS are used to assess the relationship between objective and subjective indicators. This part aims to study the relationship between objective density, subjective overcrowding, and satisfaction with overcrowding.

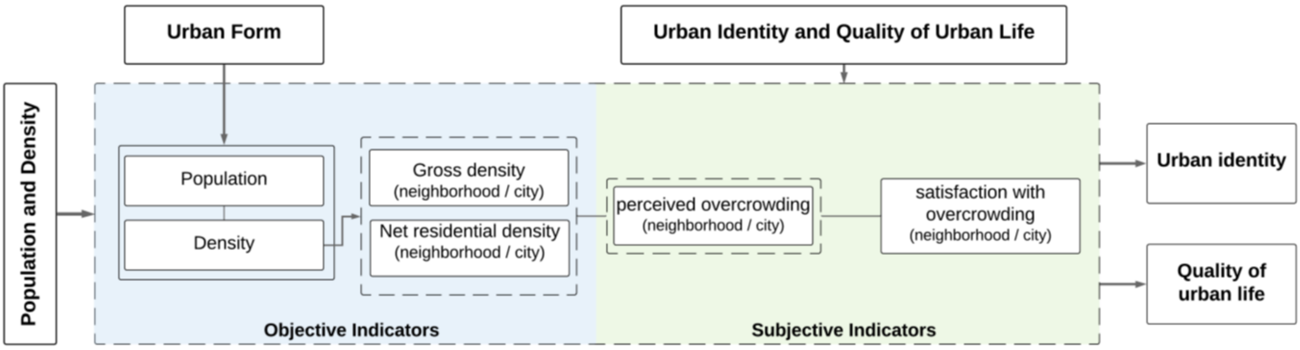


Figure 5.2.1. Structural model of indicators of population and density in this research – source: researcher

As it can be seen in table 5.2.1, the objective indicators that are used to assess population and density in Andisheh new town are population size, household size, population structure, population density, gross density (city, quarter, neighborhood), and net residential density (city, quarter, neighborhood); the subjective indicators are perceived overcrowding (city, neighborhood) and satisfaction with overcrowding (city, neighborhood).

Table 5.2.1. Indicators of population and density in this research – source: researcher

	Measure	indicator	description	source
Objective	**Population**	Population size	Number of inhabitants of the whole city	Statistical Center of Iran (2012, 2017)
		Population structure	Number of inhabitants according to their age and gender	Statistical Center of Iran (2012)
		Household size	Number of households of the whole city	Statistical Center of Iran (2012)
		Population density	The ratio of persons to the specific area	Statistical Center of Iran (2017)
	Density	Gross density (City)	The ratio of persons, households, or dwelling units to the entire area of the city regardless of land use	Statistical Center of Iran (2017)

		Gross density (Quarter)	The ratio of persons, households, or dwelling units to the entire area of the quarter regardless of land use	Andisheh New Town Development Company (2017)
		Gross density (Neighborhood)	Number of persons, households, or dwelling units per hectare of the total neighborhood area.	
		Net residential Density (City)	Number of persons, households, or dwelling per hectare of the total land area devoted to residential land use within the city.	
		Net residential Density (Quarter)	The number of persons, households, or dwelling per hectare of the total land area devoted to residential land use within the quarter.	
		Net residential Density (Neighborhood)	The number of persons, households, or dwelling per hectare of the total land area devoted to residential land use.	
Subjective	**Overcrowding**	Perceived overcrowding	how residents perceive overcrowding	residents of Andisheh new town, through questionnaire Field survey (2017)
		Satisfaction with overcrowding	how satisfied are residents with the overcrowding	residents of Andisheh new town, through questionnaire Field survey (2017)

Population Size of Andisheh New Town

In this research, the population of Andisheh new town is determined from the latest census of the population of Andisheh new town by Statistical Center of Iran in 2017 that is collected by the researcher from Municipality of Andisheh new town (2017), and with more details from Statistical Center of Iran (2019). This statistic presents that Andisheh new town has 116062 residents who live in five quarters of this new town.

This statistical data includes the number of population of each statistical block in its attribute table in GIS and population structure based on age and gender in Excel. So it limits calculating population structure in GIS. The following table represents the population of quarters of Andisheh new town in 2012 and 2017 in Andisheh new town and its quarters (Phases).

Table 5.2.2. The population of Andisheh new town – source: Statistical Center of Iran (2012)

	year	**quarters**					**city**	**source**
		Phase 2	**Phase 3**	**Phase 4**	**Phase 5**	**Phase 6**	**Andisheh new town**	
population	**2012**	13778	35897	29153	6557	0	85731[8]	Statistical Center of Iran
	2017	20019	43441	38113	12999	1490	116062	Statistical Center of Iran

[8] . There was a doubt on considering Phase 2 as a quarter of Andisheh new town before 2017. But as it is considered as new town, the population of this Phase is calculated.

It is notable that statistical information represents that Phase 3 is the most populated quarter in 2012 and 2017. After that, Phase 4 has the highest population in 2012 and 2017. The point that should be considered is the population of Phase 6 is increased from 0 to 1490 residents that are 1.28 percent of the population of Andisheh new town. By comparing the population of Andisheh new town in 2012 and 2017, an increase of 35.38 percent is observed during these five years. It is stated in the comprehensive plan of Andisheh new town (1995), that the predicted population in 2016 is 100,000 people; therefore, the current population of Andisheh new town shows this city achieved this goal. The table below – table 5.2.3 - represents the expected population in Andisheh new town in the comprehensive plan.

Table 5.2.3. The predicted population of Andisheh – source: comprehensive plan of Andisheh new town (1995)

	short-term plan 1991 - 1996	medium-term plan 1991 - 2006	long-term plan 1991 - 2016
predicted population	**25,000**	**60,000**	**100,000**

Population Structure of Andisheh New Town

The data of the population structure of Andisheh new town in 2017 is achieved in 2019; to have an overall view of demographic structure, statistical data in 2012 is also used in this part. Population structure is divided into two categories of age and gender. The following table - Table 5.2.4 - represents population structure based on the age of residents of Andisheh new town and the figures 5.2.2 and 5.2.3 illustrate it on the chart.

Table 5.2.4. Population structure of Andisheh new town based on the age - source: Municipality of Andisheh new town (2012); Statistical Center of Iran (2019)

	Age / Year		up to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59	60 to 64	more than 65	Whole population
Number of people	**2012**		526	5893	7179	7898	10458	**11344**	9215	7417	8279	7607	639	4090	2094	3092	**85731**
	2017	M	3873	3940	3968	3983	4185	5770	**6258**	5437	4320	4363	4152	3510	2412	2546	**58717**
		F	3697	3789	3644	3863	4290	5853	**6993**	5645	4372	4535	3909	2845	1681	2229	**57345**
		Sum	7570	7729	7612	7846	8475	11623	**13251**	11082	8692	8898	8061	6355	4093	4775	**116062**

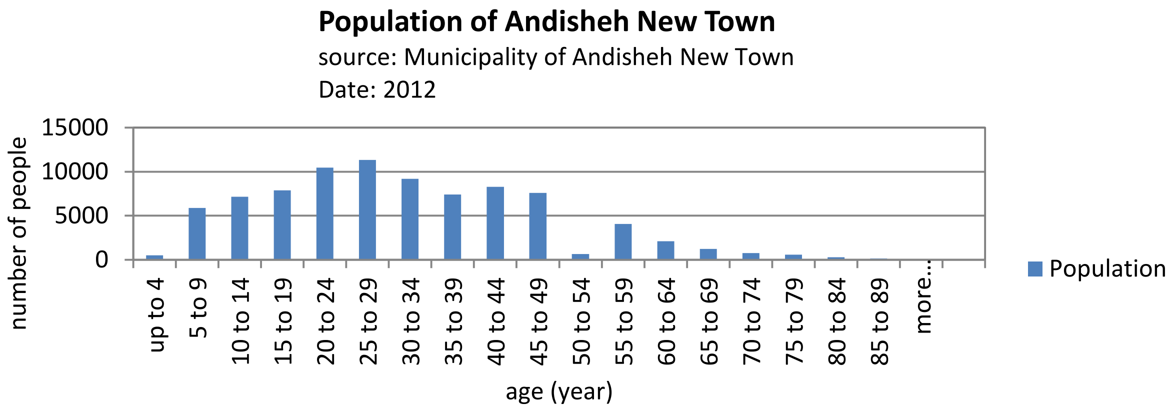


Figure 5.2.2. Population structure of Andisheh new town based on the age - source: Municipality of Andisheh new town (2012)

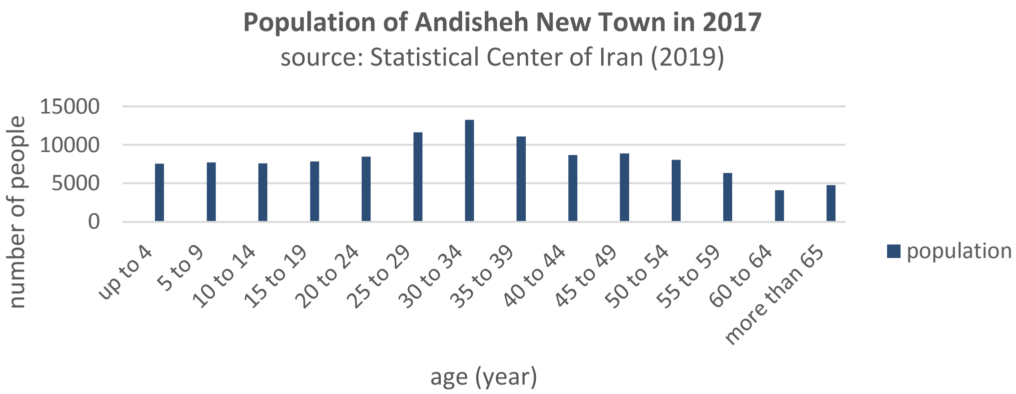


Figure 5.2.3. Population structure of Andisheh new town based on the age and gender - source: Statistical Center of Iran (2019)

Statistical data from the Statistical Center of Iran in 2012 represents most of the residents of Andisheh new town are young people between 20 to 34 years old and statistical data of 2017 indicates the most of the residents are between 30 to 34 years. It is stated in the comprehensive plan of this city, one of the main goals of forming Andisheh new town is to attract young people who are looking for affordable housing near the metropolises of Tehran and Karaj.

Additionally, through the questionnaires filled out by residents of Andisheh new town, the age of them is asked as general information of respondents. The age in the questionnaire was categorized into five ranges. Table 5.2.5, which is prepared using SPSS, shows that the range of 26 to 40 years of respondents is the most population of this sampling, therefore of the city.

Table 5.2.5. Age of respondents of the questionnaire using SPSS – source: field survey (2017)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid (age)	< 16	6	1.5	1.5	1.5
	17 - 25	106	25.7	26.0	27.5
	26 – 40	196	47.5	48.2	75.7
	41 – 64	97	23.5	23.8	99.5
	> 65	2	0.5	0.5	100.0
	Total	407	98.5	100.0	
Missing	System	6	1.5		
Total		413	100.0		

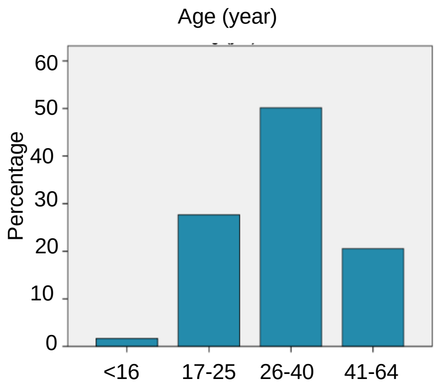


Figure 5.2.4. Age of respondents of the questionnaire (field survey, 2017)

The next category of population structure is gender. According to the statistical data of Andisheh new town (2012), the ratio of females to males in this city is 42072 to 43659, which means 49.07 percent of the population of this city are women (female) and 50.93 percent are men (male). Population structure based on the gender in each quarter is presented in table 5.2.6. The statistical data of 2017 shows that the number of women (female) is 57345 and the number of men (male) is 58717 in this year, figure 5.2.6.

Table 5.2.6. Population structure of Andisheh based on the gender - source: Statistical Center of Iran (2012)

population structure of Andisheh new town			
	female	**male**	**population**
Phase 2	6778	7010	13788
Phase 3	17682	18395	36077
Phase 4	14419	14872	29291
Phase 5	3193	3382	6575
Phase 6	0	0	0
Andisheh new town	**42072**	**43659**	**85731**

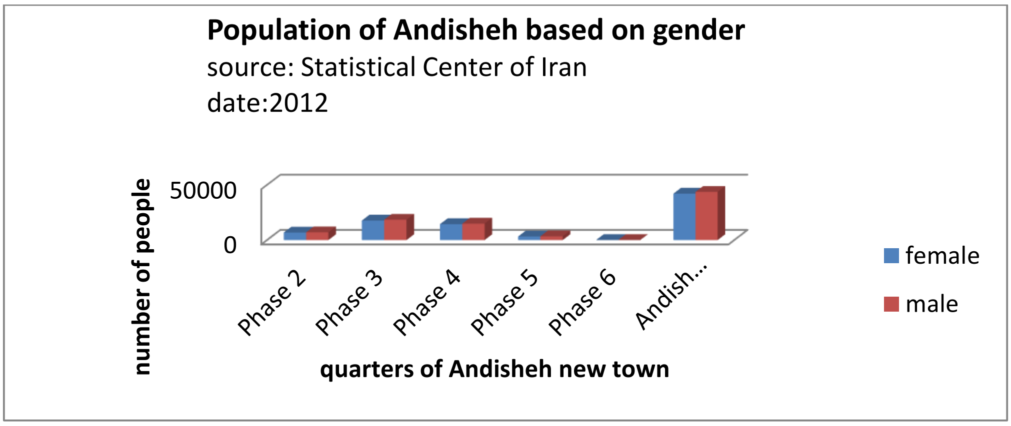


Figure 5.2.5. Population structure of Andisheh new town based on the gender - source: Statistical Center of Iran (2012)

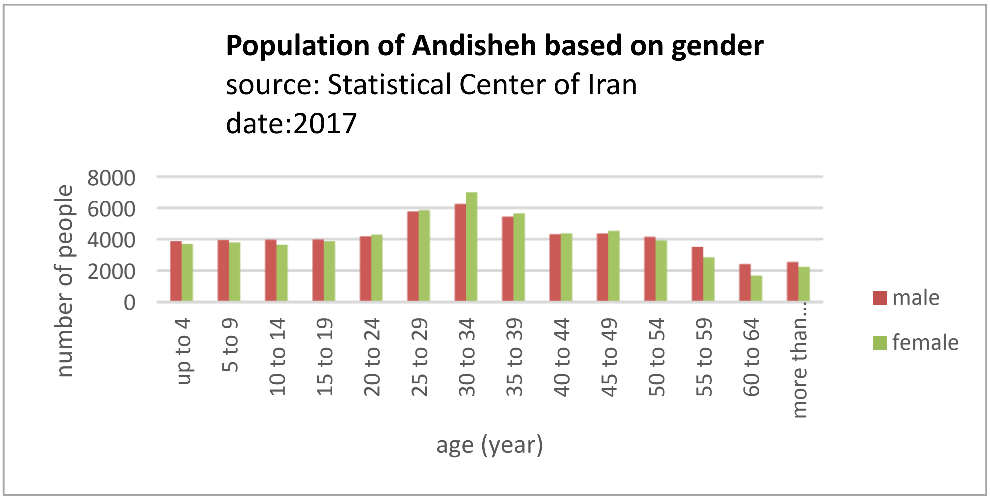


Figure 5.2.6. Population structure of Andisheh new town based on the gender - source: Statistical Center of Iran (2017)

Moreover, this indicator is also asked in the questionnaires as the general information of respondents. 47.40 percent of respondents of the questionnaire were female and 49.60 percent of them were male. It indicates that there is a similarity between sampling and statistical data. The following table represents the gender of respondents:

Table 5.2.7. Age of respondents of the questionnaire using SPSS – source: field survey (2017)

		Frequency	Percent	Valid Percent	Cumulative percent
gender	**female**	196	47.4	48.6	48.6
	male	205	49.6	50.9	99.5
	Total	401	97.1	100.0	100.0
Missing	System	12	2.9		
Total		413	100.0		

Household Size of Andisheh New Town

The amount of households of Andisheh new town based on the statistical census in 2012 is 24099 and in 2017 it is 35572. It means the average size of each household in this city is in 2012 is 3.56 and in 2017 is 3.26. Considering the population of each quarter and the household number in that quarter, household size is calculated (based on statistical data of 2012). The household size in Phase 2, 3, and 4 are is between 3 and 4, but this size is changed in Phase 5 to 4.63. Table 5.2.8 shows the household number and household size of each quarter of Andisheh new town.

The indicator of household size plays a significant role in planning, while it is one the most important indicators to find out the deficiency of housing, estimating needs of housing, and planning housing for future residents; furthermore, this indicator is used for evaluating other indicators related with housing (Doyran, 2011).

Table 5.2.8. Household number and household size of each quarter of Andisheh new town- source: Statistical Center of Iran (2012)

	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Andisheh new town
Household number	4056	9966	8715	1362	0	24099
Household size	3.40	3.62	3.36	4.63	0	3.56

Population Density of Andisheh New Town

Population density is defined as the ratio of persons to a specific area. In this research specific area is the whole city, its quarters, and neighborhoods are considered to assess density. Therefore, it is divided into population density in the city, quarters (Phase 2, 3, 4, 5, and 6), and neighborhoods. At each urban level, two types of gross and net density are measured. The analysis of population density is explained in the next part; the density of Andisheh new town.

Density of Andisheh New Town

To calculate density the area of each urban scale and its population are needed. The population of Andisheh new town was on the layer that includes blocks of Statistical Center of Iran, so spatial join tool that is one of the overlay tools of ArcMap 10.2 is used to join attributes from statistical blocks to the layer of parcels of Andisheh new town including names of quarters and neighborhoods. In the next step, the dissolve tool is applied to the aggregate area of each quarter and neighborhood based on the population.

Net residential density is based on the residential land-use area, therefore through ArcGIS, residential land use is exported from the layer of parcel to calculate the whole residential area of each quarter and neighborhood, and then it is joined to the layer including population to estimate residential density.

It should be mentioned that the area of each neighborhood and quarter used to calculate density includes outdoor space but excludes streets and footpaths based on

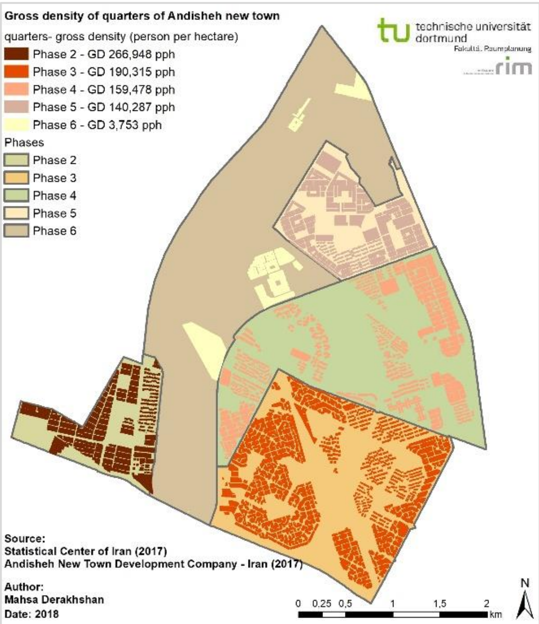


Figure 5.2.7. Gross density of quarters of Andisheh new town

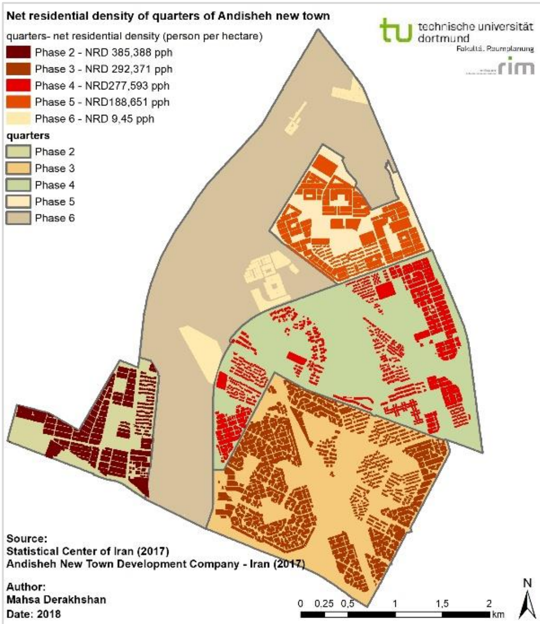


Figure 5.2.8. Net residential density of quarters of Andisheh new town

the definition. Moreover, to see how its density differs, the area of the whole city and whole quarters including roads are also calculated.

Table 5.2.9. Calculated gross and net density in quarters and the whole city of Andisheh new town using ArcGIS

	Types of density	Quarters					City
		Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Andisheh new town
Density Person per hectare	Gross density excludes streets and footpaths	266.948	190.315	159.478	140.287	3.753	112.467
	Gross density includes streets and footpaths	170.958	118.055	105.060	95.933	2.967	78.129
	Net residential density excludes streets and footpaths	385.388	292.37	277.593	188.651	9.450	205.639
Data source: 2017							

Table 5.2.9 and Figure 5.2.7 and Figure 5.2.8, show that Phase 2 of Andisheh new town has the most amount of both gross and net density, and Phase 6 has the lowest amount of density. It is notable that density in quarters is related to the time of their formation. The longer the quarters are constructed, the more density they have. Obviously, the most important reason is related to the population. People prefer to

settle down in first built quarters rather than newer, because of the better facilities and services in them.

The following maps illustrate the density of neighborhoods in each quarter. Maps of gross density are presented on the left and maps of net density are shown on the right. It should be noted that because the neighborhoods of Andisheh new town were not specified on shapefiles of ArcGIS, therefore using AutoCAD map and analog maps got from Andisheh New Town Development Company and Municipality of Andisheh new town, neighborhoods are determined in ArcGIS by the researcher.

As it is presented in Figure 5.2.9 and Figure 5.2.10, the grossest density and net density is in Phase 2, and after that in Phase 3. Phase 6 has less amount of density

The following maps represent the classification of neighborhood density in each

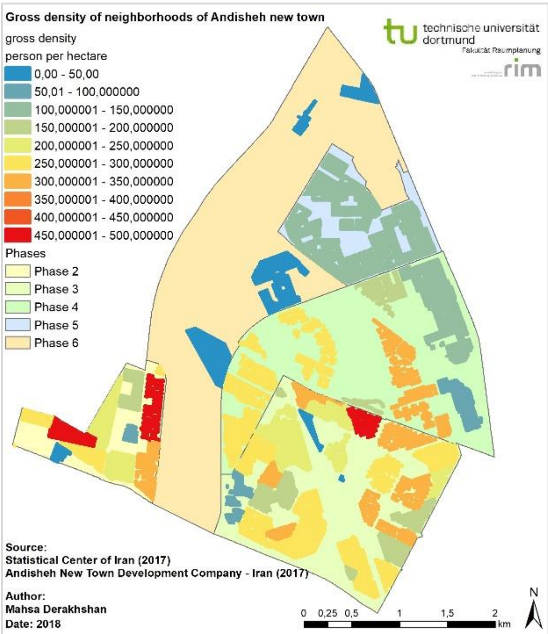


Figure 5.2.9. Gross density of neighborhoods of Andisheh new town

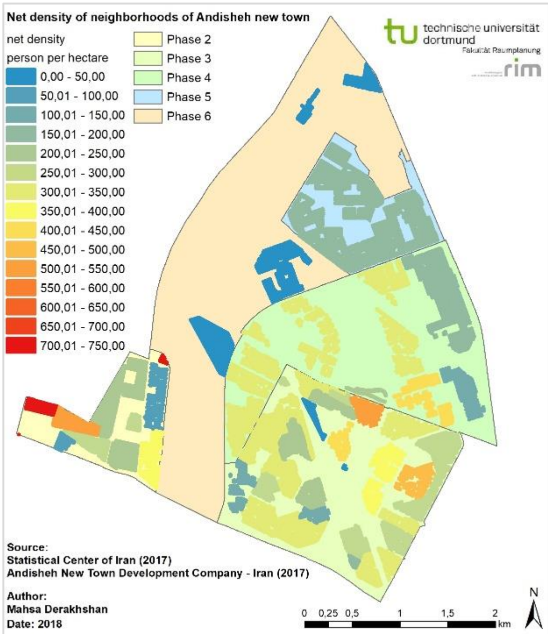


Figure 5.2.10. Net density of neighborhoods of Andisheh new town

quarter. To make the comparison of maps possible, the range and color of classification are unique in all maps.

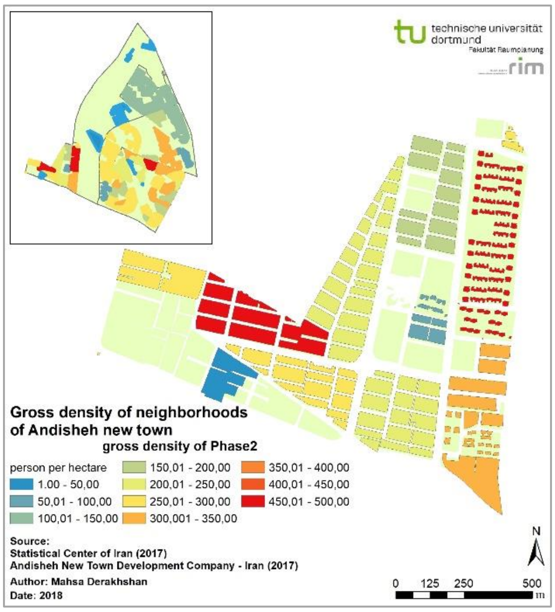


Figure 5.2.11.Gross density of neighborhoods,Phase 2

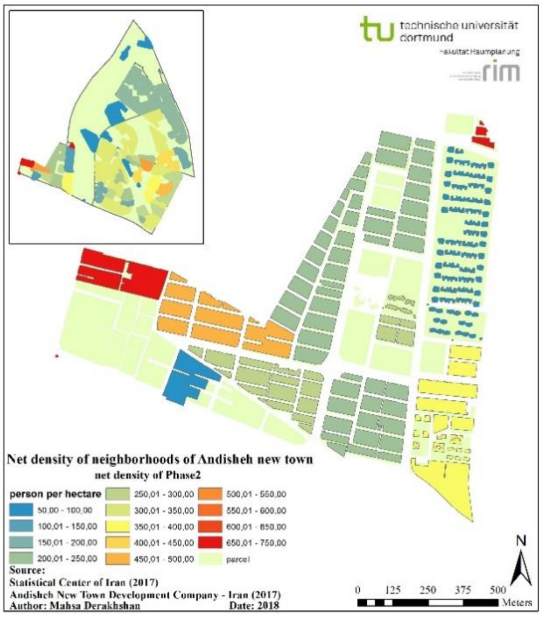


Figure 5.2.12. Net density of neighborhoods, Phase 2

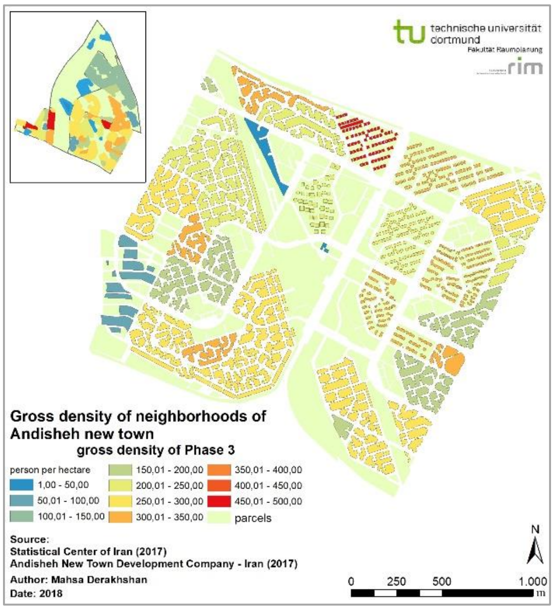


Figure 5.2.13. Gross density of neighborhoods, Phase3

Figure 5.2.14. Net density of neighborhoods, Phase3

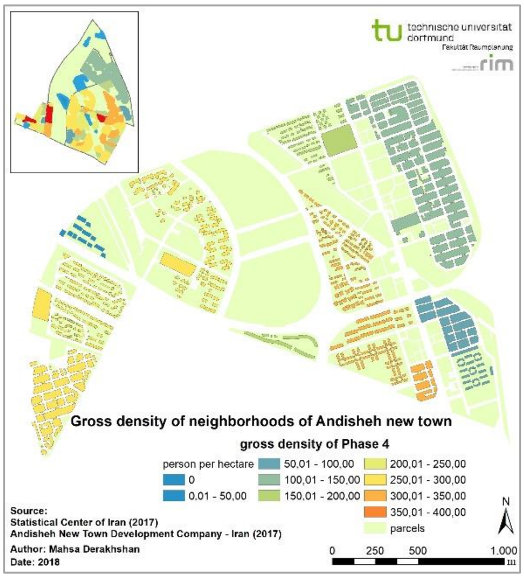


Figure 5.2.15. Gross density of neighborhoods, Phase4

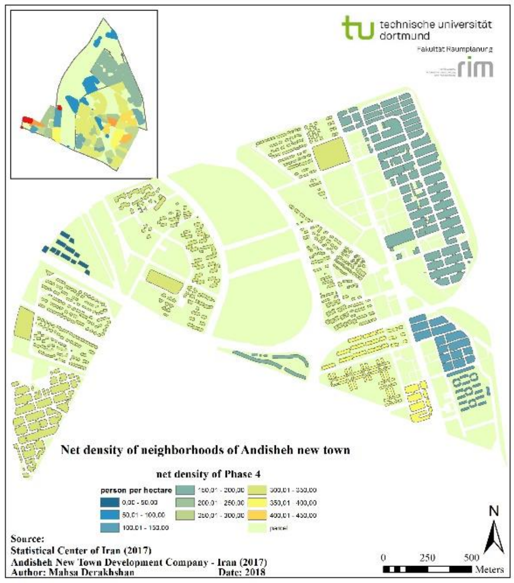


Figure 5.2.16. Net density of neighborhoods, Phase4

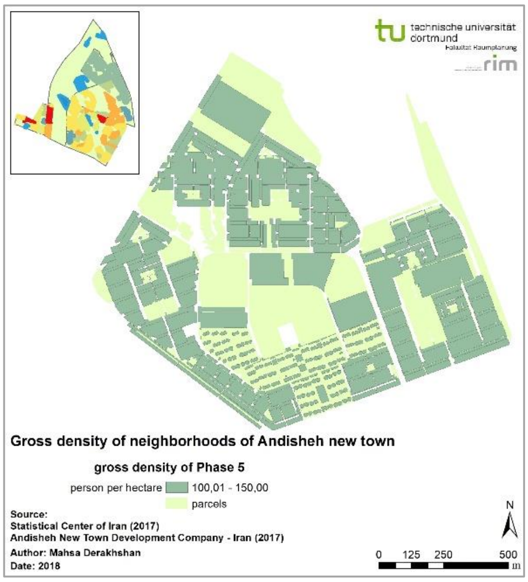


Figure 5.2.17. Gross density of neighborhoods, Phase5

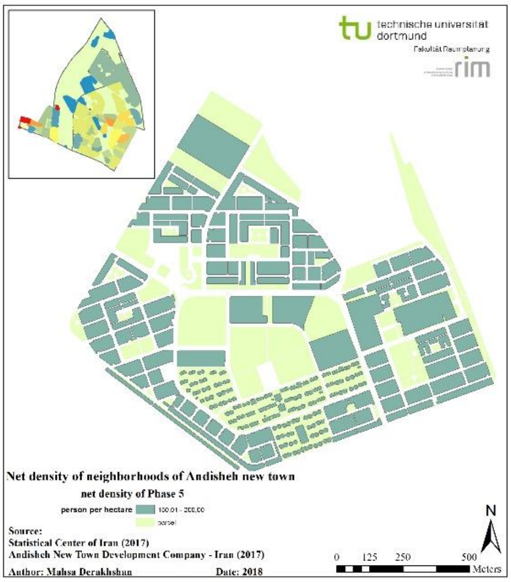


Figure 5.2.18. Net density of neighborhoods, Phase5

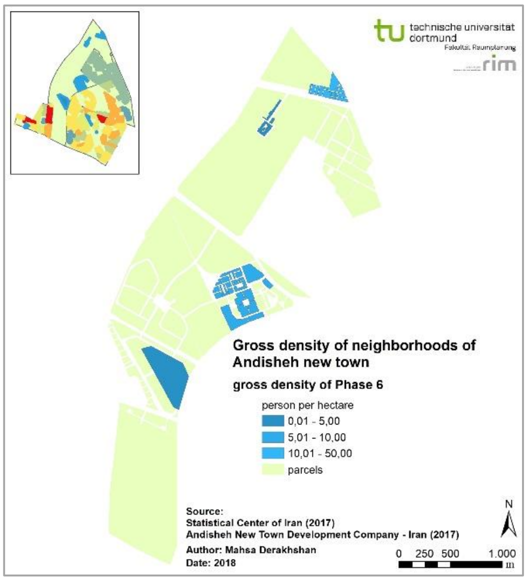


Figure 5.2.19. Gross density of neighborhoods, Phase6

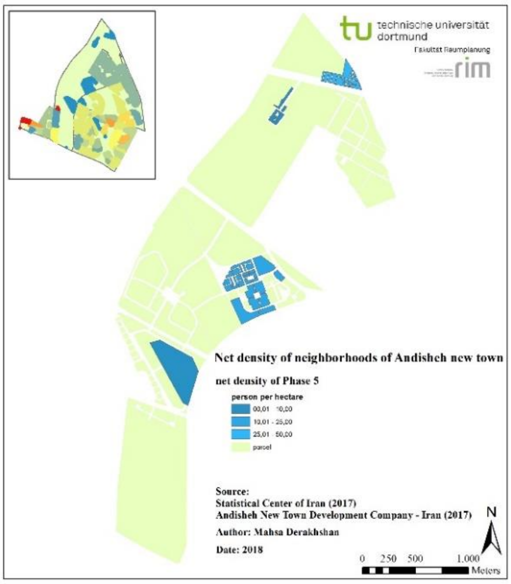


Figure 5.2.20. Net density of neighborhoods, Phase 6

Perceived Overcrowding

The sense and feeling of residents about the population and crowding around them is a perceived population. This feeling affects the satisfaction of residents with the surrounding environment as well as the sense of identity. It seems that higher objective density predicts higher subjective overcrowding that affects the quality of urban life and urban identity, this hypothesis is evaluated in this research in part 5.1 and chapter 6.

Through the questionnaire, respondents are asked to express how they perceive the population in their neighborhoods and Andisheh new town. The results are shown in the

Table 5.2.10 and Table 5.2.11, prepared using SPSS.

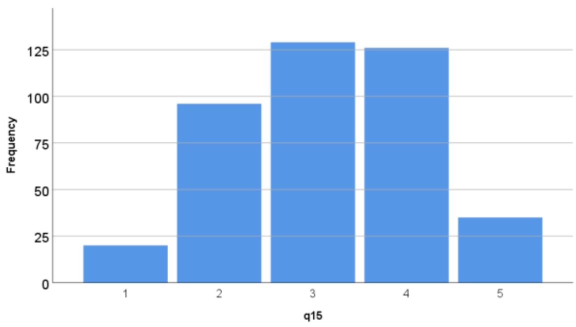


Figure 5.2.21. Perceived density in the neighborhood by residents (2017)

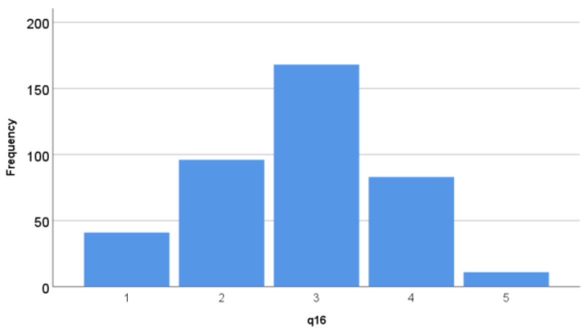


Figure 5.2.22. Perceived density in Andisheh new town by residents (2017)

Table 5.2.10. Perception of overcrowding of neighborhood by respondents of the questionnaire – source: researcher, field survey (2017)

perception of density in the neighborhood					
q15		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	20	4.8	4.9	4.9
	high	96	23.2	23.6	28.6
	Neither high nor low	129	31.23	31.8	60.3
	low	126	30.5	31.0	91.4
	very low	35	8.5	8.6	100.0
	Total	406	98.3	100.0	
Missing	System	7	1.7		
Total		413	100.0		

Table 5.2.11. Perception of overcrowding of Andisheh new town by respondents of the questionnaire – source: researcher, field survey (2017)

perception of density in Andisheh new town					
q16		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very high	41	9.9	10.3	10.3
	high	96	23.2	24.1	34.3

	Neither high nor low	168	40.7	42.1	76.4
	low	83	20.1	20.8	97.2
	very low	11	2.7	2.8	100.0
	Total	399	96.6	100.0	
Missing	System	14	3.4		
Total		413	100.0		

Considering the responses of residents of Andisheh new town, most of them perceive overcrowding of Andisheh and their neighborhoods as neither high nor low. Afterward, 30.50 percent of respondents feel their neighborhoods have low density, and 23.2 percent perceive the density of Andisheh new town as high.

Considering the location of respondents, perceived overcrowding of their neighborhood is analyzed using ArcGIS and presented in Table 5.2.12 and perceived overcrowding of the whole city is shown in Table 5.2.13. To describe the table Table 5.2.12, an example could be that through the respondents live in Phase 2, 46.03% of them think the density of their neighborhood is high, 26.98% perceive it low, 20.63% feel it neither high nor low, and 3.17% of them select very high and very low. Most of the respondents who live in Phase 2 (46.03%), perceive the density of their neighborhood as high, Phase 3 (34.21%), Phase 4 (39.84), perceive the density of their neighborhood as neither high nor low, Phase 5 (55.74%), and Phase 6 (71.43%) perceive the density of their neighborhood as low.

Table 5.2.12. The perceived density of neighborhood based on the location of respondents through ArcMap– source: researcher, field survey (2017)

perceived density of neighborhood based on the location of respondents										
	Phase 2		**Phase 3**		**Phase 4**		**Phase 5**		**Phase 6**	
q15	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
very high	2	3.17	14	9.21	4	3.25	0	0.00	0	0.00
high	29	46.03	41	26.97	25	20.33	1	1.64	0	0.00
neither high nor low	13	20.63	52	34.21	49	39.84	15	24.59	0	0.00
low	17	26.98	32	21.05	38	30.89	34	55.74	5	71.43
very low	2	3.17	13	8.55	7	5.69	11	18.03	2	28.57
total	63	100.00	152	100.00	123	100.00	61	100.00	7	100.00

As it is presented in Figure 5.2.9 that shows the map of the gross density of neighborhoods of Andisheh new Town and Figure 5.2.11, which represents the map of the gross density of neighborhoods of Phase2, the gross density in neighborhoods of Phase2 is higher than other phases, as the results of questionnaires show the residents of Phase2, perceived density high in their neighborhoods.

Table 5.2.13. The perceived density of Andisheh new town based on the location of respondents through ArcMap – source: researcher, field survey (2017)

the perceived density of the whole city based on the location of respondents										
	Phase 2		Phase 3		Phase 4		Phase 5		Phase 6	
q16	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
very high	11	17.46	21	14.19	8	6.67	1	1.64	0	0.00
high	21	33.33	40	27.03	29	24.17	5	8.20	1	14.29
neither high nor low	14	22.22	66	44.59	59	49.17	27	44.26	2	28.57
low	17	26.98	17	11.49	21	17.50	25	40.98	3	42.86
very low	0	0.00	4	2.70	3	2.50	3	4.92	1	14.29
total	63	100.00	148	100.00	120	100.00	61	100.00	7	100.00

Table 5.2.13 shows that most of the residents of the quarters such as 44.59% of residents of Phase3, 49.17% of residents of Phase4, and 44.26% of residents of Phase5, perceive the overcrowding of Andisheh new town neither high nor low. 33.33% of residents of Phase2, perceive the overcrowding of the whole city high and 42.86% of residents of Phase6 perceive the overcrowding of the whole city low.

Satisfaction with Overcrowding

The respondents of questionnaires are asked about their satisfaction with the population of their neighborhoods and Andisheh; their answers are analyzed through SPSS and represented in the following tables - Table 5.2.14 and Table 5.2.15:

Table 5.2.14. Satisfaction with population and overcrowding of neighborhood– source: researcher, field survey (2017)

satisfaction with overcrowding of neighborhood					
q61		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very satisfied	42	10.2	10.5	10.5
	satisfied	187	45.3	46.8	57.3
	Neither satisfied nor dissatisfied	104	25.2	26.0	83.3
	dissatisfied	46	11.1	11.5	94.8
	very dissatisfied	21	5.1	5.3	100.0
	Total	400	96.9	100.0	
Missing	System	13	3.1		
Total		413	100.0		

Table 5.2.15. Satisfaction with the population and overcrowding of Andisheh new town– source: researcher, field survey (2017)

satisfaction with overcrowding of Andisheh new town					
q62		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very satisfied	27	6.5	6.8	6.8
	satisfied	164	39.7	41.5	48.4
	Neither satisfied nor dissatisfied	139	33.7	35.2	83.5
	dissatisfied	44	10.7	11.1	94.7
	very dissatisfied	21	5.1	5.3	100.0
	Total	395	95.6	100.0	
Missing	System	18	4.4		
Total		413	100.0		

Most of the residents of Andisheh are satisfied with the overcrowding of Andisheh new town as well as their neighborhoods. In sequence, 39.7% and 45.3% of respondents are satisfied with the population and overcrowding of Andisheh and their neighborhoods.

Considering the addresses of the residents, the level of their satisfaction with the population and crowded is analyzed through GIS. As it can be seen in the following tables - Table 5.2.16 and Table 5.2.17, frequency shows the number of respondents who selected various values in each phase. Table 5.2.16 is classified based on the phases and indicates what percentage of value is selected in each phase. Through this calculation, it can be understood that most people who are living in Phase 2 (67.74% of respondents), Phase 3 (45.64%), Phase 4 (39.34%), Phase 5 (41.67%), and Phase 6 (57.14%) are satisfied with the overcrowding of their neighborhoods. In addition, most of the respondents of Phase 2, 3, and 6 are satisfied with the overcrowding of the whole city.

Table 5.2.16. Satisfaction with overcrowding of neighborhood based on the locations of respondents through ArcMap – source: researcher, field survey (2017)

Satisfaction with overcrowding of neighborhood based on the location of respondents										
	Phase 2		**Phase 3**		**Phase 4**		**Phase 5**		**Phase 6**	
q61	Frequency	Percent – based on Phase	Frequency	Percent – based on Phase	Frequency	Percent – based on Phase	Frequency	Percent – based on Phase	Frequency	Percent – based on Phase
very satisfied	5	8.06	18	12.08	14	11.48	5	8.33	0	0.00
satisfied	42	67.74	68	45.64	48	39.34	25	41.67	4	57.14
neither satisfied nor dissatisfied	7	11.29	42	28.19	39	31.97	14	23.33	2	28.57

dissatisfied	6	9.68	13	8.72	15	12.30	11	18.33	1	14.29
very dissatisfied	2	3.23	8	5.37	6	4.92	5	8.33	0	0.00
total	62	100.00	149	100.00	122	100.00	60	100.00	7	100.00

Table 5.2.17. Satisfaction with overcrowding of Andisheh based on the location of respondents through ArcMap – source: researcher, field survey (2017)

Satisfaction with overcrowding of city based on the location of respondents										
	Phase 2		**Phase 3**		**Phase 4**		**Phase 5**		**Phase 6**	
q62	Frequency	Percent – based on Phase	Frequency	Percent – based on Phase	Frequency	Percent – based on Phase	Frequency	Percent – based on Phase	Frequency	Percent – based on Phase
very satisfied	4	6.56	9	6.21	8	6.56	6	10.00	0	0.00
satisfied	40	65.57	59	40.69	43	35.25	18	30.00	4	57.14
neither satisfied nor dissatisfied	11	18.03	50	34.48	54	44.26	22	36.67	2	28.57
dissatisfied	4	6.56	17	11.72	13	10.66	10	16.67	0	0.00
very dissatisfied	2	3.28	10	6.90	4	3.28	4	6.67	1	14.29
total	61	100.00	145	100.00	122	100.00	60	100.00	7	100.00

Therefore, based on the calculation and analysis have done on the questionnaires through SPSS and GIS, it can be pointed that most of the residents of different phases of Andisheh new town are satisfied (or neither satisfied nor dissatisfied) with the population and crowded of their neighborhoods.

Analyzing the relationships between Objective Density and Subjective overcrowding

To answer the first hypothesis (H1) that is "higher objective measures of density predicts higher subjective measures of overcrowding and lower satisfaction with overcrowding", Structural Equation Model (SEM) is applied to evaluate the relation between objective indicators of density that are gross density and net residential density in two scales of neighborhood and city and subjective indicators of overcrowding that are perceived overcrowding and satisfaction with overcrowding in a scale of neighborhood and city. The objective indicators calculated through ArcGIS and geocoded subjective information from the questionnaire in ArcGIS are used in this model. The attribute table of the geocoded data in ArcGIS is converted to Excel using the tools of the Arc Toolbox. Amos (version 24) is applied to achieve SEM to figure out the correlation between indicators. SEM used 4 manifest subjective variables derived from the field survey to measure 2 latent subjective variables (subjective overcrowding and satisfaction with overcrowding), and 2 manifest objective variables to measure 1 objective variable (objective density).

To study the hypothesis and to find out the correlation two hypotheses are defined:

- H_0: there is no correlation between objective density and subjective overcrowding.
- H_1: there is a correlation between objective density and subjective overcrowding.

Table 5.2.18. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
objective density → perceived overcrowding	-0.13	-2.431	0.015	decreasing

Considering the t-value that should be more than 1.96 or less than -1.96 and it is -2.431, the p-value, which should be less than 0.05 to be significant and it is 0.276, it can be concluded that the H_0 is rejected. Therefore, there is negative correlation between objective density and subjective overcrowding (perceived overcrowding). the result can be interpreted as: If objective density increases by 1 standard deviation, perceived density decreases by 0.13 standard deviation on average.

to examine the second part of the hypothesis, two hypotheses are defined:

- H_0: there is no correlation between objective density and satisfaction with overcrowding.
- H_1: there is a correlation between objective density and satisfaction with overcrowding.

Table 5.2.19. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
objective density → satisfaction with overcrowding	-0.53	-9.367	0.00	decreasing

According to the t-value, which should be more than 1.96 or less than -1.96, and p-value, it can be concluded that the H_0 is rejected. Therefore, there is a correlation between objective density and satisfaction with overcrowding. The negative path coefficient indicates a negative correlation between these two indicators. Therefore, if objective density increases by 1 standard deviation, satisfaction with overcrowding also decreased by 0.53 standard deviation on average.

Table 5.2.20. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
subjective density ⟶ satisfaction with overcrowding	0.08	1.144	0.253	No correlation

Considering the t-value that should be more than 1.96 and it is 1.144, the p-value, which should be less than 0.05 to be significant and it is 0.253, it can be concluded that the H_0 is not rejected. Therefore, there is not any correlation between subjective density and satisfaction with overcrowding.

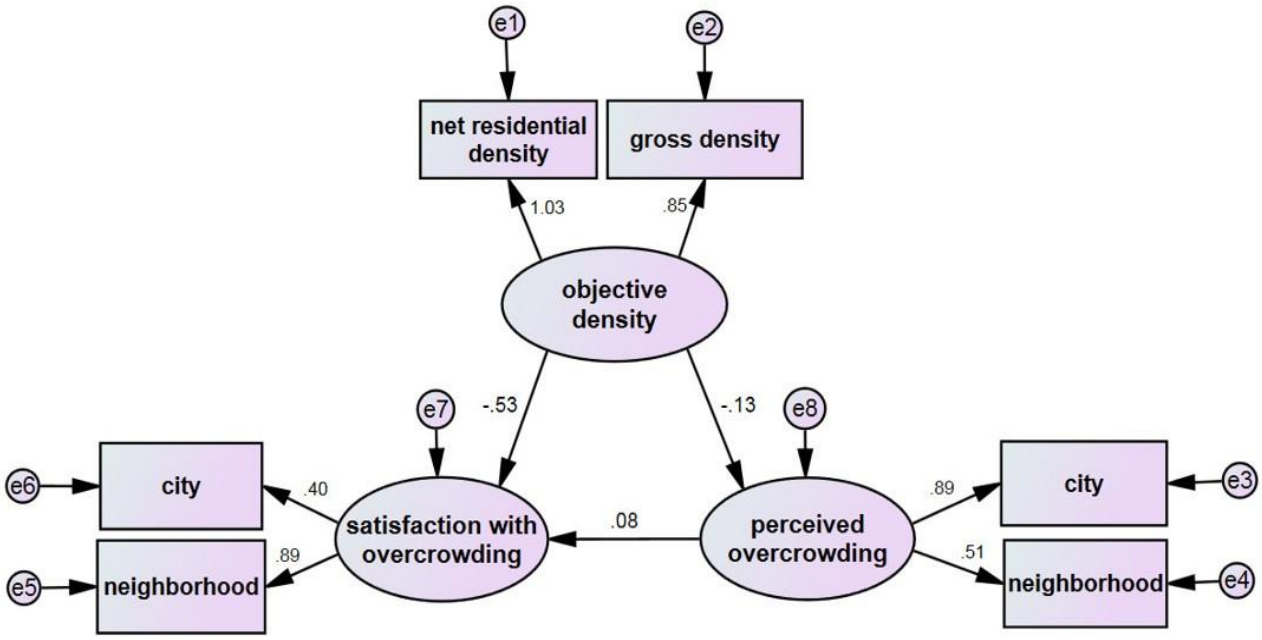


Figure 5.2.23. Structural Equation Modelling: path analysis model to investigate the relationship between objective density, subjective overcrowding, and satisfaction with overcrowding

In the above model, the root means square error of approximation (RMSEA) is 0.00, and the chi-squared test (X^2/ df) is 0.989. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.995, adjusted goodness of fit index (AGFI) is 0.983, comparative fit index (CFI) is 1.00, normed fit index (NFI) is 0.993, non-normed fit index or Tucker-Lewis index is 1.00, and incremental fit index is 1.00, these values of indices indicate the good fit of the model.

Table 5.2.21. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	*Appropriate limit of statistic*	*Reported value*
root mean square error of approximation (RMSEA)	≤0.08	0.00
chi-squared test (x^2 / df)	< 3	0.989
goodness of fit index (GFI)	≥0.90	0.995
adjusted goodness of fit index (AGFI)	≥0.90	0.983
comparative fit index (CFI)	≥0.90	1.00
normed fit index (NFI)	≥0.90	0.993
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	1.00
incremental fit index (IFI)	≥0.90	1.00

5.3 Analysis of Housing Types and Characteristics in Andisheh new town

The analyses of housing in Andisheh new town are conducted using objective and subjective measures based on geo-database of the case study and data derived from field survey. In this part, GIS analysis and descriptive analysis are applied

The measurements and indicators applied to analyze the housing and building types and characteristics based on the theoretical part, field survey, and geo-database are presented in the table below (table 5.3.1).

In this part, descriptive analysis is applied to study indicators of population, which are descriptive statistics. GIS methodology is taken to link objective information with subjective indicators by linking the residential locations of survey respondents. SPSS analysis and the structural equation model (SEM) are used to assess the relationship between objective and subjective indicators.

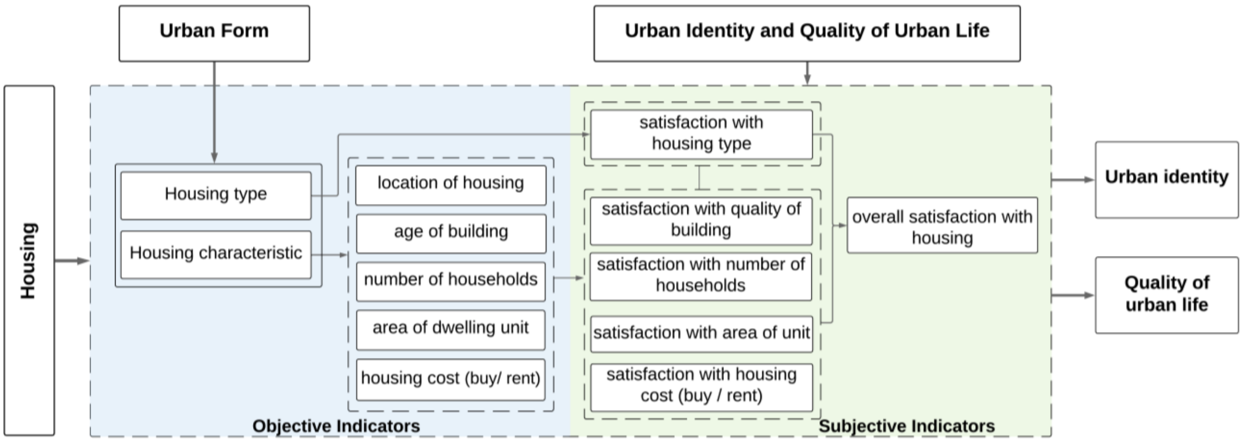


Figure 5.3.1. Structural model of indicators of housing in this research – source: researcher

The main goals of this part are to find the relationship between objective measures of housing and satisfaction with housing (subjective housing), as well as, the relationship between density, overcrowding, and housing cost.

Table 5.3.1. Indicators of housing type and characteristics in this research – source: researcher

	measures	indicator	description
housing	Housing type	- detached – terraced housing - flat/ apartments with four floors - flat/ apartment more than four floors	- low-density housing* - middle-density housing - high-density housing *based on the definition of the comprehensive plan of Andisheh new town (1995)
	Housing characteristics	characteristics of individual dwellings	- age of the building - number of households in building - area of dwelling unit - price of buying the dwelling unit

5.3.1 Housing Type

Three types of housing in Andisheh new town are determined in the Comprehensive Plan and Master Plan of this city including detached – terraced houses defined as low density, four-floor apartments defined as middle density, and more than four floors (four to eight floor) apartments defined as high density (Figure 5.3.2). Although the

Figure 5.3.2. Photos of three types of housing of Andisheh new town - source: author (2016)

types of housing are specified in the geo-database, the respondents of questionnaires have also been asked to mention the type of housing they are living in.

Housing type in Phase 2 of Andisheh new town

A largely residential area in Phase 2, dominated by detached and semi-detached houses with one or two floors. The apartments with middle density (four-floor apartments) exist in one neighborhood (5th neighborhood) of this quarter. There is not any high-density housing that defines in the comprehensive plan as an apartment with more than four floors.

The following Map (figure 5.3.3) shows the housing type of Phase 2 and Figure 5.3.4 presents some photos of housing types in this quarter.

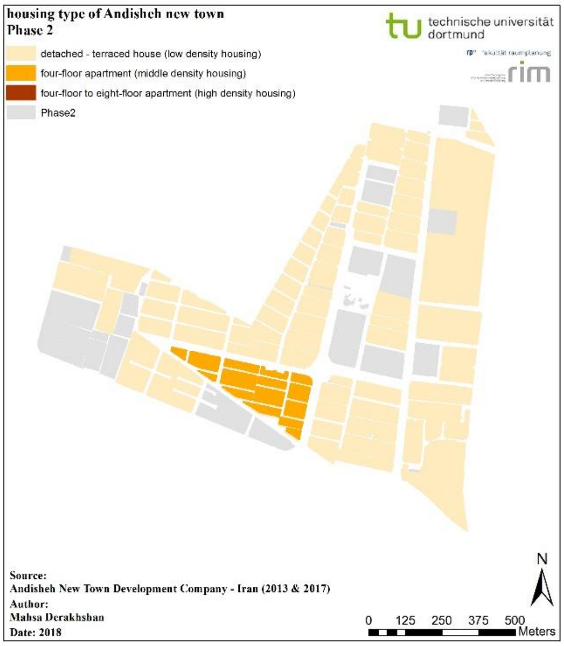


Figure 5.3.3. Housing type of Phase 2 of Andisheh new town

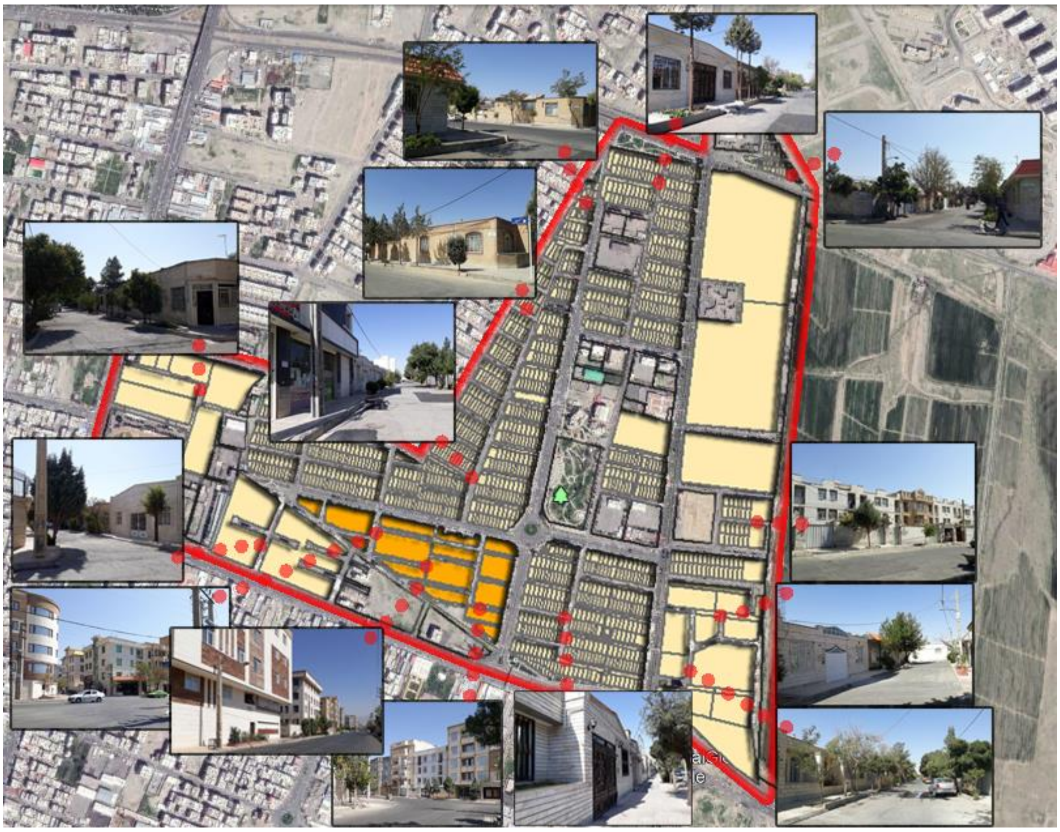


Figure 5.3.4. Photos of different housing types in Phase 2 of Andisheh new town- source: researcher (2019)

Housing type in Phase 3 of Andisheh new town

Phase 3 of Andisheh new town is a very diverse area. Residential land uses are varied from low density to high-density flats. Some neighborhoods contain semi-detached houses with two floors. Different residential complexes are built in this Phase by different organizations for their employments. These types of complexes are usually middle-density flats with four floors. This quarter includes the most population of Andisheh new town. The distribution of different housing types is presented in map Figure 5.3.5. Figure 5.3.6 shows some photos of various housing types in this quarter.

Figure 5.3.5. Housing type of Phase3 of Andisheh new town

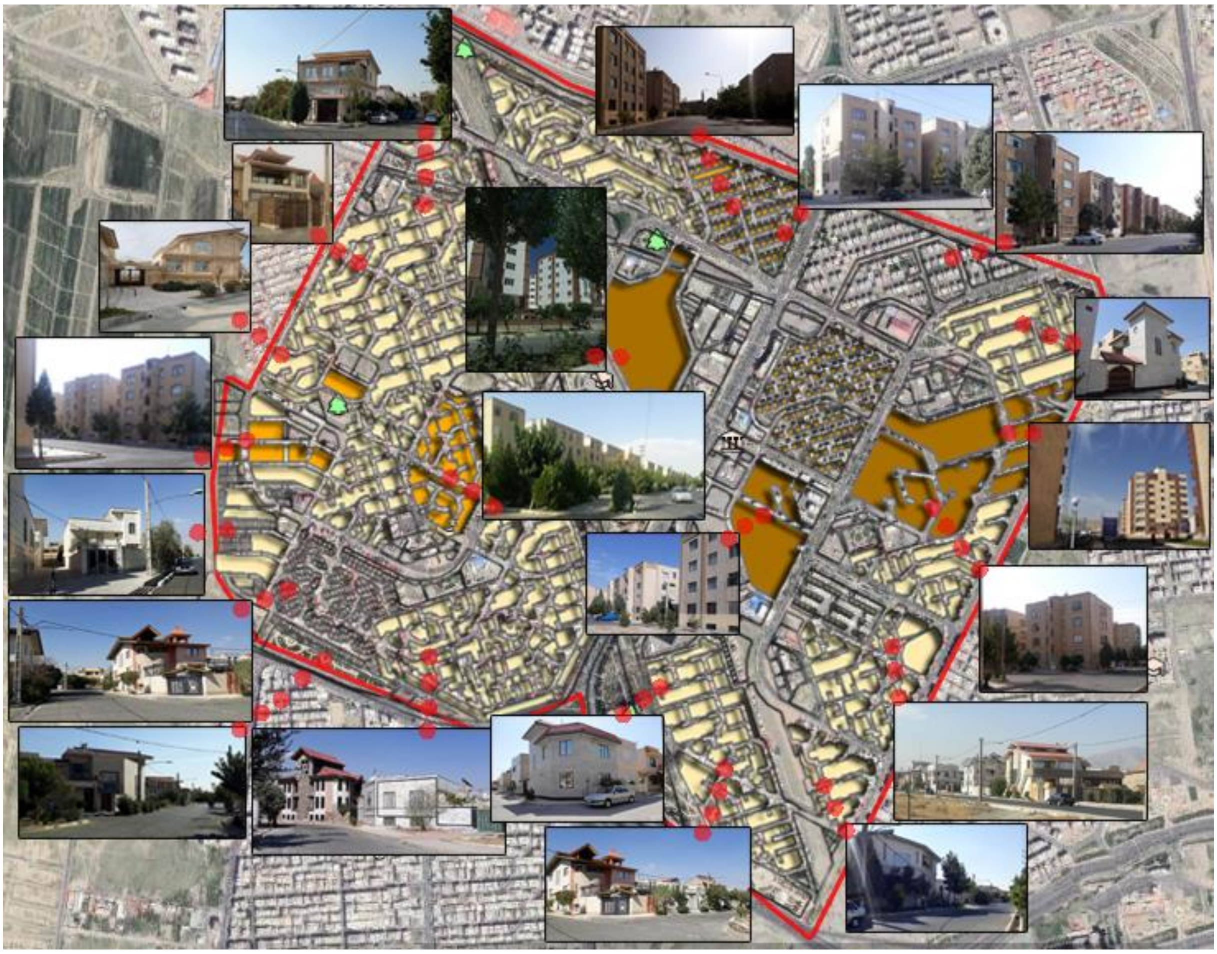


Figure 5.3.6. Photos of different housing types in Phase 3 of Andisheh new town- source: researcher (2019)

Housing type in Phase 4 of Andisheh new town

Phase 4 has two distinct areas, one part is low density with two-floor houses and the other part includes high-density flats with more than four floors. There are also various residential complexes in this Phase, which are constructed by different organizations and include high-density apartments with more than four-floor apartments. As can be seen in the map (figure 5.3.7), the centralization of high-density housing is in Phase 4. Some parts of this quarter are still not built or under construction. In the middle of Phase 4, the CBD is located.

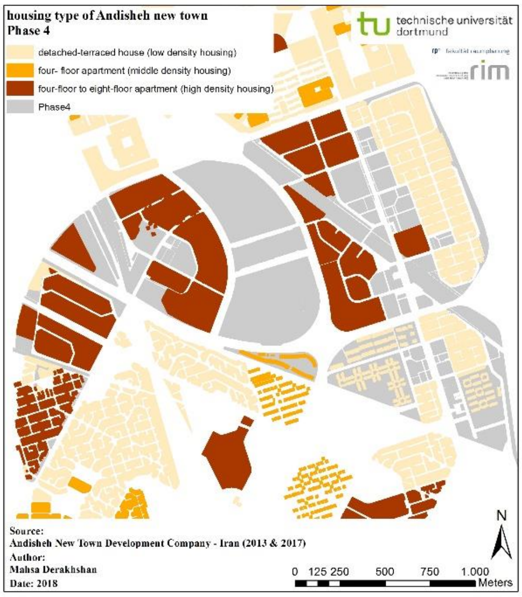


Figure 5.3.7. Housing type of Phase4 of Andisheh new town

Figure 5.3.8 presents some photos of housing types in this quarter.

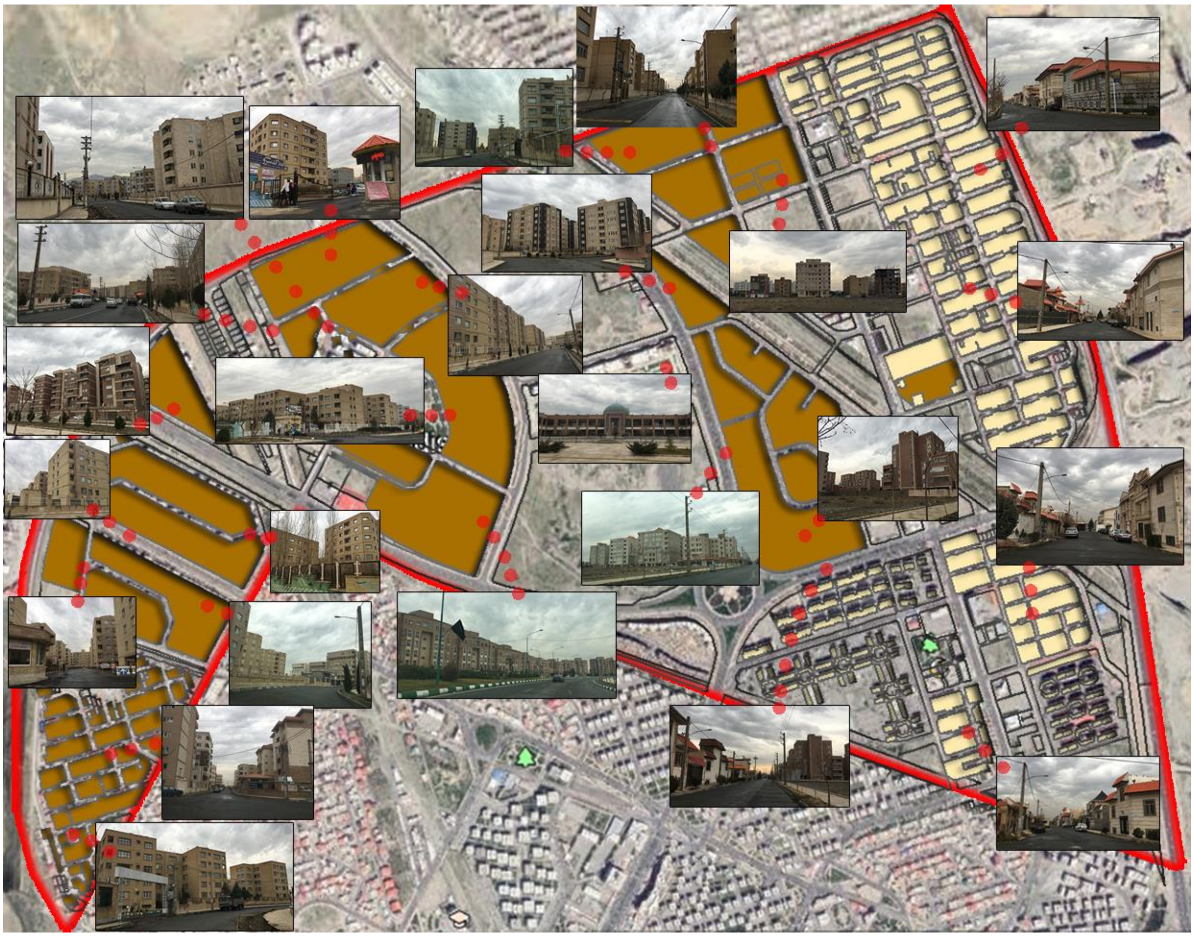


Figure 5.3.8. Photos of different housing types in Phase 4 of Andisheh new town - source: researcher (2019)

Housing type in Phase 5 and 6 of Andisheh new town

Phase 5 is a mixture of housing types; it includes low and middle-density buildings and one high-density residential complex in the middle of this quarter.

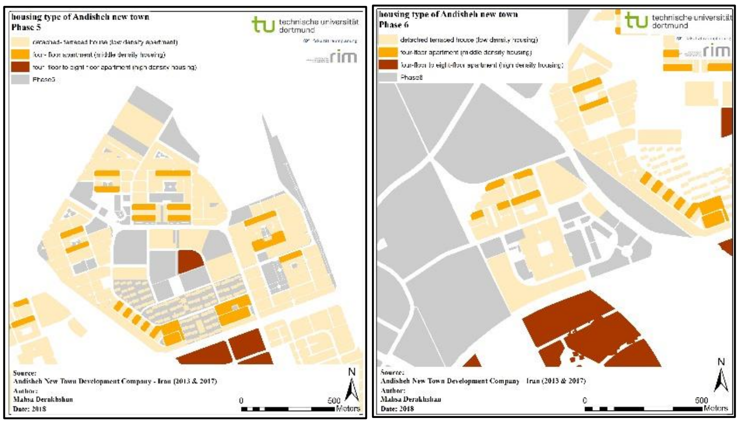


Figure 5.3.9. Housing type of Phase 5 and 6 of Andisheh new town

Phase 6 has the largest area comparing to other quarters, but only one neighborhood is almost completed. Figure 5.3.9 presents the maps of housing types in Phase 5 and 6 of Andisheh new town, and in figure, 5.3.10 photos of various housing types are shown.

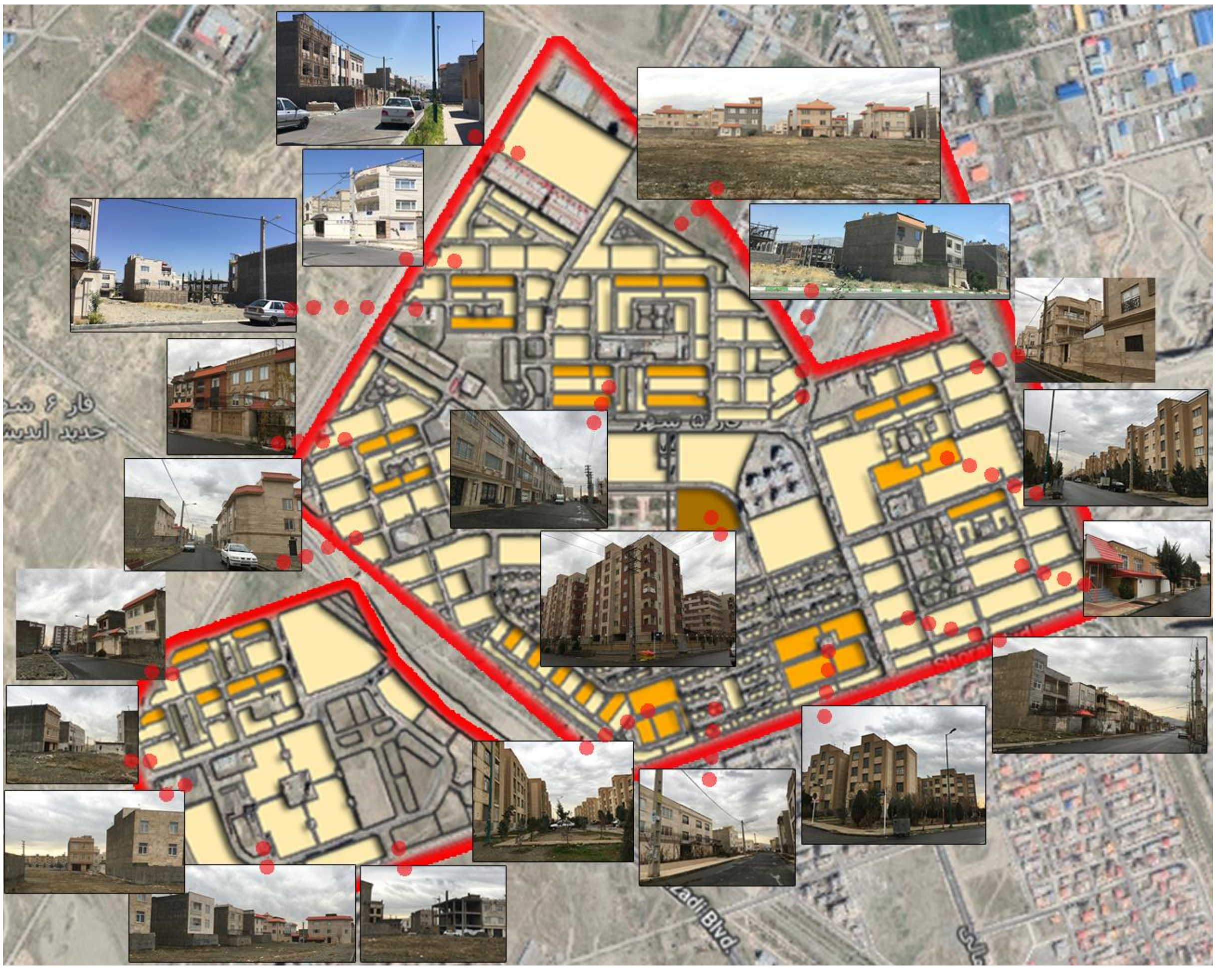


Figure 5.3.10. Photos of different housing types in Phase 5 and 6 of Andisheh new town

Housing type of respondents of questionnaires

The locations of respondents are asked in questionnaires and their addresses are geocoded using ArcGIS. Therefore their addresses are linked to the different types of housing. Housing type in questionnaires is classified into five groups of one-floor detached- terraced house, two-floor detached- terraced house, four-floor apartment, five- and six-floor apartment, and seven- and eight-floor apartment. The following table is prepared using SPSS (Table 5.3.2) to represent the housing type of respondents.

Table 5.3.2. Housing type of respondents of questionnaires - source: field survey (2017)

Housing type of respondents					
q3		Frequency (F)	Percent (%)	Valid Percent	Cumulative Percent
	Detached- terraced house (1-floor)	15	3.6	3.7	3.7
	Detached- terraced house (2-floor)	254	61.5	62.4	66.1
	Four-floor apartment	33	8.0	8.1	74.2
	Five-floor & six-floor apartment	56	13.6	13.8	88.0
	Seven-floor & eight-floor apartment	49	11.9	12.0	100.0
	Total	407	98.5	100.0	
Missing	System	6	1.5		
Total		413	100.0		

Satisfaction with the Housing Type

Considering the result, most respondents of Phase 2 (47.62%), Phase 3 (36.73%), Phase 4 (35.25%), Phase 5 (49.18%), and Phase 6 (71.43%) are satisfied with the type of their housing. The following table (5.3.3) and map (5.3.11) represent how satisfied are respondents with housing type and their locations.

Table 5.3.3. Satisfaction with housing type through the questionnaire using SPSS and ArcGIS – source: researcher

Satisfaction with the housing type															
						Phase									
						2		**3**		**4**		**5**		**6**	
q53		Frequency	Percent	Valid Percent	Cumulative	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very satisfied	97	23.5	24.3	24.3	3	4.76	46	31.29	25	20.49	23	37.70	0	0.00
	Satisfied	162	39.2	40.5	64.8	30	47.62	54	36.73	43	35.25	30	49.18	5	71.43
	neither satisfied nor dissatisfied	61	14.8	15.3	80.0	18	28.57	24	16.33	13	10.66	6	9.84	0	0.00
	dissatisfied	67	16.2	16.8	96.8	12	19.05	17	11.56	35	28.69	2	3.28	1	14.29
	very dissatisfied	13	3.1	3.3	100	0	0.00	6	4.08	6	4.92	0	0.00	1	14.29
	Total	400	96.9	100		63	100	147	100	122	100	61	100	7	100
Missing System		13	3.1												
Total		413	100												

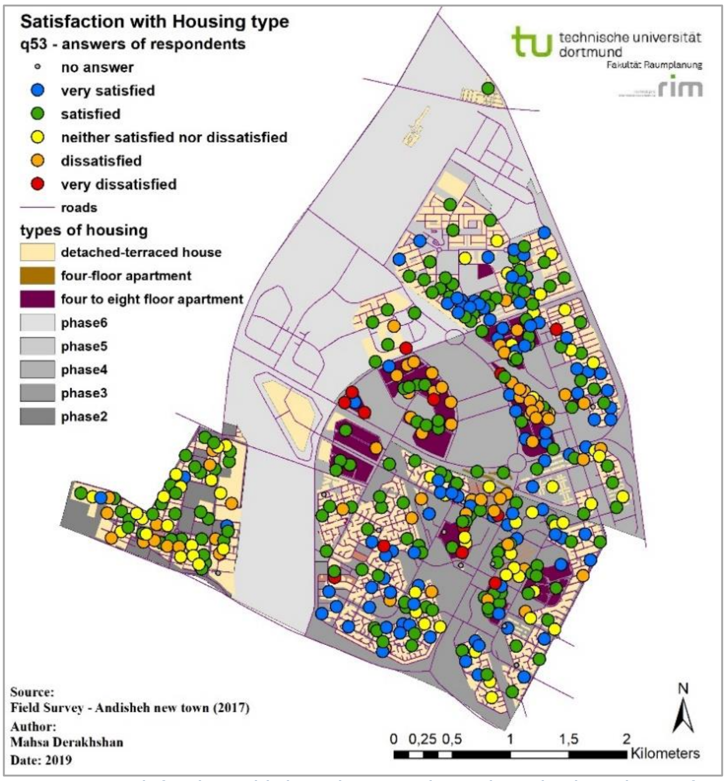


Figure 5.3.11. Satisfaction with housing type based on the locations of respondents

5.3.2 Housing Characteristics

To analyze the housing characteristics the questions such as the age of the building, area of the dwelling unit, the number of households living in the building, the price of renting the dwelling unit, and the price of buying it are asked from residents. The answers of residents are geocoded in ArcGIS and analyzed as follows.

Age of the Building

Considering the lack of information and data, the age of the building is asked through the questionnaire (Table 5.3.4) and geocoded through ArcMap 10.2 (Figure 5.3.13. Age of the building based on questionnaire table 5.3.5).

Table 5.3.4. Age of the building based on the questionnaire through SPSS

age of the building					
q6		Frequency (F)	Percent (%)	Valid Percent	Cumulative Percent
Year	<7	114	27.6	27.9	27.9
	8-14	106	25.7	26.0	53.9
	15-21	84	20.3	20.6	74.5
	22-28	84	20.3	20.6	95.1
	>29	20	4.8	4.9	100.0
	Total	408	98.8	100.0	
Missing	System	5	1.2		
Total		413	100.0		

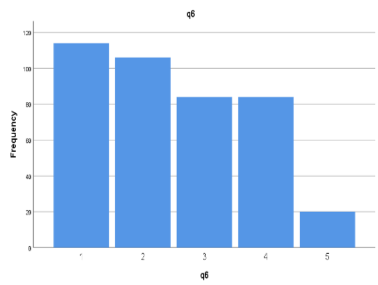


Figure 5.3.12. Age of the building(year)

Through the answers of respondents, 42.86 percent of the residents of Phase 2, 35.06 percent of the residents of Phase 3 live in 22-28 years building. 41.46 percent of residents of Phase 4 live in 8-14 years of building and most of the residents of Phase 5 and Phase 6 live in the newest buildings. This result is consistent with the formation of these quarters.

Table 5.3.5. Age of the buildings in each quarter based on the questionnaires through ArcMap - researcher

Age of building (year)	Phase 2		Phase 3		Phase 4		Phase 5		Phase 6	
	F	%	F	%	F	%	F	%	F	%
<7	8	12.70	17	11.04	43	34.96	39	63.93	7	100.00
8 – 14	7	11.11	26	16.88	51	41.46	22	36.07	0	0.00
15 – 21	15	23.81	43	27.92	26	21.14	0	0.00	0	0.00
22 – 28	27	42.86	54	35.06	3	2.44	0	0.00	0	0.00
>29	6	9.52	14	9.09	0	0.00	0	0.00	0	0.00
Total	63	100.00	154	100.00	123	100.00	61	100.00	7	100.00

Table 5.3.5 represents the number and percent of residents of different quarters, based on the age of their buildings. The result of the SPSS analysis shows that 30.51 percent of respondents live in the buildings that are constructed less than 7 years.

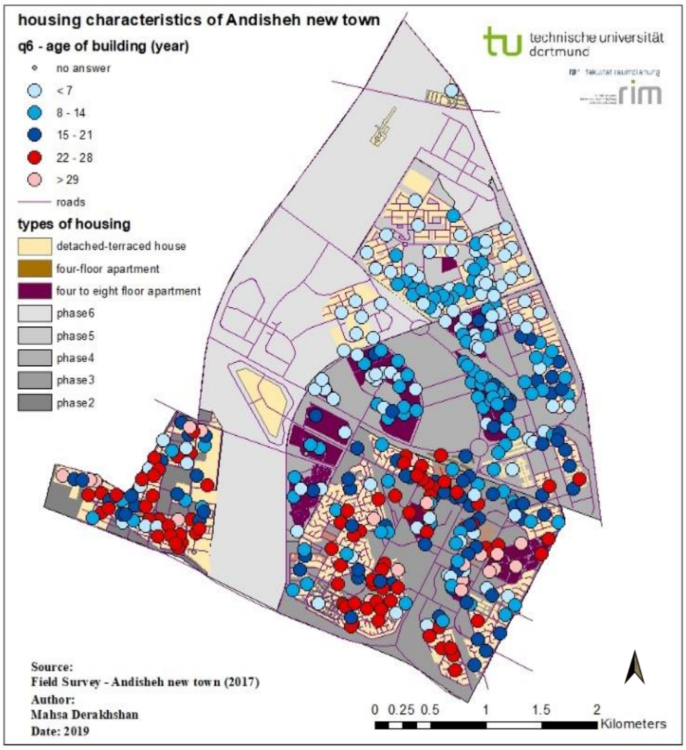


Figure 5.3.13. Age of the building based on questionnaires geocoded using ArcMap

Satisfaction with the Quality of Building

This question is how satisfied the respondents are with the quality of their building to find out how the age of a building affects its quality from its resident's opinion.

Table 5.3.6. Satisfaction with the quality of building based on the questionnaires through ArcMap - researcher

Satisfaction with the quality of building															
q54		Frequency	Percent	Valid Percent	Cumulative Percent	Phase									
						2		3		4		5		6	
						Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very satisfied	53	12.8	13.5	13.5	3	4.76	25	17.61	20	16.53	5	8.33	0	0.00
	Satisfied	135	32.7	34.4	47.8	35	55.56	41	28.87	37	30.58	17	28.33	5	71.43
	neither satisfied nor dissatisfied	92	22.3	23.4	71.2	11	17.46	30	21.13	33	27.27	18	30.00	0	0.00
	dissatisfied	94	22.8	23.9	95.2	13	20.63	37	26.06	23	19.01	20	33.33	1	14.29
	very dissatisfied	19	4.6	4.8	100	1	1.59	9	6.34	8	6.61	0	0.00	1	14.29
	Total	393	95.2	100		63	100.00	142	100.00	121	100.00	60	100.00	7	100.00
Missing System		20	4.8												
Total		413	100												

As can be seen in Table 5.3.6, most of the respondents (32.7%) are satisfied and (22.8%) of them are dissatisfied with the quality of their buildings. Through them, most of the respondents of Phase 2 (55.56%), Phase 3 (28.87%), Phase 4 (30.58%) and Phase 6 (71.43%) are satisfied, and most of the respondents of Phase 5 (33.33%) are dissatisfied with the quality of their buildings.

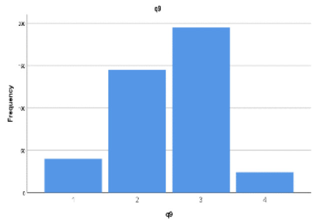
Considering the whole respondents of Andisheh new town, less percentage of them are very dissatisfied with the quality of their buildings.

Area of Dwelling Unit

Respondents of the questionnaire are asked to classify the area of their dwelling units into five categories. Using the geocoding method through ArcMap 10.2, table 5.3.7, and map– figure 5.3.15 - is prepared.

Table 5.3.7 and Figure 5.3.14. Area of dwelling units based on the questionnaire (through SPSS)

area of dwelling unit of residents					
q9		Frequency	Percent	Valid Percent	Cumulative Percent
m2	<35	40	9.7	9.9	9.9
	36-70	145	35.1	35.9	45.8
	71-105	195	47.2	48.3	94.1
	106-140	24	5.8	5.9	100.0
	>141	0	0.0	0.0	100.0
	Total	404	97.8	100.0	
Missing	System	9	2.2		
Total		413	100.0		



SPSS analysis shows that 47.2 percent of respondents live in dwelling units with area 71-105 m^2. Additionally, the analysis through ArcMap represents that the most residents of Phase 3 (43.79%), Phase 4 (48.78%), Phase 5 (70.00%) live in 71-105 m^2 unit, and 46.03 percent of respondents of Phase 2 live in 36-70 m^2 unit.

Table 5.3.8 represents the number and percent of respondents of each quarter, considering their dwelling units.

Table 5.3.8. the area of dwelling unit of each quarter based on questionnaire through ArcMap - researcher

Area of dwelling unit (m^2)	Phase 2		Phase 3		Phase 4		Phase 5		Phase 6	
	F	%	F	%	F	%	F	%	F	%
<35	6	9.52	17	11.11	9	7.32	6	10.00	2	40.00
36 – 70	29	46.03	58	37.91	46	37.40	11	18.33	1	20.00
71 – 105	24	38.10	67	43.79	60	48.78	42	70.00	2	40.00
106 – 140	4	6.35	11	7.19	8	6.50	1	1.67	0	0.00
>141	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	63	100.00	153	100.00	123	100.00	60	100.00	5	100.00

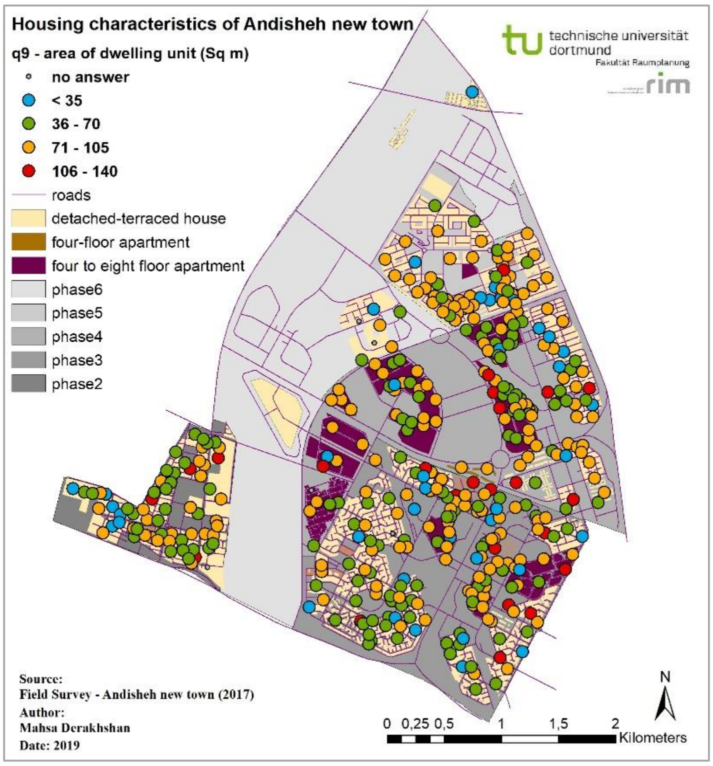


Figure 5.3.15. Area of dwelling units of residents of Andisheh new town based on the questionnaires

Satisfaction with the Area of the dwelling unit

The following table shows that most of the people who live in Phase 2 (51.61%), Phase 3 (37.24%), Phase 4 (34.17%), and Phase 6 (42.86%) are satisfied with the area of their dwelling units, however, most of the residents of and Phase 5 (42.62%) have selected neither satisfied nor dissatisfied to this question, after that, they have selected that they are satisfied with the area of their dwelling units.

Table 5.3.9. Satisfaction with the area of their dwelling unit based on questionnaire through ArcMap - researcher

Satisfaction with the area of the dwelling unit															
						Phase									
						2		3		4		5		6	
q52		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very satisfied	78	18.9	19.7	19.7	11	17.74	30	20.69	26	21.67	11	18.03	0	0.00
	Satisfied	147	35.6	37.2	57.0	32	51.61	54	37.24	41	34.17	17	27.87	3	42.86
	neither satisfied nor dissatisfied	99	24.0	25.1	82.0	10	16.13	33	22.76	28	23.33	26	42.62	2	28.57
	dissatisfied	50	12.1	12.7	94.7	7	11.29	20	13.79	19	15.83	3	4.92	1	14.29
	very dissatisfied	21	5.1	5.3	100	2	3.23	8	5.52	6	5.00	4	6.56	1	14.29

	Total	395	95.6	100		62	100.0	145	100.0	120	100.0	61	100.0	7	100.0
Missing System		18	4.4												
Total		413	100												

Number of households in the building

The analysis through SPSS and ArcMap represents that most of the respondents (31.0 percent) live in buildings with three or four households in their buildings. After that, 28.8 percent of respondents live in buildings with one or two other households.

Table 5.3.10. Number of households in the building based on the questionnaire through SPSS

number of households in the building					
q7		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-2	119	28.8	29.5	29.5
	3-4	128	31.0	31.7	61.1
	5-6	32	7.7	7.9	69.1
	7-8	53	12.8	13.1	82.2
	>9	72	17.4	17.8	100.0
	Total	404	97.8	100.0	
Missing	System	9	2.2		
Total		413	100.0		

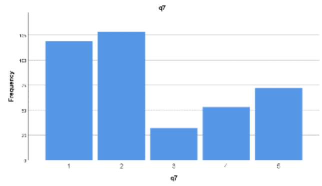


Figure 5.3.16.. Number of households

Considering the respondents of questionnaires, most of the respondents of Phase 2 (44.44%), Phase 3 (34.90%), and Phase 6 (71.43%) live in the buildings with one or two households in their buildings; 42.74 percent of respondents of Phase 4 live in the buildings with more than nine households, and 68.85 percent of respondents of Phase 5, live in the buildings with three or four households.

In the following table (table 5.3.11), the number of households in the buildings are categorized based on the questionnaires and the location of each building.

Table 5.3.11. number of households in the building of each quarter based on the questionnaire through ArcMap

Number of households in the building (q7)	Phase 2		Phase 3		Phase 4		Phase 5		Phase 6	
	F	%	F	%	F	%	F	%	F	%
1 - 2	28	44.44	52	34.90	20	16.13	14	22.95	5	71.43
3 – 4	18	28.57	43	28.86	23	18.55	42	68.85	2	28.57
5 – 6	9	14.29	15	10.07	4	3.23	4	6.56	0	0.00
7 – 8	4	6.35	25	16.78	24	19.35	0	0.00	0	0.00
> 9	4	6.35	14	9.40	53	42.74	1	1.64	0	0.00
Total	63	100.00	149	100.00	124	100.00	61	100.00	7	100.00

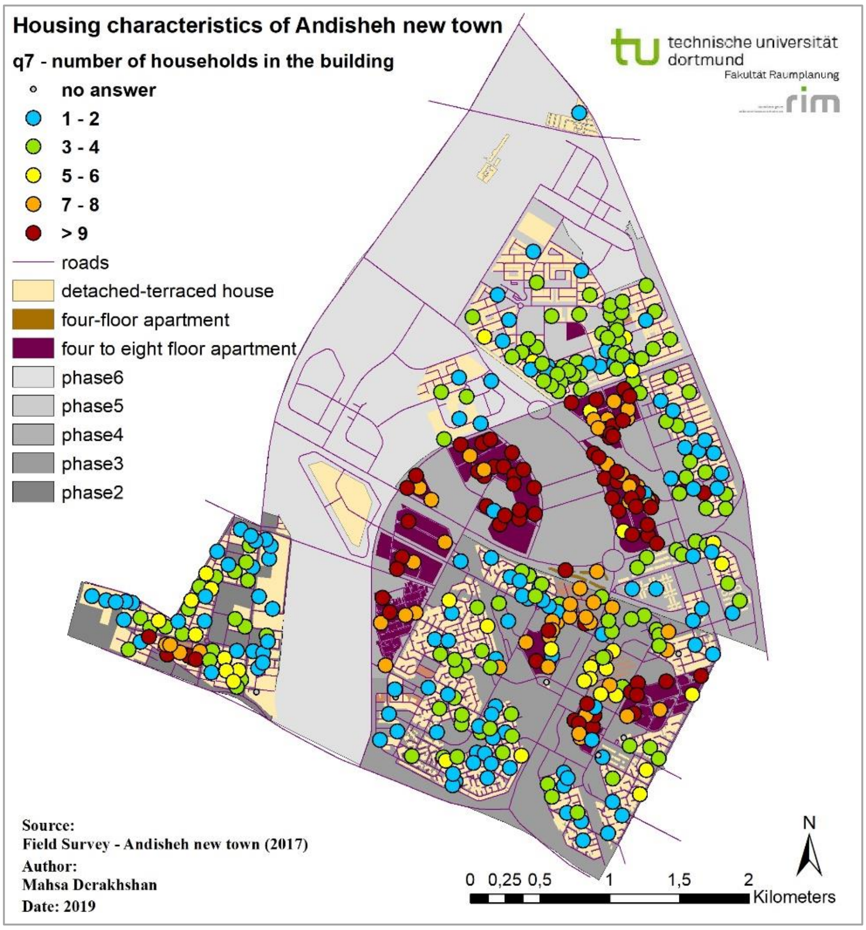


Figure 5.3.17. Number of households in the building based on the questionnaires

Satisfaction with the number of households in the building

Most respondents who live in Phase 2 (53.97), Phase 3 (31.47%), Phase 4 (39.17%), Phase 5 (33.90%), and Phase 6 (57.14%) are satisfied with the number of households in their building.

Table 5.3.12. Satisfaction with the number of households in the building

Satisfaction with the number of households in the building															
						Phase									
						2		3		4		5		6	
Q55		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very satisfied	82	19.9	20.9	20.9	10	15.87	34	23.78	26	21.67	10	16.95	2	28.57
	Satisfied	150	36.3	38.3	59.2	34	53.97	45	31.47	47	39.17	20	33.90	4	57.14
	neither satisfied nor dissatisfied	85	20.6	21.7	80.9	11	17.46	34	23.78	22	18.33	18	30.51	0	0.00
	dissatisfied	54	13.1	13.8	94.6	8	12.70	19	13.29	17	14.17	10	16.95	0	0.00
	very dissatisfied	21	5.1	5.4	100	0	0.00	11	7.69	8	6.67	1	1.69	1	14.29

Total	392	94.9	100		63	100.00	143	100.00	120	100.00	59	100.00	7	100.00
Missing System	21	5.1												
Total	413	100												

Considering the whole respondents of Andisheh new town, most of the residents are satisfied (36.3%) with the number of households in their building, and fewer of them are very dissatisfied with this indicator.

Price to buy dwelling unit

There is not any integrated system to have information about the price of the whole buildings of Andisheh new town; the only places that give information about the price of buildings – not whole buildings of the city - are private real state agencies when someone wants to buy or rent a building. Therefore, this question is asked through questionnaires from residents. The range of price in the questionnaire is the currency of Iran and is changed to the Euro based on the difference between these two currencies at the time of the field survey. The result is illustrated in the following maps (figure 5.3.18 and 5.3.19) and tables (5.3.13 and 5.3.14).

Table 5.3.13. Price to buy one square meter of the dwelling unit based on questionnaire through SPSS

price of buying dwelling unit (per m^2)					
Q10		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<375 €	43	10,4	10,6	10,6
	376-500€	114	27,6	28,2	38,9
	501-625€	120	29,1	29,7	68,6
	626-750€	100	24,2	24,8	93,3
	>751 €	27	6,5	6,7	100,0
	Total	404	97,8	100,0	
Missing	System	9	2,2		
Total		413	100,0		

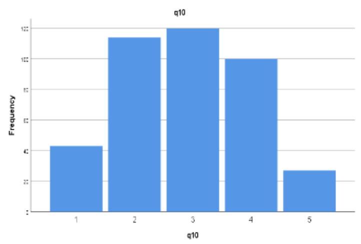


Figure 5.3.18. Price to buy dwelling unit

According to the answers of respondents, Phase 3 has the most expensive apartments or houses. The price is decreased in other quarters. The lowest price is in Phase 6 that is still under construction.

Table 5.3.14. Pice to buy one square meter of the dwelling unit in each quarter of Andisheh based on the questionnaires through ArcMap

Price to buy one m^2 of dwelling unit	**Phase 2**		**Phase 3**		**Phase 4**		**Phase 5**		**Phase 6**	
	F	%	F	%	F	%	F	%	F	%
< 375 €	2	3.28	2	1.30	4	3.31	30	49.18	5	71.43
376 – 500 €	27	44.26	14	9.09	49	40.50	24	39.34	0	0.00
501 – 625 €	13	21.31	51	33.12	49	40.50	5	8.20	2	28.57
626 – 750 €	16	26.23	63	40.91	19	15.70	2	3.28	0	0.00
> 751 €	3	4.92	24	15.58	0	0.00	0	0.00	0	0.00
Total	61	100.00	154	100.00	121	100.00	61	100.00	7	100.00

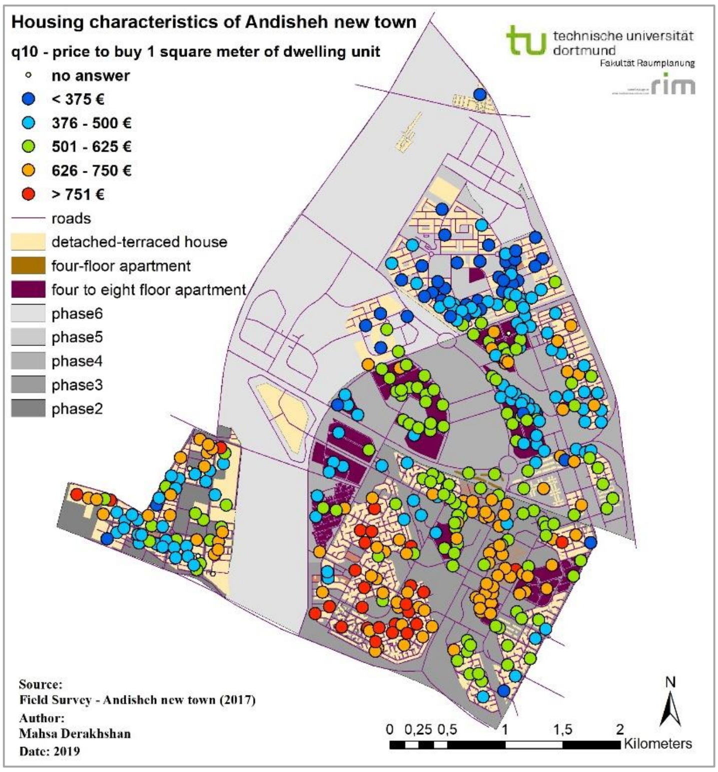


Figure 5.3.19. Price to buy one square meter of dwelling unit through the questionnaires

Satisfaction with the price of buying the dwelling unit

As it is presented in the following table - table 5.3.15 – most people of the whole Andisheh (32.4%) as well as respondents of Phase 3 (30.99%), Phase 4 (35.14%), Phase 5 (42.62%) have selected that they are neither satisfied nor dissatisfied with the price of buying their dwelling unit.

The most selected value after neither satisfied nor dissatisfied by respondents in whole Andisheh is being satisfied with the price. On average 30.0% of respondents of Andisheh new town are satisfied with this indicator. 54.24% of respondents of Phase 2, 28.87% of respondents of Phase 3, 23.42% of respondents of Phase 4, 34.43% of respondents of Phase 5, and 57.14% of Phase 6 are satisfied.

Table 5.3.15. Satisfaction with the price to buy dwelling unit

Satisfaction with the price to buy dwelling unit															
						Phase									
						2		3		4		5		6	
q50		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
	very satisfied	49	11.9	12.9	12.9	1	1.69	21	14.79	25	22.52	2	3.28	0	0.00

va lid	Satisfied	124	30.0	32.6	45.5	32	54.24	41	28.87	26	23.42	21	34.43	4	57.14
	neither satisfied nor dissatisfied	134	32.4	35.3	80.8	22	37.29	44	30.99	39	35.14	26	42.62	3	42.86
	dissatisfied	57	13.8	15.0	95.8	3	5.08	28	19.72	14	12.61	12	19.67	0	0.00
	very dissatisfied	16	3.9	4.2	100	1	1.69	8	5.63	7	6.31	0	0.00	0	0.00
	Total	380	92.0	100		59	100.00	142	100.00	111	100.00	61	100.00	7	100.00
Missing System		33	8.0												
Total		413	100												

Price to rent the dwelling unit

The price of a dwelling unit to rent (per square meter) is another indicator related to housing characteristics. Table 5.3.16 represents the price respondents pay to rent their housing.

Table 5.3.16. Price of renting the dwelling unit based on the questionnaire through SPSS

The price of renting dwelling unit (per m^2)					
Q11		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<75 €	45	10,9	11,6	11,6
	76-125€	124	30,0	31,9	43,4
	126-175€	82	19,9	21,1	64,5
	176-225€	101	24,5	26,0	90,5
	>226€	37	9,0	9,5	100,0
	Total	389	94,2	100,0	
Missing	System	24	5,8		
Total		413	100,0		

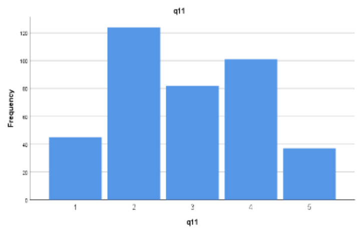


Figure 5.3.20. Price to rent dwelling unit

Using ArcMap to analyze geocoded data from respondents shows that the price of renting a dwelling unit in Phase 3 differs from the lowest amount to the highest. The analysis through SPSS shows that to rent a unit, most of the residents pay 76 – 125 € per one meter.

Table 5.3.17 presents the range of price of renting one square meter of respondents' dwelling units considering the number and percent of respondents of each quarter of Andisheh new town. The range of price of the questionnaire considers the currency of Iran; so it is changed to Euro at the time of the field survey. The result is illustrated in the map (5.3.21).

Table 5.3.17. Price to rent dwelling unit of quarters of Andisheh based on questionnaire through ArcMap-researcher

Price to rent one m² of dwelling unit (q11)	Phase 2		Phase 3		Phase 4		Phase 5		Phase 6	
	F	%	F	%	F	%	F	%	F	%
< 75 €	0	0.00	5	3.27	11	9.57	22	39.29	7	100.00
76 – 125 €	29	50.88	23	15.03	44	38.26	28	50.00	0	0.00
126 – 175 €	9	15.79	38	24.84	34	29.57	0	0.00	0	0.00
176 – 225 €	18	31.58	64	41.83	15	13.04	4	7.14	0	0.00
> 226 €	1	1.75	23	15.03	11	9.57	2	3.57	0	0.00
Total	57	100.00	153	100.00	115	100.00	56	100.00	7	100.00

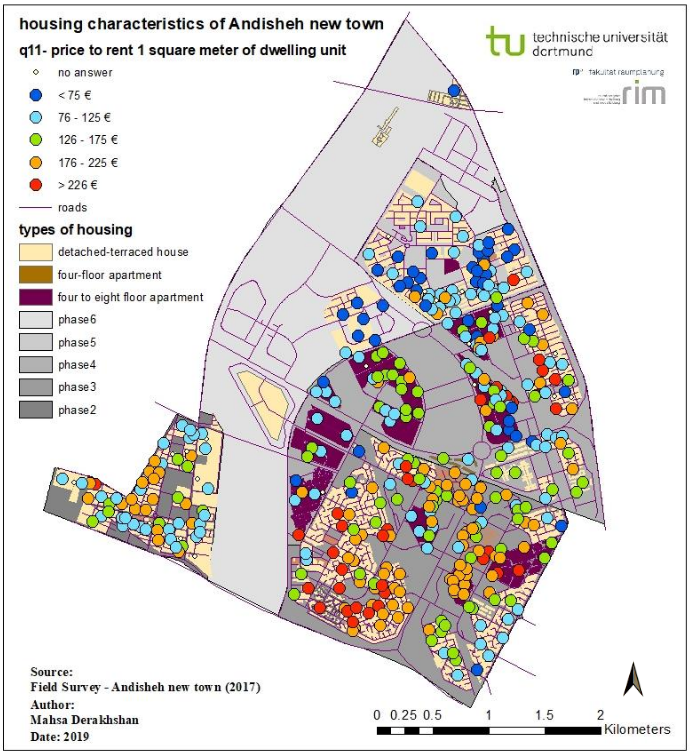


Figure 5.3.21. Price to rent dwelling unit of quarters of Andisheh based on questionnaire through ArcMap

Satisfaction with the price to rent the dwelling unit (If it is rented)

The result shows that most of the people who live in Andisheh are neither satisfied nor dissatisfied with the price of renting their dwelling units.

Table 5.3.18. Satisfaction with the price to rent the dwelling unit

Satisfaction with the price to rent dwelling unit (If it is rented)						Phase									
						2		3		4		5		6	
q51		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
	very satisfied	28	6,8	9,6	9,6	2	5.41	11	9.73	10	10.53	4	10.00	1	14.29

valid	Satisfied	88	21,3	30,1	39,7	11	29.73	34	30.09	29	30.53	13	32.50	1	14.29
	neither satisfied nor dissatisfied	122	29,5	41,8	81,5	20	54.05	46	40.71	40	42.11	13	32.50	3	42.86
	dissatisfied	32	7,7	11,0	92,5	3	8.11	13	11.50	8	8.42	8	20.00	0	0.00
	very dissatisfied	22	5,3	7,5	100	1	2.70	9	7.96	8	8.42	2	5.00	2	28.57
	Total	292	70,7	100		37	100.00	113	100.00	95	100.00	40	100.00	7	100.00
Missing System		121	29,3												
Total		413	100												

Then, it can be understood from the table 5.3.18, 29.5% of residents are neither satisfied nor dissatisfied with the price of renting their housing; after that 21.3% of whole respondents are satisfied with it.

Overall satisfaction with housing

This measurer indicates how respondents are generally satisfied with their housing regardless of the other qualitative and quantitative indicators that have been asked before. These indicators directly affect the quality of urban life. As it is presented in the following table (5.3.19), most of the respondents are satisfied (51.3%), after that they are very satisfied (21.1%) with their housing.

Table 5.3.19. Overall satisfaction of housing

Overall satisfaction with housing in Andisheh new town															
						Phase									
						2		**3**		**4**		**5**		**6**	
q49		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very satisfied	87	21,1	21,8	21,8	7	11.11	29	19.73	31	25.41	18	29.51	2	28.57
	Satisfied	212	51,3	53,0	74,8	41	65.08	74	50.34	60	49.18	34	55.74	3	42.86
	neither satisfied nor dissatisfied	57	13,8	14,2	89,0	9	14.29	20	13.61	22	18.03	4	6.56	2	28.57
	dissatisfied	32	7,7	8,0	97,0	6	9.52	15	10.20	7	5.74	4	6.56	0	0.00
	very dissatisfied	12	2,9	3,0	100	0	0.00	9	6.12	2	1.64	1	1.64	0	0.00
	Total	400	96,9	100		63	100.00	147	100.00	122	100.00	61	100.00	7	100.00
Missing System		13	3,1												
Total		413	100												

Map 5.3.22 represents the location of respondents and how they are satisfied with housing in Andisheh new town.

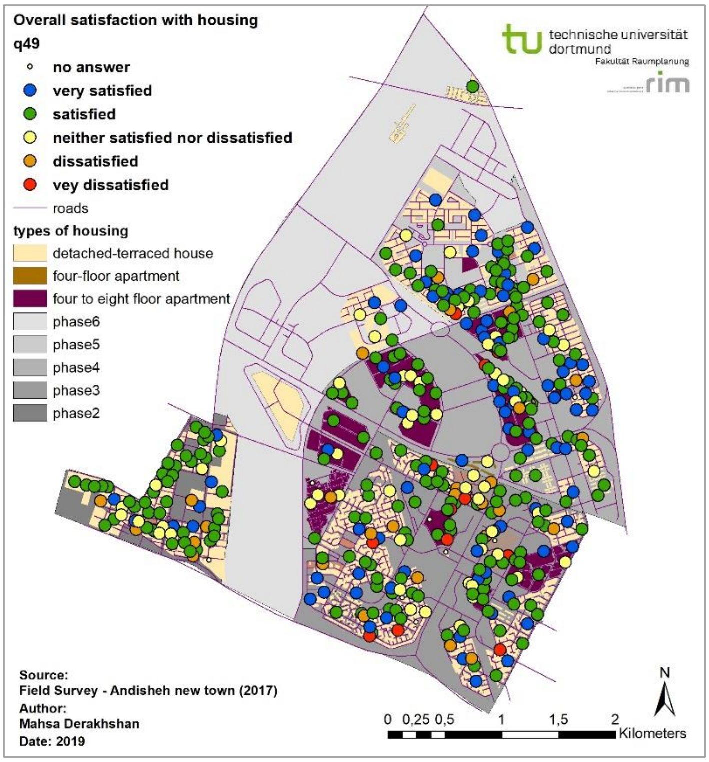


Figure 5.3.22. Overall satisfaction with housing in Andisheh new town

Analyzing the relationships between Objective Housing and Subjective Housing

To answer the second hypothesis **(H2)** that is "**objective measures of housing affects satisfaction with housing**", Structural Equation Model (SEM) is applied to evaluate the relation between objective indicators of housing that are housing type, age of the building, number of households in the building, area of the dwelling unit, housing cost (buy or rent), and location of housing and subjective indicators of housing that are satisfied with the housing type, satisfaction with the quality of the building, satisfaction with the number of households in the building, satisfaction with the area of the dwelling unit, satisfaction with the cost of building, and overall satisfaction with housing.

Except for the indicator of housing type, the objective indicators were gathered from questionnaires and geocoded in ArcGIS as well as subjective information. Using tools of Arc Toolbox, the attribute table of the geocoded data in ArcGIS is converted to Excel. Amos 24 is applied to achieve the Structural Equation Model (SEM) to find out the correlation between indicators. SEM used 6 manifest subjective variables derived from the field survey to measure 1 latent subjective variable (satisfaction with housing), and 7 manifest objective variables to measure 1 objective variable (objective housing).

to examine the hypothesis and to find out the correlation two hypotheses are defined:

- H_0: there is no correlation between objective housing and subjective housing.
- H_1: there is a correlation between objective housing and subjective housing.

Table 5.3.20. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
objective housing → subjective housing	0.32	5.132	0.00	increasing

Considering the t-value that should be more than 1.96 and it is 5.132, the p-value, which should be less than 0.05 to be significant and it is 0.00, it can be concluded that the H_0 is rejected. Therefore, there is a correlation between objective housing and subjective housing. The positive path coefficient indicates a positive correlation between these two variables. Therefore, higher objective measures of housing predict higher satisfaction with housing.

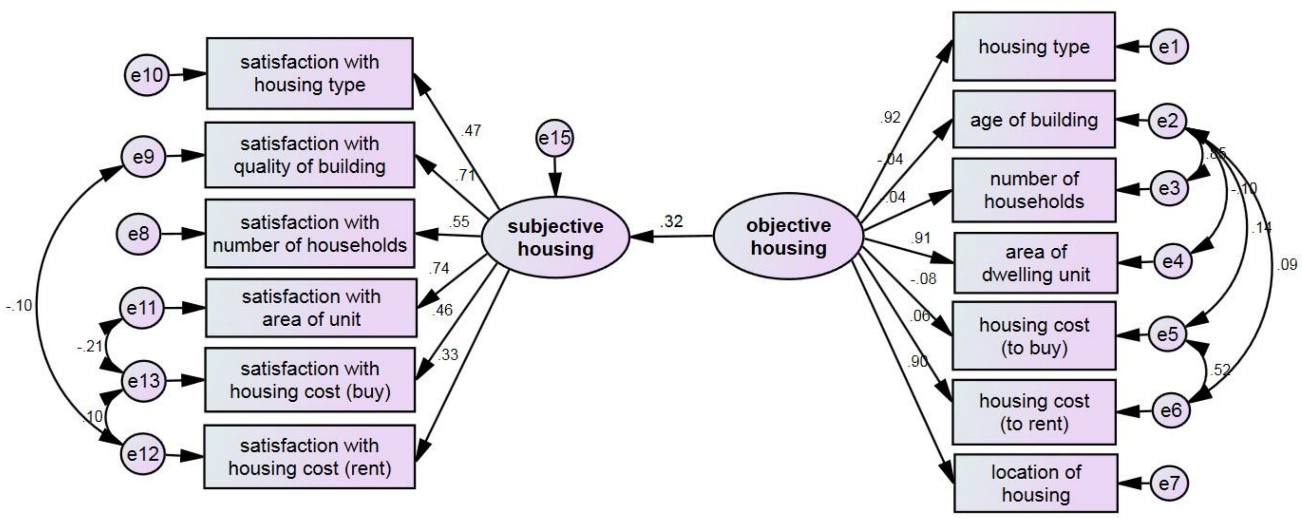


Figure 5.3.23. Structural Equation Modelling: path analysis model to investigate the relationship between objective housing and satisfaction with housing (subjective housing)

In this model, the root mean square error of approximation (RMSEA) is 0.064, and the chi-squared test (X^2/ df) is 2.679. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 (more than 90%) indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.949, adjusted goodness of fit index (AGFI) is 0.917, comparative fit index (CFI) is 0.959, normed fit index (NFI) is 0.937, non-normed fit index or Tucker-Lewis index is 0.943, and incremental fit index is 0.959, these values of indices indicate the good fit of the model.

Table 5.3.21. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.064
chi-squared test (x^2 / df)	< 3	2.679
goodness of fit index (GFI)	≥0.90	0.949
adjusted goodness of fit index (AGFI)	≥0.90	0.917
comparative fit index (CFI)	≥0.90	0.959
normed fit index (NFI)	≥0.90	0.937
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.943
incremental fit index (IFI)	≥0.90	0.959

5.4 Analysis of Land use in Andisheh new town

In this part, the spatial distribution pattern of four types of land uses that are commercial, educational, health services, and green space are analyzed through the Nearest Neighbor method. As it is described in Chapter 4, this method evaluates the spatial distribution pattern of the urban land uses by measuring the real distance between the geographical location of each land use and the geographical location of the nearest land use. The indicator RN, produced by this method and continues from 0 – 2.15, indicates the spatial distribution pattern of phenomena or elements in the case study. The analyses of each land use are categorized in the following parts: 5.4.1: commercial land use, 5.4.2: educational land use, 5.4.3: health centers, and 5.4.4: green space.

Afterward, the GIS method is used to link objective information with subjective indicators by linking the residential locations of survey respondents. SPSS analysis and the structural equation model (SEM) are used to assess the relationship between objective and subjective indicators.

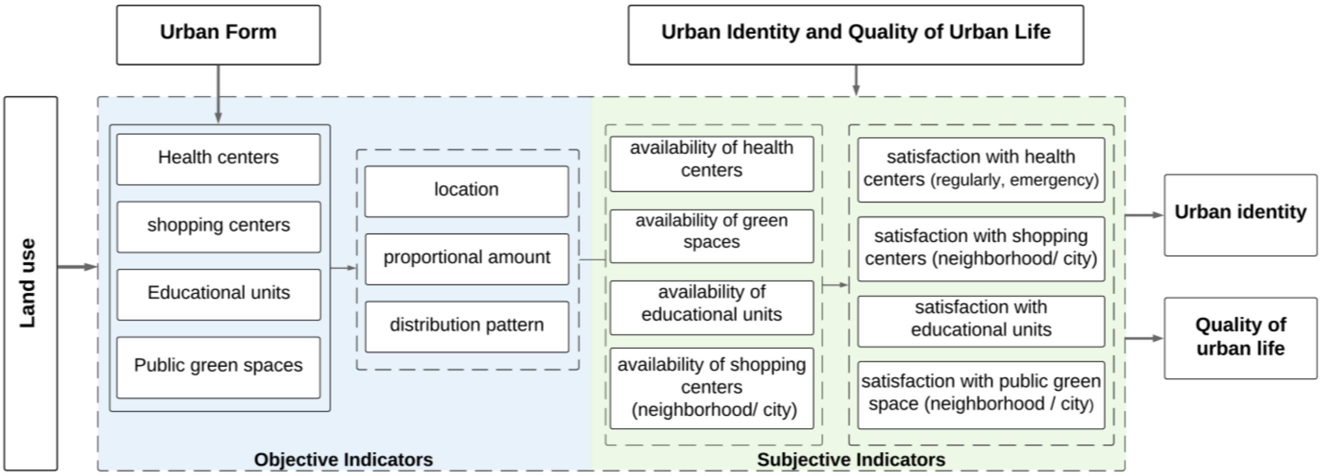


Figure 5.4.1. Structural model of indicators land use in this research – source: researcher

5.4.1 Commercial land use, shopping centers

This type of land use contains all wholesale centers, retail centers, shopping centers, and centers supplying daily needs. The commercial land use per capita in this city according to the population of Andisheh new town in 2017 is 20.1 m^2 (Consulting Company of Our City, 2019), however, the calculated amount per capita is 1.1m^2 through ArcGIS (researcher). In comparison with standard commercial land use per capita defined by the Ministry of Housing and Urban Development of Iran, which is 2.5 m^2, the commercial land use in this city is inappropriate. However, according to the suggested commercial land use per capita in a detailed plan of this city, which is 1 m^2, no significant differences are noted. The commercial land use per capita in various scales of local, urban, and regional scales is much more than the suggested amount.

To achieve a more accurate analysis of land uses, the distribution pattern of commercial land use is analyzed. This analysis is conducted through ArcGIS 10.2 using spatial analysis tools, analyzing patterns, average nearest neighborhood.

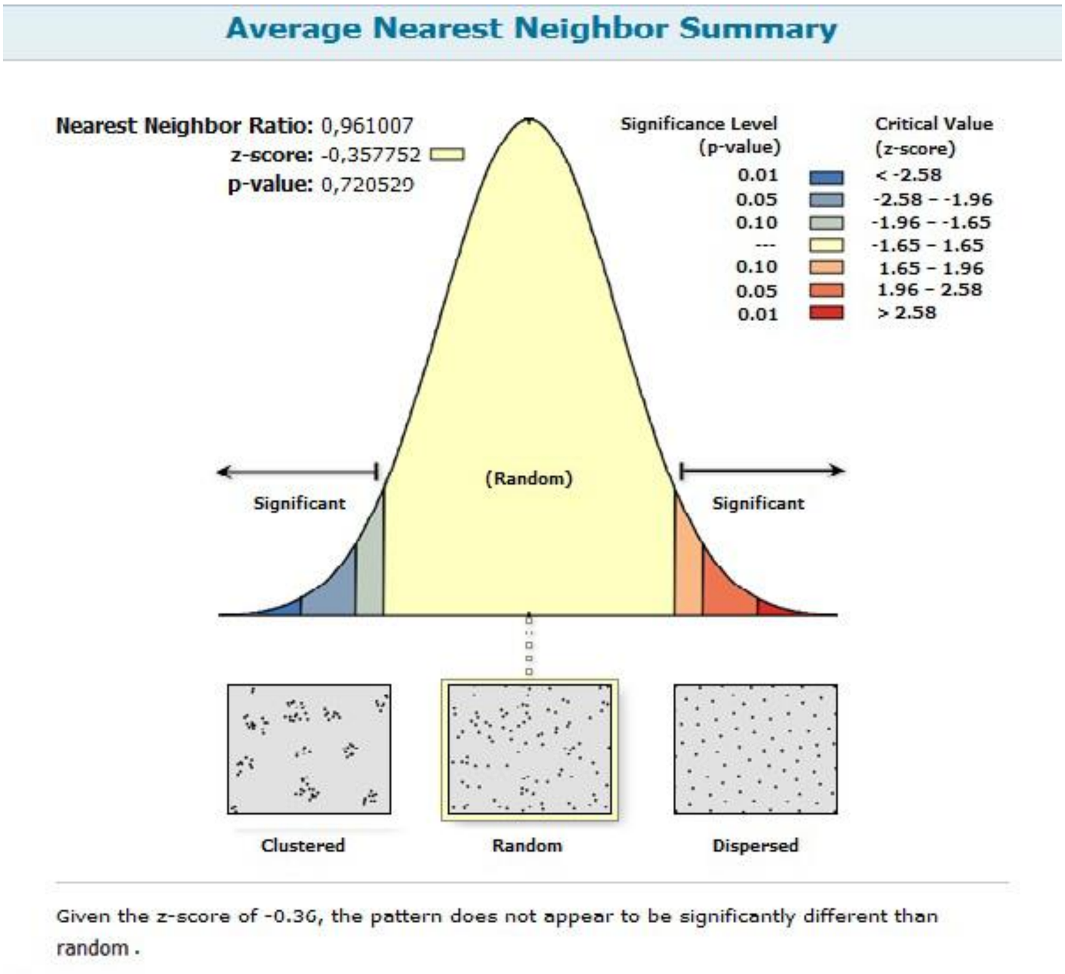


Figure 5.4.2. Spatial distribution pattern of commercial land use in Andisheh new town through ArcMap

Table 5.4.1. Average Nearest Neighbor Summary of commercial land use through ArcMap

Average Nearest Neighbor Summary	
Observed Mean Distance:	307,1357 Meters
Expected Mean Distance:	319,5978 Meters
Nearest Neighbor Ratio:	0,961007
z-score:	-0,357752
p-value:	0,720529

The result is represented as a chart in figure 5.4.2 and table 5.4.1. The result of spatial analysis through the Average Nearest Neighborhood shows that the nearest neighborhood ratio is 0.96, which indicates that the spatial distribution pattern of commercial land use in Andisheh new town is random. The random distribution pattern is also considered harmonic because the actual distance is close to the theory.

Possibility to provide daily needs from the neighborhood

Through the questionnaires, most residents of Andisheh have stated that the possibility to provide their daily needs from their neighborhood is t is good (43.3%). Considering each quarter, the residents of Phase 2 are more satisfied with this indicator (68.25%) after that 51.35% of the respondents of Phase 3. In general, it can result that the daily needs of residents can be prepared from their neighborhood because it is distributed randomly.

Table 5.4.2. The possibility of providing daily needs from the neighborhoods, based on questionnaires analyzed through SPSS and ArcGIS- source: researcher

How possible it is for respondents to provide daily needs from their neighborhood?																
						Phase										
						2		**3**		**4**		**5**		**6**	
q31		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very good	47	11,4	11,7	11,7	6	9.52	24	16.22	14	11.38	3	4.92	0	0.00
	good	179	43,3	44,5	56,2	43	68.25	76	51.35	45	36.59	15	24.59	0	0.00
	neither good nor bad	106	25,7	26,4	82,6	8	12.70	31	20.95	34	27.64	30	49.18	3	42.86
	bad	55	13,3	13,7	96,3	5	7.94	12	8.11	23	18.70	11	18.03	4	57.14
	very bad	15	3,6	3,7	100	1	1.59	5	3.38	7	5.69	2	3.28	0	0.00
	Total	402	97,3	100		63	100.00	148	100.00	123	100.00	61	100.00	7	100.00
Missing System		11	2,7												
Total		413	100												

Possibility to provide daily needs from Andisheh new town

Through the field study, this question is asked in questionnaires to figure out if people cannot prepare their daily needs from their neighborhood, how it is possible to provide them from Andisheh new town. Considering the answers of respondents of questioners, most of the respondents (53.3%) state that they can provide their daily needs from Andisheh new town good.

Table 5.4.3. Possibility to provide daily needs from Andisheh new town based on questionnaires analyzed through SPSS and ArcGIS- source: researcher

How possible it is for respondents to provide daily needs from Andisheh new town?															
						Phase									
						2		3		4		5		6	
q32		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very good	70	16,9	17,7	17,7	14	22.58	31	20.95	20	16.81	3	5.00	2	28.57
	good	220	53,3	55,6	73,2	39	62.90	76	51.35	72	60.50	30	50.00	3	42.86
	neither good nor bad	73	17,7	18,4	91,7	8	12.90	28	18.92	16	13.45	20	33.33	1	14.29
	bad	21	5,1	5,3	97,0	1	1.61	7	4.73	6	5.04	6	10.00	1	14.29
	very bad	12	2,9	3,0	100	0	0.00	6	4.05	5	4.20	1	1.67	0	0.00
	Total	396	95,9	100		62	100.00	148	100.00	119	100.00	60	100.00	7	100.00
Missing System		17	4,1												
Total		413	100												

Where do residents provide their daily needs?

This question is asked through questionnaires to find out from which quarter respondents provide their daily needs. Although most of the residents can prepare their daily needs from their neighborhood, the result shows that most of the residents of Phase 2 (60.32%) and Phase 3 (81.12%) provide their daily needs from the quarter they live.

However, most of the residents of Phase 4 (55.46%), Phase 5 (65.57%), and Phase 6 (57.14%) refer to Phase 3 to prepare their daily needs (table 5.4.4).

Table 5.4.4. Where do respondents prepare their daily needs? Based on the questionnaire analyzed through ArcGIS – source: researcher

Where do respondents provide their daily needs?													
				Phase									
				2		**3**		**4**		**5**		**6**	
q33		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	Phase 2	40	9,7	38	60.32	0	0.00	1	0.84	0	0.00	0	0.00
	Phase 3	244	59,1	18	28.57	116	81.12	66	55.46	40	65.57	4	57.14
	Phase 4	63	15,3	5	7.94	14	9.79	33	27.73	10	16.39	1	14.29
	Phase 5	18	4,4	1	1.59	2	1.40	5	4.20	10	16.39	0	0.00
	none of them	29	7,0	1	1.59	11	7.69	14	11.76	1	1.64	2	28.57
	Total	394	95,4	63	100.00	143	100.00	119	100.00	61	100.00	7	100.00
Missing System		19	4,6										
Total		413	100										

Respondents mentioned the name of the shopping center they prepared their daily needs.

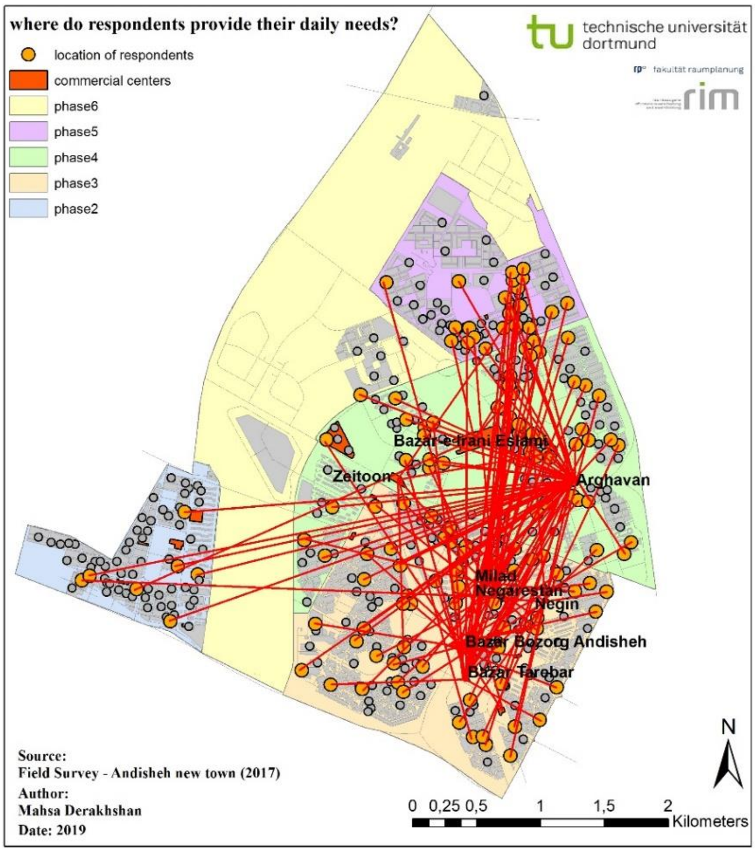


Figure 5.4.3. Location of commercial centers used by respondents to provide their daily needs based on the questionnaire through ArcMap – source: researcher

Through the questionnaires, residents are asked to write the name of the stores or shopping centers that they use to provide their daily needs. Map 5.4.3 is prepared based on their answers, it illustrates most of the respondents refer to Phase 3 and Phase 4 in this regard. Residents refer more to Bazar Tarebar, Bazar-e Bozorg Andisheh, Negarestan, Negin, and Milad in Phase 3, moreover, Arghavan, Zeitoon, and Bazar-e Irani - Eslami in Phase 4.

Satisfaction with providing daily needs in Andisheh new town?

This question is asked to understand whether residents can prepare their daily needs from their city, how satisfied they are with it. The result shows that 47.5% of respondents are satisfied. Through them, considering the result, most of the residents of Andisheh and each quarter – 60.66% of respondents of Phase 2, 49.66% of respondents of Phase 3, 44.26% of respondents of Phase 4, 45.00% of respondents of Phase 5, and 83.33% of respondents s of Phase 6 are satisfied with providing their daily needs in Andisheh new town.

Table 5.4.5. Satisfaction with providing daily needs in Andisheh new town based on questionnaire, analyzed through SPSS and ArcGIS. Source: researcher

Satisfaction with providing daily needs in Andisheh new town															
g64		Frequency	Percent	Valid Percent	Cumulative Percent	Phase 2 Frequency	Phase 2 Percent	Phase 3 Frequency	Phase 3 Percent	Phase 4 Frequency	Phase 4 Percent	Phase 5 Frequency	Phase 5 Percent	Phase 6 Frequency	Phase 6 Percent
valid	very satisfied	76	18,4	19,1	19,1	3	4.92	32	21.77	27	22.13	13	21.67	1	16.67
	Satisfied	196	47,5	49,4	68,5	37	60.66	73	49.66	54	44.26	27	45.00	5	83.33
	neither satisfied nor dissatisfied	70	16,9	17,6	86,1	13	21.31	26	17.69	20	16.39	10	16.67	0	0.00
	dissatisfied	34	8,2	8,6	94,7	6	9.84	10	6.80	13	10.66	5	8.33	0	0.00
	very dissatisfied	21	5,1	5,3	100	2	3.28	6	4.08	8	6.56	5	8.33	0	0.00
	Total	397	96,1	100		61	100.00	147	100.00	122	100.00	60	100.00	6	100.00
Missing System		16	3,9												
Total		413	100												

Satisfaction with shopping centers and CBD of Andisheh new town?

The result states that most of the respondents are satisfied (42.6%) with shopping centers and CBD in Andisheh new town. Most of the respondents of Phase 2 (62.30%), Phase 3 (43.54%), Phase 5 (44.26%), and Most of the respondents of Phase 6 (85.71%) are satisfied with this indicator. And most of the residents of Phase 4 (41.46%) are very satisfied with the shopping centers of this city.

Table 5.4.6. Satisfaction with shopping centers and CBD of Andisheh new town based on questionnaire, analyzed through SPSS and ArcGIS. Source: researcher

Satisfaction with shopping centers and CBD of Andisheh new town															
q65						Phase									
						2		3		4		5		6	
		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very satisfied	111	26,9	27,8	27,8	4	6.56	37	25.17	51	41.46	19	31.15	0	0.00
	Satisfied	176	42,6	44,1	71,9	38	62.30	64	43.54	41	33.33	27	44.26	6	85.71
	neither satisfied nor dissatisfied	40	9,7	10,0	82,0	7	11.48	15	10.20	15	12.20	3	4.92	0	0.00
	dissatisfied	48	11,6	12,0	94,0	10	16.39	22	14.97	8	6.50	7	11.48	1	14.29
	very dissatisfied	24	5,8	6,0	100	2	3.28	9	6.12	8	6.50	5	8.20	0	0.00
	Total	399	96,6	100		61	100.00	147	100.00	123	100.00	61	100.00	7	100.00
Missing System		14	3,4												
Total		413	100												

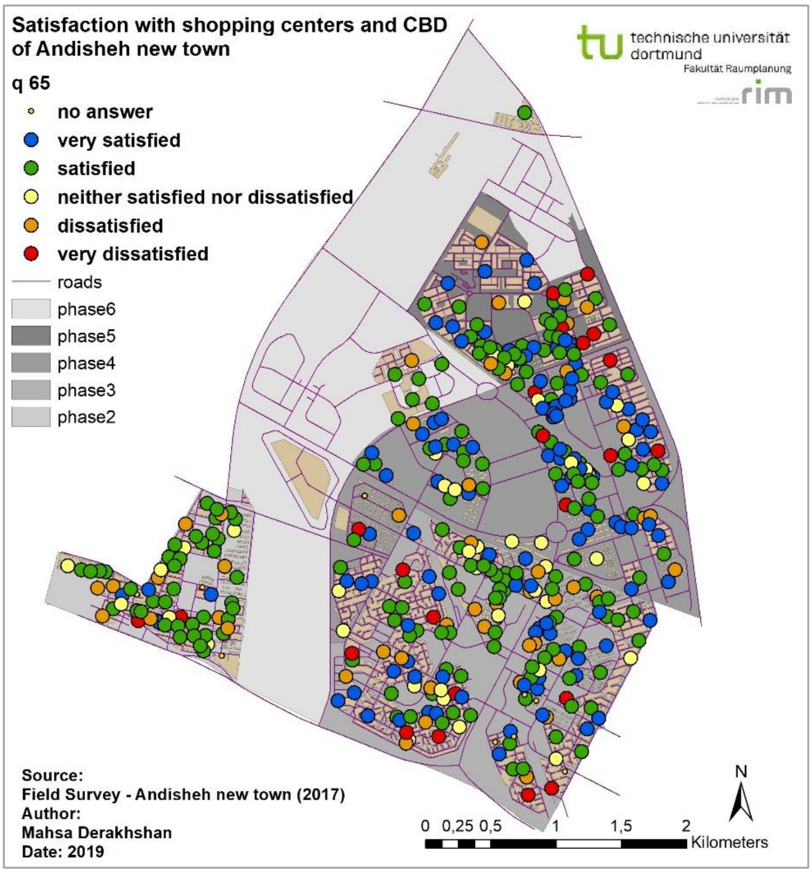


Figure 5.4.4. Satisfaction with shopping centers of Andisheh new town based on questionnaire through ArcMap

5.4.2 Educational land use

In terms of the importance of educational land use in developing human resources and society, this land use is especially important in urban planning. The standards of the educational land use per capita are defined in a detailed plan of Andisheh new town 5.2 m^2 that includes kindergarten (0.1 m^2), elementary school (0.6 m^2), high school (0.9 m^2), and high educational units (3.6 m^2). The educational land uses per capita in Andisheh town is 5.3m^2, elementary school and high school are in the optimal situation, but there is a lack of kindergarten (Consulting Company of Our City, 2019). Additionally, based on the defined standards due to the urban division by the Ministry of Housing and Urban Development of Iran that is 2-5 m^2, the whole educational land use per-capita in Andisheh new town is 2.05 m^2 (calculated through ArcGIS), therefore it is at the minimum appropriate situation.

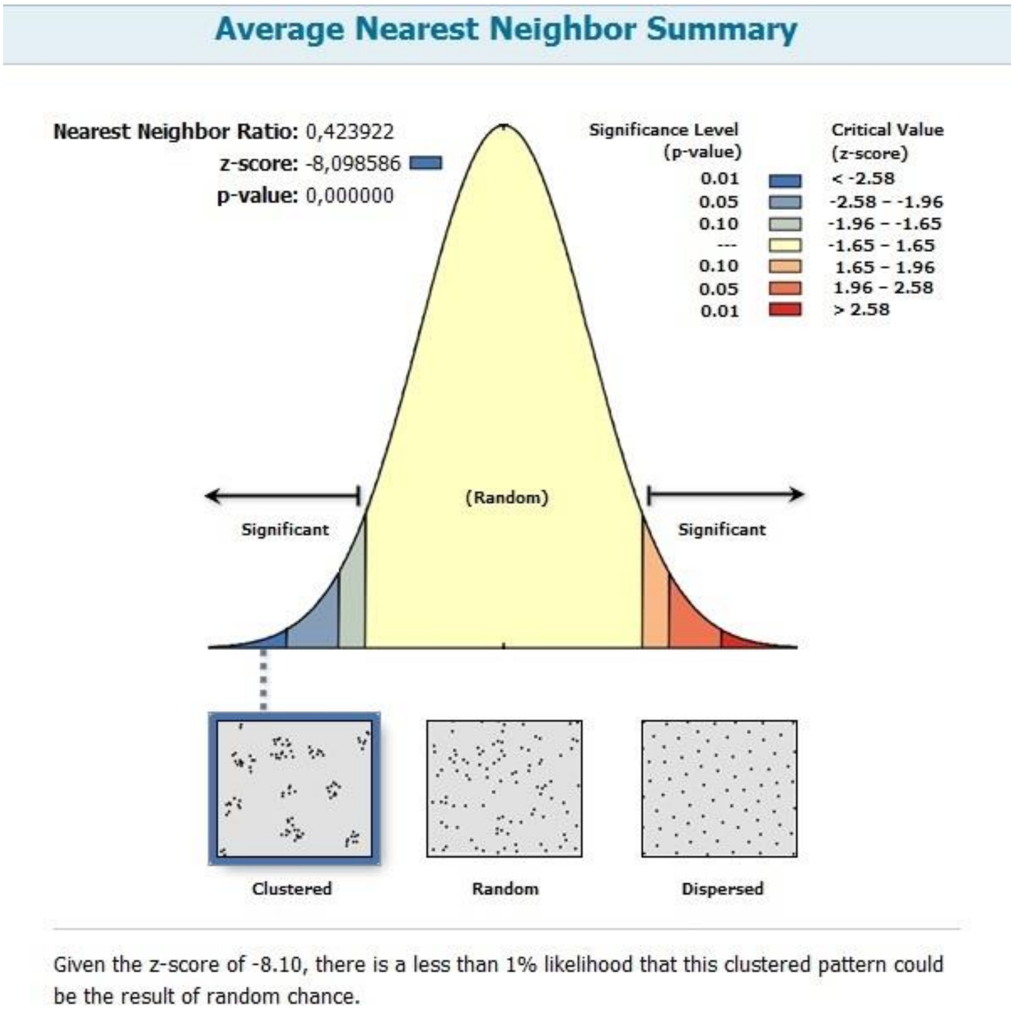


Figure 5.4.5. Spatial distribution pattern of educational land use in Andisheh new town through ArcMap

Table 5.4.7. Average Nearest Neighbor Summary of educational land use through ArcMap

Average Nearest Neighbor Summary	
Observed Mean Distance:	120,1085 Meters
Expected Mean Distance:	283,3270 Meters
Nearest Neighbor Ratio:	0,423922
z-score:	-8,098586
p-value:	0,000000

Therefore, the result of spatial analysis through the Average Nearest Neighborhood presents that the nearest neighborhood ratio is 0.42, which indicates that the spatial distribution pattern of educational land use in Andisheh new town is clustered. It means the concentration of this land use in one place is more than in other places.

The type of educational units used by respondents (if they use)

The following table represents that 39.2% of respondents (including their family) do not use any educational units, however, most of the respondents and their families (27.4%) use primary school.

Table 5.4.8. The type of educational units used by respondents and their family (if they use) through questionnaire analyzed through ArcMap – source: researcher

Which kind of educational units do respondents or their family use?															
						Phase									
						2		3		4		5		6	
q27		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	Kindergarden	16	3,9	4,1	4,1	4	6.35	5	3.45	4	3.45	3	5.45	0	0.00
	Primary school	113	27,4	29,3	33,4	18	28.57	39	26.90	34	29.31	18	32.73	4	57.14
	High school	80	19,4	20,7	54,1	12	19.05	28	19.31	27	23.28	13	23.64	0	0.00
	university	15	3,6	3,9	58,0	7	11.11	3	2.07	2	1.72	3	5.45	0	0.00
	None	162	39,2	42,0	100	22	34.92	70	48.28	49	42.24	18	32.73	3	42.86
	Total	386	93,5	100		63	100.00	145	100.00	116	100.00	55	100.00	7	100.00
Missing System		27	6,5												
Total		413	100												

The location of educational units used by respondents

The following table (5.4.9) represents that most of the residents (28.3%) refer to Phase 3 to access the educational center.

Table 5.4.9. The location of education units used by residents

In which quarter are the educational unit used by respondents located?														
				Phase										
				2		3		4		5		6		
q28		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Valid	Phase 2	23	5,6	19	33.93	2	2.13	1	1.33	1	2.33	0	0.00	
	Phase 3	117	28,3	13	23.21	46	48.94	34	45.33	22	51.16	2	33.33	
	Phase 4	41	9,9	2	3.57	19	20.21	17	22.67	3	6.98	0	0.00	
	Phase 5	25	6,1	2	3.57	3	3.19	8	10.67	10	23.26	2	33.33	
	None	68	16,5	20	35.71	24	25.53	15	20.00	7	16.28	2	33.33	
	Total	274	66,3	56	100.00	94	100.00	75	100.00	43	100.00	6	100.00	
Missing System		139	33,7											
Total		413	100,0											

Moreover, the educational unit used by each respondent is illustrated in the next map. The map 5.4.6 is prepared through ArcMap 10.2 using the location of the mentioned educational unit and address of each respondent. It is notable that many respondents refer to other quarters to reach educational units.

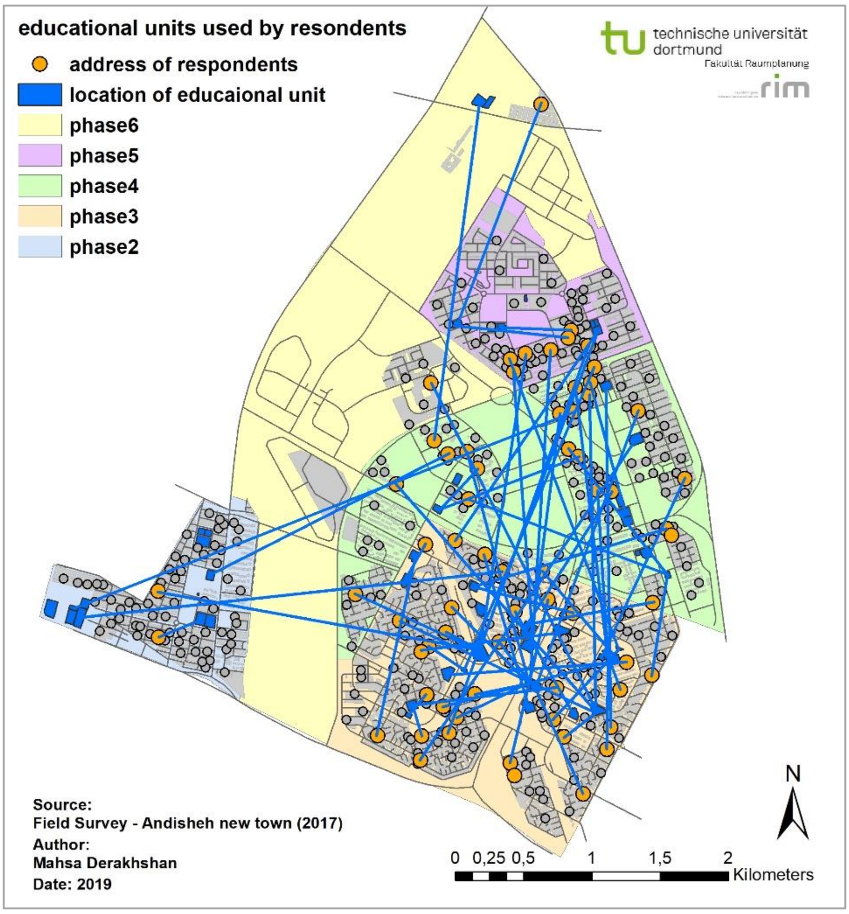


Figure 5.4.6. The location of educational units used by respondents

Satisfaction with the educational centers in Andisheh new town

Most of the residents (39.2%) state that they are satisfied with educational units, afterward 19.6% of them have selected neither satisfied nor dissatisfied.

Table 5.4.10. Satisfaction with the educational unis of Andisheh new town based on the questionnaires, analyzed through SPSS and ArcMap

Satisfaction with the educational centers in Andisheh new town														
					Phase									
					2		3		4		5		6	
q69	Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent

valid	very satisfied	87	21,1	21,9	21,9	4	6.67	35	23.65	34	27.87	13	21.31	1	14.29
	Satisfied	162	39,2	40,7	62,6	30	50.00	59	39.86	45	36.89	24	39.34	4	57.14
	neither satisfied nor dissatisfied	81	19,6	20,4	82,9	17	28.33	27	18.24	24	19.67	11	18.03	2	28.57
	dissatisfied	43	10,4	10,8	93,7	8	13.33	18	12.16	9	7.38	8	13.11	0	0.00
	very dissatisfied	25	6,1	6,3	100	1	1.67	9	6.08	10	8.20	5	8.20	0	0.00
	Total	398	96,4	100		60	100.00	148	100.00	122	100.00	61	100.00	7	100.00
Missing System		15	3,6												
Total		413	100												

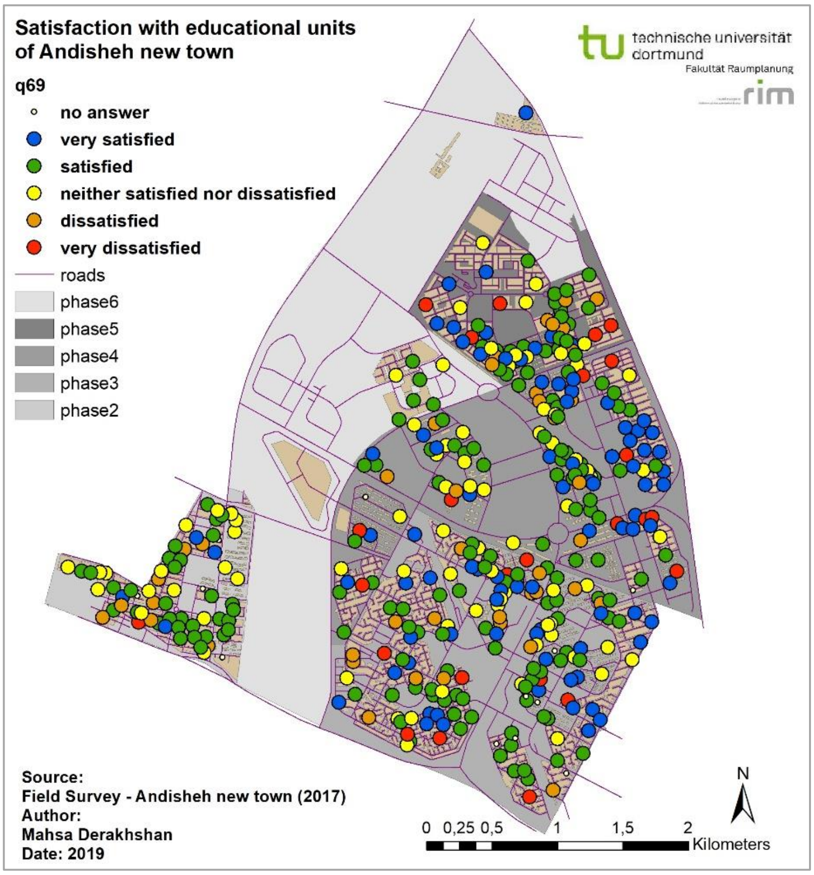


Figure 5.4.7. Satisfaction with educational centers of Andisheh new town based on questionnaire through ArcMap

5.4.3 Hospital and Health centers

This land use is one of the main urban infrastructures in developing the regions. Accessibility and people's need should be considered in locating health care centers. It is stated in the report of Consulting Company of Shahre-Ma that considering the population of Andisheh new town, 116062 people in 2017, this land-use per-capita is 30.0 m^2, which is more than the suggested standard of this land use in the detailed plan of Andisheh new town, 5.1 m^2 per-capita (Consulting Company of Shahre-Ma, 2019) and defined standards by Ministry of Housing and Urban Development of Iran that is 1 – 1.5 m^2 per-capita. However, the area of hospital and healthcare centers per capita is 0.19 m^2, which indicates the lack of this land use in Andisheh new town.

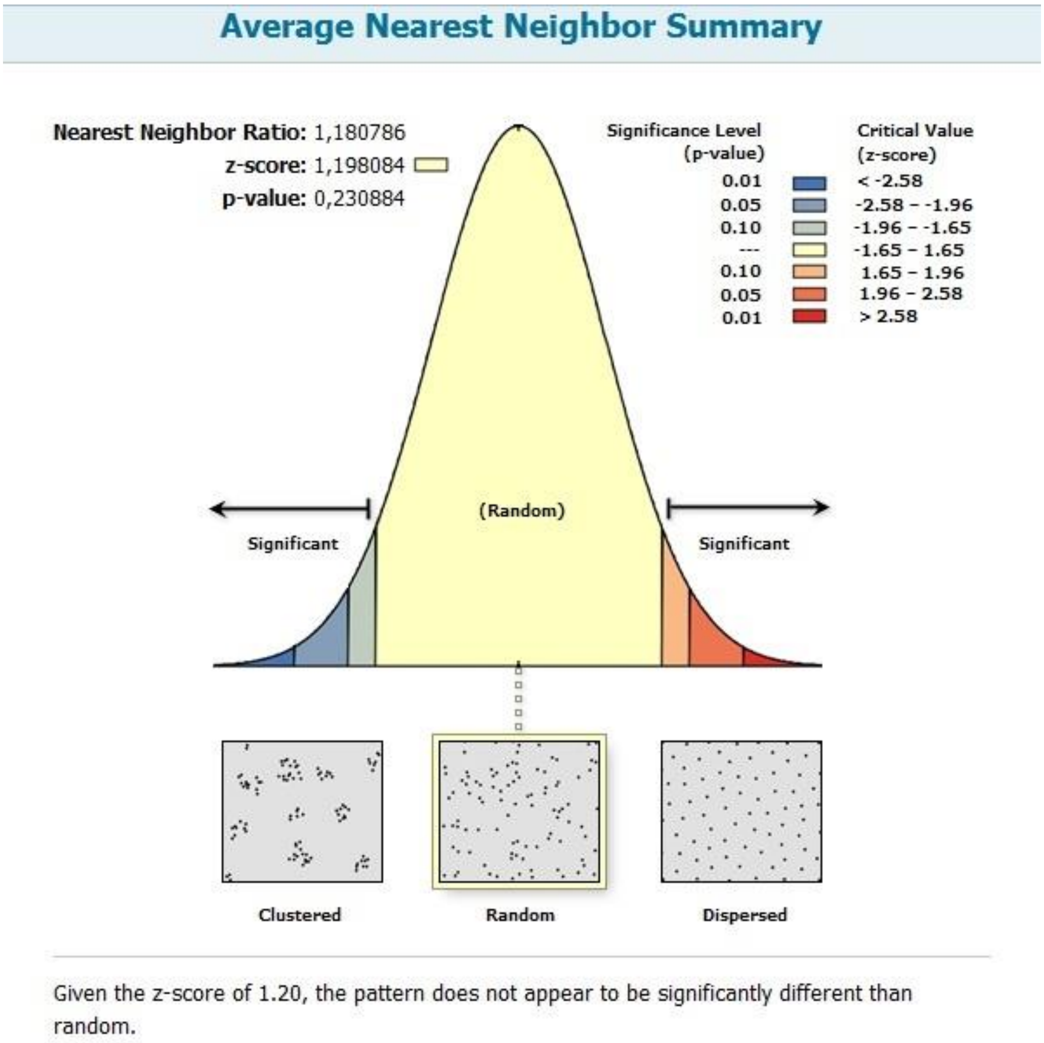


Figure 5.4.8. Spatial distribution pattern of health centers in Andisheh new town through ArcMap

The distribution pattern of health care land use is analyzed in Andisheh new town. The result of spatial analysis through the Average Nearest Neighborhood shows that the nearest neighborhood ratio is 1.18, which indicates that the spatial distribution pattern of healthcare land use in Andisheh new town is random (figure 5.4.8 and table 5.4.11).

Table 5.4.11. Average Nearest Neighbor Summary of commercial land use through ArcMap

Average Nearest Neighbor Summary	
Observed Mean Distance:	564,4995 Meters
Expected Mean Distance:	478,0708 Meters
Nearest Neighbor Ratio:	1,180786
z-score:	1,198084
p-value:	0,230884

The random distribution pattern is also considered harmonic.

The location of health centers used by respondents regularly

As it is mentioned by respondents of the questionnaires, most of them (69.2%) use health centers located in Phase 3.

Table 5.4.12. Location of health centers used by respondents regularly

In which quarter are the health centers used by respondents, located?													
				Phase									
				2		3		4		5		6	
q20		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	Phase 2	18	4,4	11	17.74	4	2.70	0	0.00	3	5.00	0	0.00
	Phase 3	286	69,2	35	56.45	116	78.38	91	77.78	39	65.00	5	71.43
	Phase 4	32	7,7	3	4.84	9	6.08	17	14.53	3	5.00	0	0.00
	Phase 5	8	1,9	0	0.00	0	0.00	2	1.71	6	10.00	0	0.00
	None	50	12,1	13	20.97	19	12.84	7	5.98	9	15.00	2	28.57
	Total	395	95,6	62	100.00	148	100.00	117	100.00	60	100.00	7	100.00
Missing System		18	4,4										
Total		413	100										

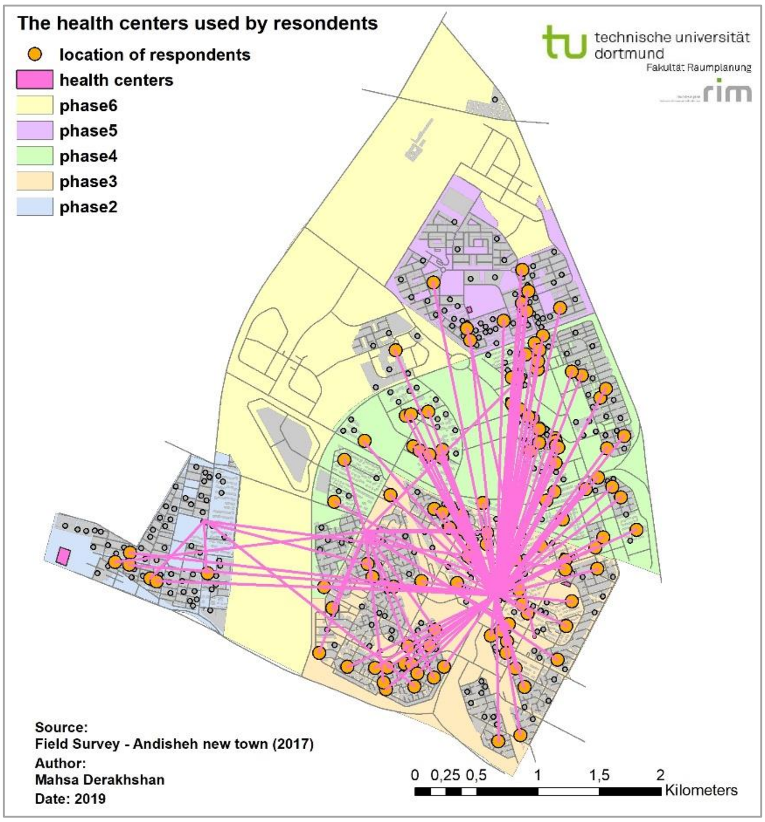


Figure 5.4.9. Location of health centers used by respondents

Through questionnaires, respondents are also asked to mention the name of the health centers, where they refer generally. Then, using ArcGIS, considering the address of respondents, the following map has been prepared, which specifies each respondent refers to which health center.

As can be seen in table 5.4.12, and the map 5.4.9, most of the residents refer to Andisheh Clinic that is located in Phase 3 in Azadi Blvd., which is the main street of this city.

The location of health centers used by respondents emergency

In comparison with the previous indicator, the result shows that more residents of Andisheh new town refer to emergency centers outside of this city rather than health centers in the Andisheh. However, the health centers of Phase 3 are still allocated more percentage of users to themselves.

Table 5.4.13. Location of the health centers used by respondents (emergency)

In which quarter are the health centers used by respondents, located?													
				Phase									
				2		3		4		5		6	
q21		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	Phase 2	32	7,7	27	42.86	2	1.40	0	0.00	3	5.00	0	0.00
	Phase 3	235	56,9	28	44.44	95	66.43	77	65.81	32	53.33	3	42.86
	Phase 4	31	7,5	0	0.00	11	7.69	17	14.53	3	5.00	0	0.00
	Phase 5	16	3,9	0	0.00	1	0.70	2	1.71	11	18.33	2	28.57
	none	76	18,4	8	12.70	34	23.78	21	17.95	11	18.33	2	28.57
	Total	391	94,7	63	100.00	143	100.00	117	100.00	60	100.00	7	100.00
Missing System		22	5,3										
Total		413	100										

Satisfaction with the health centers (regularly)

Most residents of Andisheh new town (32.7%) are dissatisfied with the health centers, where they refer regularly.

Table 5.4.14. Satisfaction with the quality of health centers

Satisfaction with the health centers									
					Phase				
q74	Freq	Perc	Valid	Cum	2	3	4	5	6

						Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very satisfied	23	5,6	5,8	5,8	1	1.67	8	5.48	9	7.38	5	8.20	0	0.00
	Satisfied	76	18,4	19,2	25,0	7	11.67	32	21.92	25	20.49	9	14.75	3	42.86
	neither satisfied nor dissatisfied	122	29,5	30,8	55,8	31	51.67	39	26.71	32	26.23	19	31.15	1	14.29
	dissatisfied	135	32,7	34,1	89,9	15	25.00	49	33.56	46	37.70	22	36.07	3	42.86
	very dissatisfied	40	9,7	10,1	100	6	10.00	18	12.33	10	8.20	6	9.84	0	0.00
	Total	396	95,9	100		60	100.00	146	100.00	122	100.00	61	100.00	7	100.00
Missing System		17	4,1												
Total		413	100												

Satisfaction with the health centers (emergency)

Although, most of the respondents are neither satisfied nor dissatisfied with the health centers they refer to in an emergency, in comparison with the previous indicator, it is notable that more respondents are dissatisfied with these centers.

Table 5.4.15. Satisfaction with the quality of health centers in an emergency

Satisfaction with the health centers															
						Phase									
						2		**3**		**4**		**5**		**6**	
q75		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very satisfied	24	5,8	6,0	6,0	2	3.33	9	7.03	9	7.38	4	6.56	0	0.00
	Satisfied	75	18,2	18,9	24,9	7	11.67	31	24.22	25	20.49	12	19.67	0	0.00
	neither satisfied nor dissatisfied	79	19,1	19,9	44,8	26	43.33	2	1.56	21	17.21	10	16.39	1	14.29
	dissatisfied	160	38,7	40,3	85,1	19	31.67	60	46.88	47	38.52	28	45.90	6	85.71
	very dissatisfied	59	14,3	14,9	100	6	10.00	26	20.31	20	16.39	7	11.48	0	0.00
	Total	397	96,1	100		60	100.00	128	100.00	122	100.00	61	100.00	7	100.00
Missing System		16	3,9												
Total		413	100												

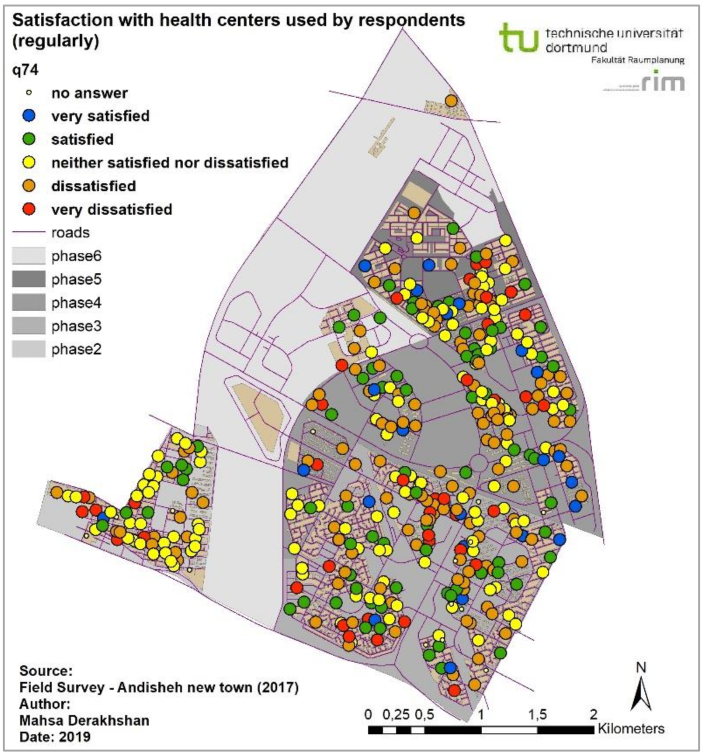


Figure 5.4.10. Satisfaction with hospital and health centers used by respondents of Andisheh new town (regularly) based on questionnaire through ArcMap

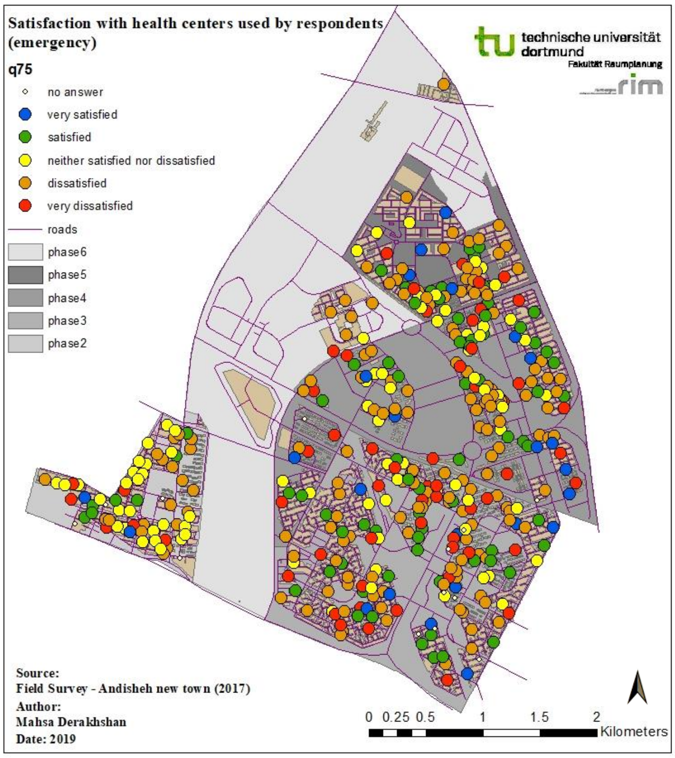


Figure 5.4.11. Satisfaction with hospital and health centers used by respondents of Andisheh new town (emergency) based on questionnaire through ArcMap

5.4.4 Green space and park

Nowadays, green space in cities is one of its essential elements. This land use includes parks and public green spaces that are accessible for all residents. Due to the population of Andisheh new town in 2017, this land use per capita is 2.36 m^2. The suggested green space per capita by United Nations is 20 – 24 m^2, the suggested green space per capita by the Ministry of Housing and Urban Development of Iran is 7-12 m^2, and the suggested green space in the detailed plan of this city is 12.00 m^2. Therefore, in comparison with the standard per-capita of Iran and its detailed plan, Andisheh new tow has a deficiency of green space and park for its residents.

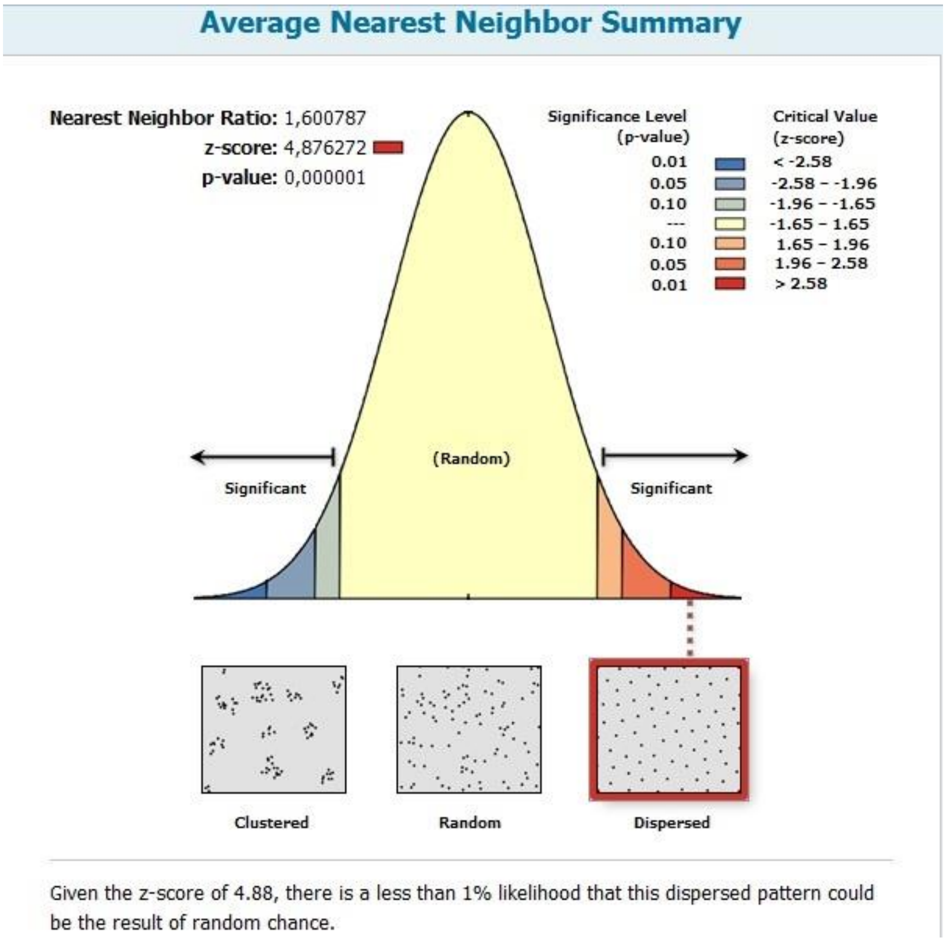


Figure 5.4.12. Spatial distribution pattern of green space in Andisheh new town through ArcMap

The result of spatial analysis through the Average Nearest Neighborhood shows that the nearest neighborhood ratio is 1.60, which indicates that the spatial distribution pattern of green space land use in Andisheh new town is dispersed. It means this land use is distributed regularly and homogeneous in the whole city (figure 5.4.12 and table 5.4.16).

Table 5.4.16. Average Nearest Neighbor Summary of green space through ArcMap

Average Nearest Neighbor Summary	
Observed Mean Distance:	608,6001 Meters
Expected Mean Distance:	380,1880 Meters
Nearest Neighbor Ratio:	1,600787
z-score:	4,876272
p-value:	0,000001

The location of public green space used by respondents

Based on the questionnaires, most of the respondents (53.0%) use public green space located in Phase 3.

Table 5.4.17. Location of public green space through SPSS and ArcMap – source: researcher

The location of public green space														
				Phase										
				2		**3**		**4**		**5**		**6**		
q24		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	Phase 2	32	7.7	25	40.32	4	2.90	3	2.54	0	0.00	0	0.00
	Phase 3	219	53.0	29	46.77	98	71.01	59	50.00	30	51.72	3	42.86
	Phase 4	56	13.6	2	3.23	19	13.77	27	22.88	8	13.79	0	0.00
	Phase 5	19	4.6	0	0.00	1	0.72	3	2.54	11	18.97	4	57.14
	None	57	13.8	6	9.68	16	11.59	26	22.03	9	15.52	0	0.00
	Total	383	92.7	62	100.00	138	100.00	118	100.00	58	100.00	7	100.00
Missing System		30	7.3										
Total		413	100										

Respondents are asked to mention the name of the public green spaces they use mostly; considering their answers the following map – 5.4.13 - is prepared using ArcGIS to illustrate the result.

It can be seen on the map, many of the respondents refer to public green spaces in other quarters as well as local green spaces in their neighborhoods.

Most residents use Boostan-e Hafez, which has appropriate facilities for children and adults and is also located in Phase 3 near Azadi Blvd. The other two public green spaces that are used more are Park-Jangali and Boostan-e Shohada-Hastei, which are located in Phase 3 at the entrance of this quarter. Park-e Madar (Banowan) is another park that is only for women. The idea behind it is that Iranian women are faced with imitations in public spaces and consequently in public green spaces, they cannot use the facilities of parks like men. Therefore, in this park, women can use all the facilities without any restrictions.

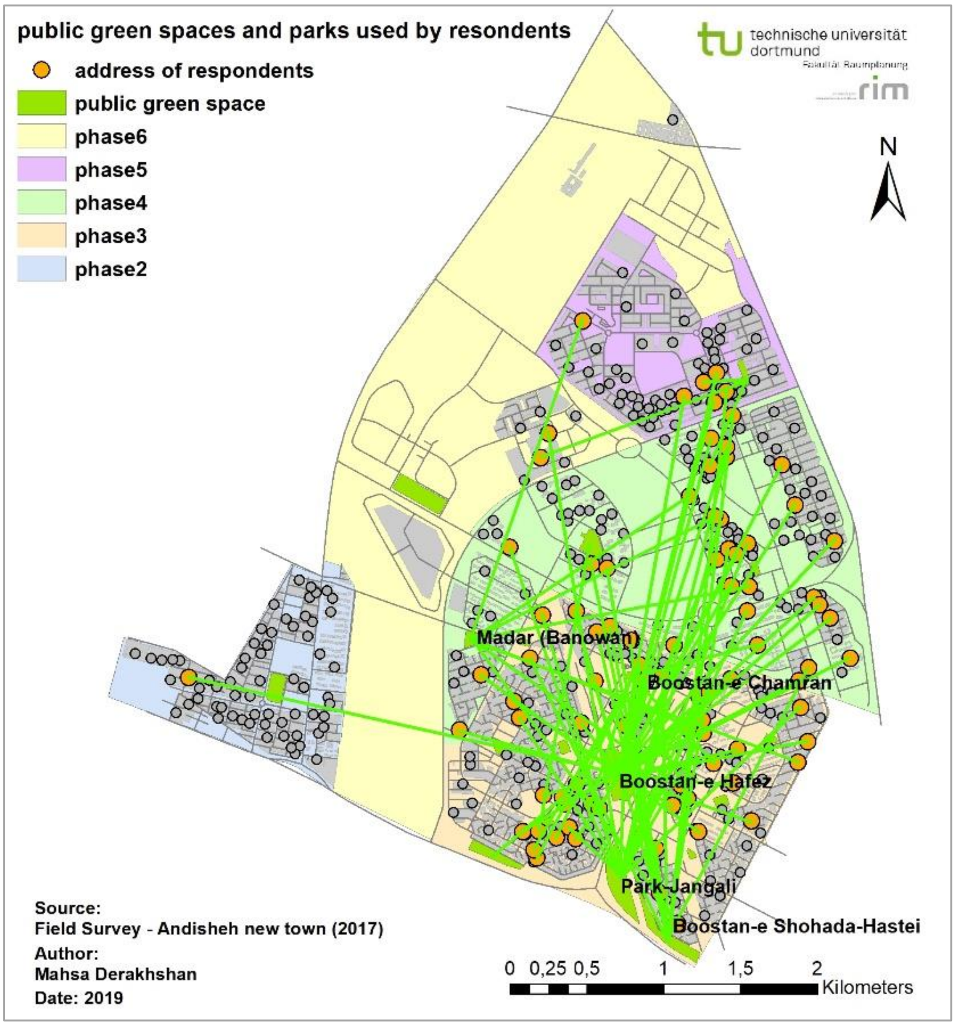


Figure 5.4.13. Location of public green spaces and parks used by respondents through ArcMap

Satisfaction with public green space in the neighborhood

Most respondents of the questionnaires are satisfied (27.8%) or dissatisfied (27.8%) with the local public green spaces in their neighborhoods. 33.33% of residents of Phase 3 are satisfied with local green space as presented in the following table. However, 43.33% of residents of Phase 2, 35.00% of residents of Phase 4, and 33.90% of residents of Phase 5 are dissatisfied with it.

Table 5.4.18, shows how respondents are satisfied with the public green space and park in their neighborhoods.

Table 5.4.18. Satisfaction with public green space in the neighborhood, based on questionnaires, analyzed through SPSS and ArcMap

Satisfaction with public green spaces in the neighborhood															
						Phase									
						2		3		4		5		6	
q71		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very satisfied	36	8,7	9,3	9,3	6	10.00	19	13.48	5	4.17	6	10.17	0	0.00
	Satisfied	115	27,8	29,7	39,0	18	30.00	47	33.33	33	27.50	15	25.42	2	28.57
	neither satisfied nor dissatisfied	91	22,0	23,5	62,5	8	13.33	37	26.24	30	25.00	13	22.03	3	42.86
	dissatisfied	115	27,8	29,7	92,2	26	43.33	25	17.73	42	35.00	20	33.90	2	28.57
	very dissatisfied	30	7,3	7,8	100	2	3.33	13	9.22	10	8.33	5	8.47	0	0.00
	Total	387	93,7	100		60	100.00	141	100.00	120	100.00	59	100.00	7	100.00
Missing System		26	6,3												
Total		413	100												

Satisfaction with public green space in Andisheh new town

The result indicates that respondents are satisfied or neither satisfied nor dissatisfied with the public green spaces in Andisheh new town. The respondents state that they are more dissatisfied with the green space in their neighborhoods rather than in Andisheh. 32.20% of respondents of Phase 5 are dissatisfied with this indicator, 34.72% of residents of Phase 3 , and 71.43% of residents of Phase 6 are satisfied with the green space of this city. However, 43.10% of residents of Phase2, and 35.00% of residents of Phase2 are neither satisfied nor dissatisfied with it.

Table 5.4.19. Satisfaction with public green space in Andisheh new town

Satisfaction with public green space in Andisheh new town															
						Phase									
						2		3		4		5		6	
q72		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very satisfied	32	7,7	8,2	8,2	8	13.79	13	9.03	6	5.00	5	8.47	0	0.00
	Satisfied	127	30,8	32,7	41,0	18	31.03	50	34.72	38	31.67	16	27.12	5	71.43
	neither satisfied nor dissatisfied	127	30,8	32,7	73,7	25	43.10	44	30.56	42	35.00	14	23.73	2	28.57
	dissatisfied	77	18,6	19,8	93,6	6	10.34	26	18.06	26	21.67	19	32.20	0	0.00
	very dissatisfied	25	6,1	6,4	100	1	1.72	11	7.64	8	6.67	5	8.47	0	0.00
	Total	388	93,9	100		58	100.00	144	100.00	120	100.00	59	100.00	7	100.00
Missing System		25	6,1												
Total		413	100												

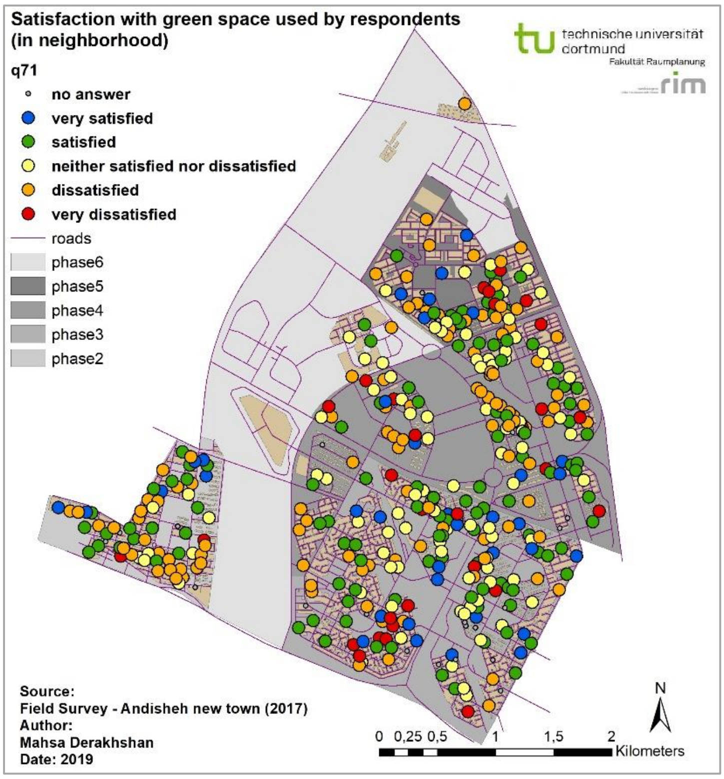


Figure 5.4.14. Satisfaction with green spaces and parks in neighborhoods used by respondents of Andisheh new town based on the questionnaires through ArcMap

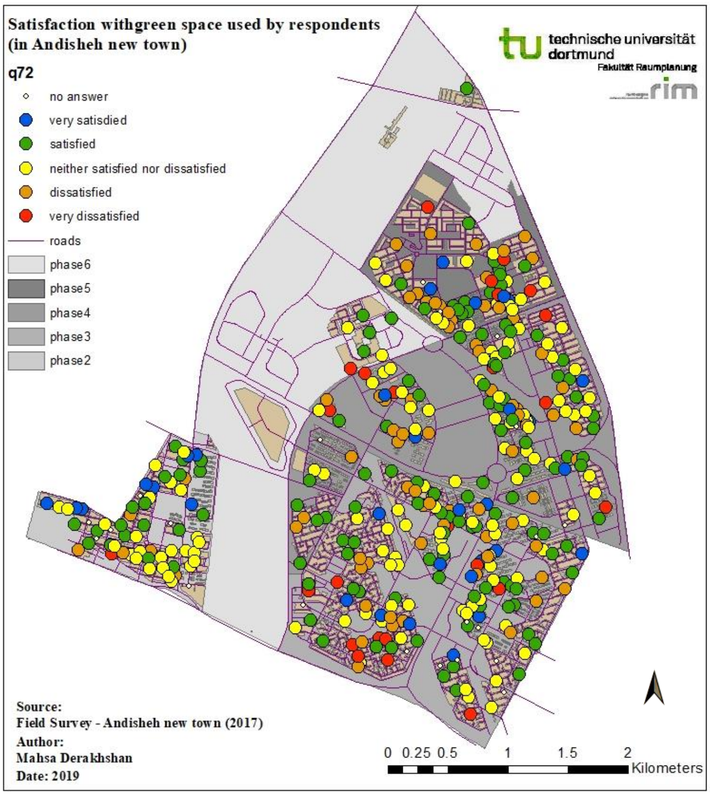


Figure 5.4.15. Satisfaction with green spaces and parks in Andisheh new town used by respondents of this city based on the questionnaires through ArcMap

Analyzing the relationships between Objective and Subjective land use

To answer the 3rd hypothesis **(H3)** that is "**higher objective measures of land use predicts higher satisfaction with land use**", Structural Equation Model (SEM) is applied to evaluate the relation between objective indicators of land use that are location, proportional amount, and average nearest neighbor of health centers, shopping centers, educational units, and green spaces and subjective indicators of land use that are satisfaction with health centers (used regularly or in emergence), satisfaction with shopping centers in the scale of neighborhood and city, satisfaction with educational units, and satisfaction with green spaces in neighborhood and city.

Structural equation modeling used 7 manifest subjective variables derived from the field survey to measure 1 latent subjective variable (subjective land use), and 12 manifest objective variables, which are summarized in 4 variables, to measure 1 objective variable (objective land use).

To study the hypothesis and to find out the correlation two hypotheses are defined:

- H_0: there is no correlation between objective land use and satisfaction with land use (subjective land use).
- H_1: there is a correlation between objective land use and satisfaction with land use (subjective land use).

Table 5.4.20. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
objective land use → satisfaction with land use	-0.03	-0.534	0.549	no correlation

Considering the t-value that should be more than 1.96 or less than -1.96 and the p-value, which should be less than 0.05 to be significant, it can be concluded that the H_0 is not rejected. Therefore, there is not any correlation between objective land use and subjective land use.

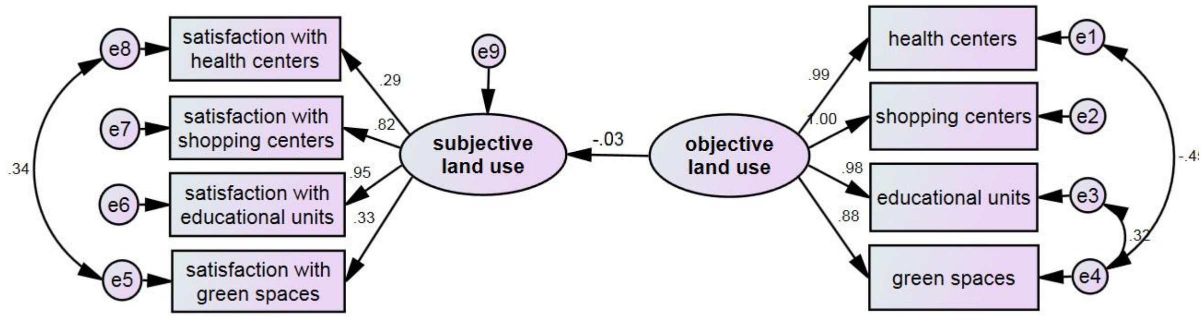


Figure 5.4.16. Structural Equation Modelling: path analysis model to investigate the relationship between objective land use and satisfaction with land use (subjective land use)

In this model, the root mean square error of approximation (RMSEA) is 0.00, and the chi-squared test (X^2/ df) is 0.818. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.992, adjusted goodness of fit index (AGFI) is 0.98, comparative fit index (CFI) is 1, normed fit index (NFI) is 0.997, non-normed fit index or Tucker-Lewis index is 1, and incremental fit index is 1, these values of indices indicate the good fit of the model.

Table 5.4.21. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.00
chi-squared test (x^2 / df)	< 3	0.818
goodness of fit index (GFI)	≥0.90	0.992
adjusted goodness of fit index (AGFI)	≥0.90	0.982
comparative fit index (CFI)	≥0.90	1
normed fit index (NFI)	≥0.90	0.997
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	1
incremental fit index (IFI)	≥0.90	1

5.5 Analysis of Layout of Andisheh new town

In this part, the main structure of Andisheh new town is described first. It includes the direction of urban development, limitation of development, natural elements inside and around the city, the pattern of Andisheh, road network, and building types of this city. Then, the main access network and the physical divisions of this city are explained. These elements are considered as the objective layout of Andisheh in this research. To assess the subjective layout of this city, three components of urban identity (see chapter 2) are physical setting, activities, and meaning that includes attributes such as satisfaction with structure, urban facilities, mixed land use, and access, as well as, social interaction, memory, symbols and signs, etc based on the perception and feeling of residents are analyzed. Both objective and subjective indicators used to analyze layout are presented in the structural model (figure 5.5.1)

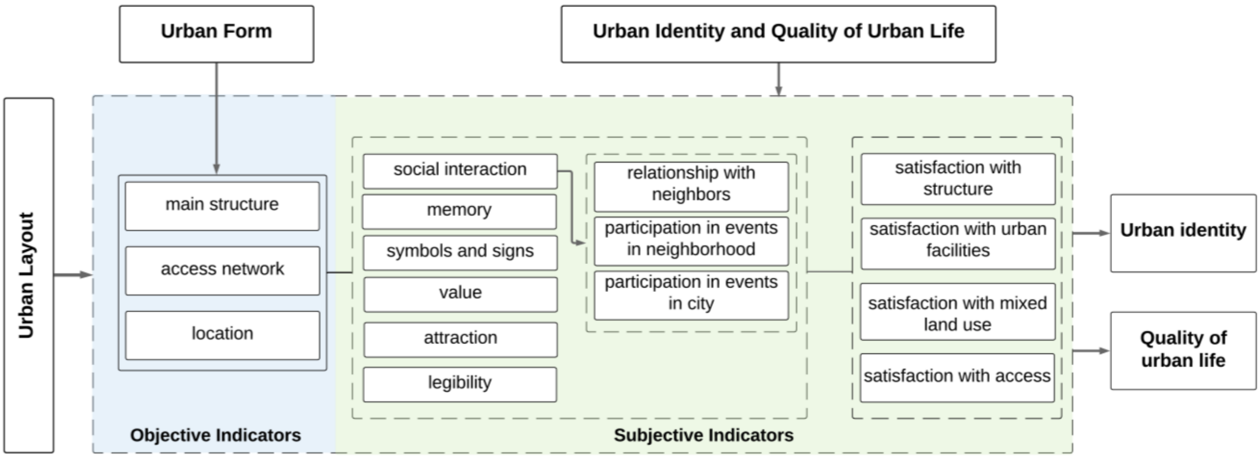


Figure 5.5.1. Structural model of indicators of layout in this research – source: researcher

5.5.1 The main structure of the whole city

The plan of Andisheh new town has been influenced by the limitations of urban development in different directions. From the north, this new town is surrounded by the Karaj region. Northeastern and southwestern of Andisheh new town are surrounded by faults of the Tehran region and Bouin-Zahra. The prevailing winds in the west and southwest axes have restricted urban development and the establishment of some land uses and activities such as industries in this city. Additionally, the Karaj-River in the eastern of this new town has limited the possibility of development of this city from the east. (*Comprehensive Plan of Andisheh new town*, 1995)

Andisheh new town is designed and planned as a single-core center including one CBD in the center of this city. It has an almost radial pattern and is designed along two main axes that at the point of their intersection there is a square. The road network is a hierarchical system (*Detailed Plan of Andisheh New Town*, 2003). The main north-south axis is the same axis of development and it is also considered as the primary road of Andisheh new town. Moreover, CBD (Bazar-e Irani – Eslami) and all the public buildings are located in line with the north-south axis (Azadi Blvd.). Bazar-e Irani - Eslami is located as the main shopping center of this city with the ability to service the region in the middle of this city and it is designed considering the principles of traditional Iranian-Islamic architecture of Naghshe-e-Jahan of Isfahan.

There are not any natural elements in this city, and due to the comprehensive plan of Andisheh new town, the construction of high-rise buildings (more than four floors) is limited because of the earth's resistance and ecological issues. Moreover, the existence of high voltage power networks, gas and oil pipelines, caused more limitations in using urban as well as reduction of effective use of land uses in the plan. (*Comprehensive Plan of Andisheh new town*, 1995)

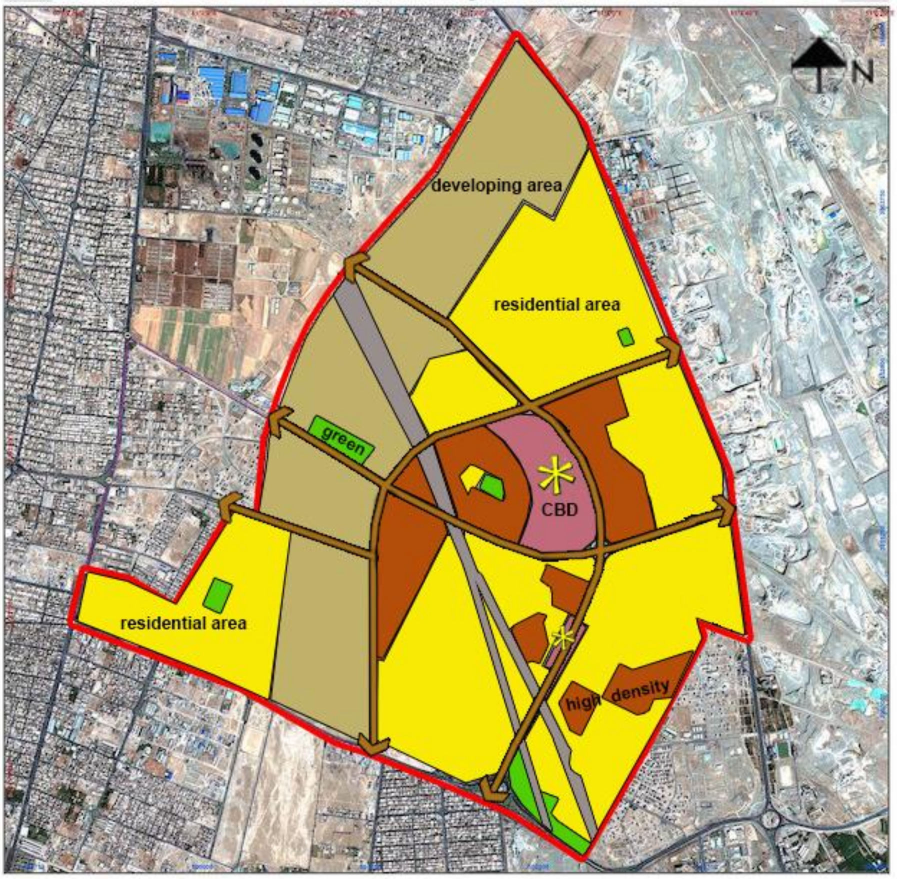


Figure 5.5.2. Main structure of Andisheh based on its Comprehensive Plan and current maps – researcher

5.5.2 Main access network

The road network of Andisheh new town is a hierarchical system. This city is developed along two main south-north axes: Azadi Blvd. and Shora Blvd, which are classified as the major arterial road in a hierarchical system and connect Phase3, Phase4, Phase5, and Phase6. The intersection of these two streets is named Khalij-e Fars (Persian Gulf).

The other major arterial road is Golha Blvd, which is the main west-east street in Andisheh. This street intersects Azadi Blvd and Shora Blvd. The intersection of Golha Blvd and Azadi Blvd is Shohada (Shohadaye Gomnam) square.

In the hierarchical system of roads in Andisheh, Minor arterial roads, collectors, and local streets are presented in the following map (Figure 5.5.3).

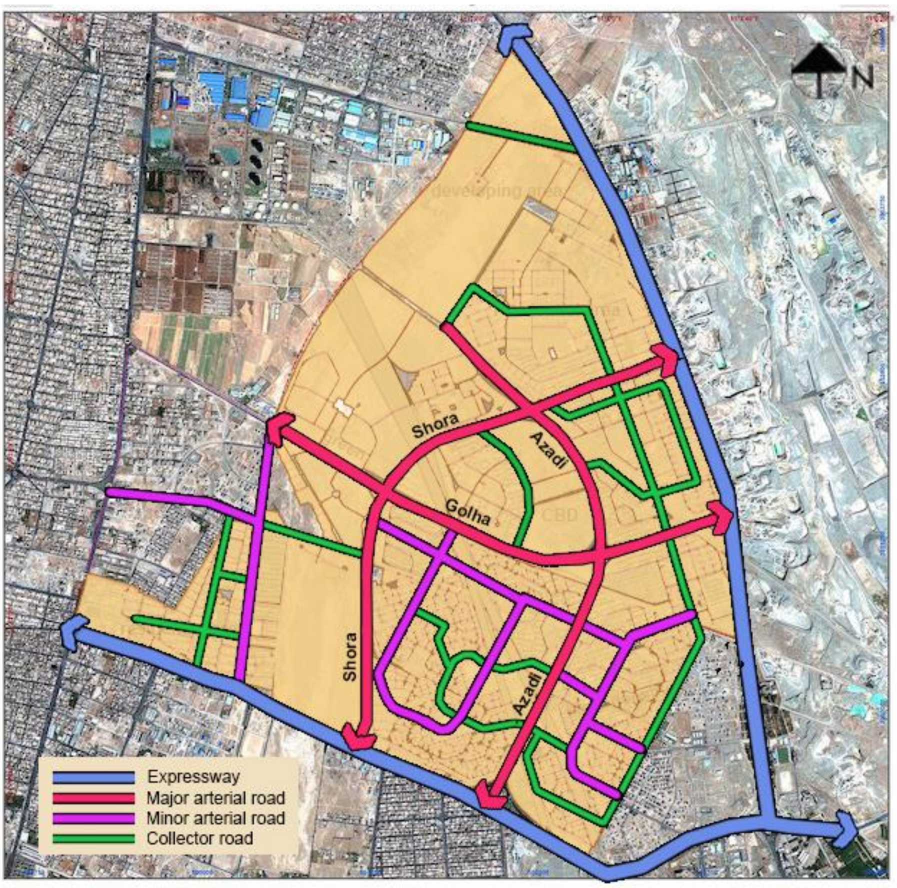


Figure 5.5.3. The hierarchy of roads network of Andisheh based on its Comprehensive Plan– researcher

5.5.3 The Physical Divisions in Andisheh new town

The hierarchy of physical divisions in Andisheh new town includes phases, neighborhoods, phase centers, nodes, and symbols (Hamidi et al., 1997) that are explained in this part as the other indicators of the urban layout.

Phases

Andisheh new town consists of five phases (quarters). The connection between Phase 2 and Phase 6 is not integrated with other phases of this city. Because the first phases are formed sooner, therefore, most of the building and as the sequence, most of the facilities and urban services have been distributed in these phases. Phase 6 is still under construction. In comparison between Phase 2 and 3, the residents of Phase 5 and 4 have more problems regarding urban services.

Neighborhoods

Due to the comprehensive plan of Andisheh new town, this city is subdivided into 59 neighborhoods. Phase 2 consists of 3 neighborhoods, Phase 3 consists of 43 neighborhoods, Phase 4 has 10 neighborhoods, Phase 5 has 1 neighborhood, and 2 neighborhoods are planned for Phase 6. Each residential neighborhood includes residential complexes, which are built by various organizations, or individual houses that help to enhance the distinguishability of these neighborhoods.

Phase Centers

Other than the main CBD of Bazar-e Irani – Eslami that is considered as not only city center of Andisheh new town but also the center of Phase 4, the center of Phase 3 is considered as a cultural center of the city, due to the cinema, library as well as commercial and cultural centers and mosque near each other.

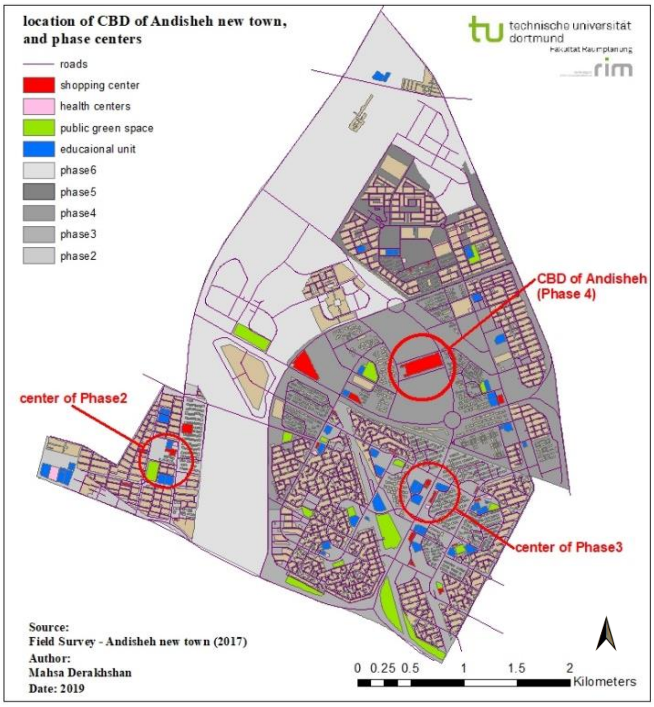


Figure 5.5.4. CBD and phase centers of Andisheh new town

Nodes

The main nodes in Andisheh new town are related to shopping and commercial centers that make functional and operational nodes. The square of Shohadaye Gomnam that is in the center of the city near the CBD in Phase 4, is considered as another node. Green spaces distributed in different parts of this city as well as administrative centers are considered as functional and operational nodes.

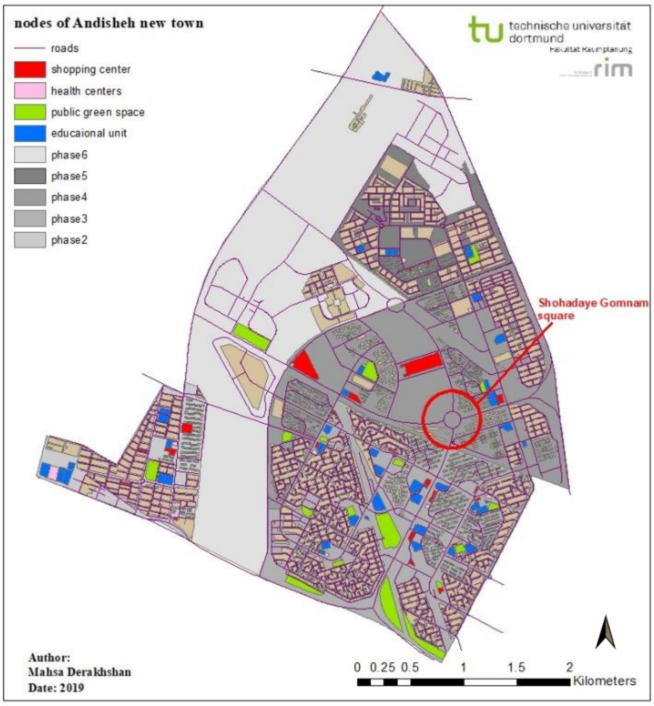


Figure 5.5.5. Nodes of Andisheh new town: Shohadaye Gomnam square, shopping centers, green spaces

Symbols

The first symbol of Andisheh new town is the entrance of this city, which is designed as a large green square including a unique structure as the symbol of this city. Bazar-e Irani – Eslami in Phase 4 can be mentioned as the other symbol of Andisheh new town.

Figure 5.5.6. The symbols of Andisheh new town: the entrance square and its structure

Figure 5.5.7. The symbols of Andisheh new town: the main CBD, Bazar Irani- Eslami

In the following parts, the subjective layout that is more related to components of urban identity is analyzed.

5.5.4 Physical Setting

As a component of urban identity, this indicator is analyzed based on the questionnaires through SPSS and ArcMap 10.2 in this part. It contains structure, facilities, and mixed land use.

Structure: Satisfaction with Structure of Andisheh new town

Considering the answers of respondents to questionnaires, most of them are satisfied with the structure of the city, when they are in it. They feel comfortable with the shape of streets, blocks of buildings, and the location of the main centers in the city. Table 5.5.1 represents how satisfied are the respondents with the structure of the city; figure 5.5.8 shows the location of respondents with their level of satisfaction.

Table 5.5.1. satisfaction with the structure of Andisheh new town

Satisfaction with the structure of the Andisheh new town															
						Phase									
						2		3		4		5		6	
q41		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	very satisfied	65	15,7	16,4	16,4	1	1.61	29	19.86	24	19.83	10	16.39	1	14.29
	satisfied	166	40,2	41,8	58,2	30	48.39	57	39.04	45	37.19	32	52.46	2	28.57
	somewhat	92	22,3	23,2	81,4	22	35.48	32	21.92	18	14.88	17	27.87	3	42.86
	dissatisfied	53	12,8	13,4	94,7	8	12.90	17	11.64	25	20.66	2	3.28	1	14.29
	very dissatisfied	21	5,1	5,3	100	1	1.61	11	7.53	9	7.44	0	0.00	0	0.00
	Total	397	96,1	100		62	100.00	146	100.00	121	100.00	61	100.00	7	100.00
Missing System		16	3,9												
Total		413	100												

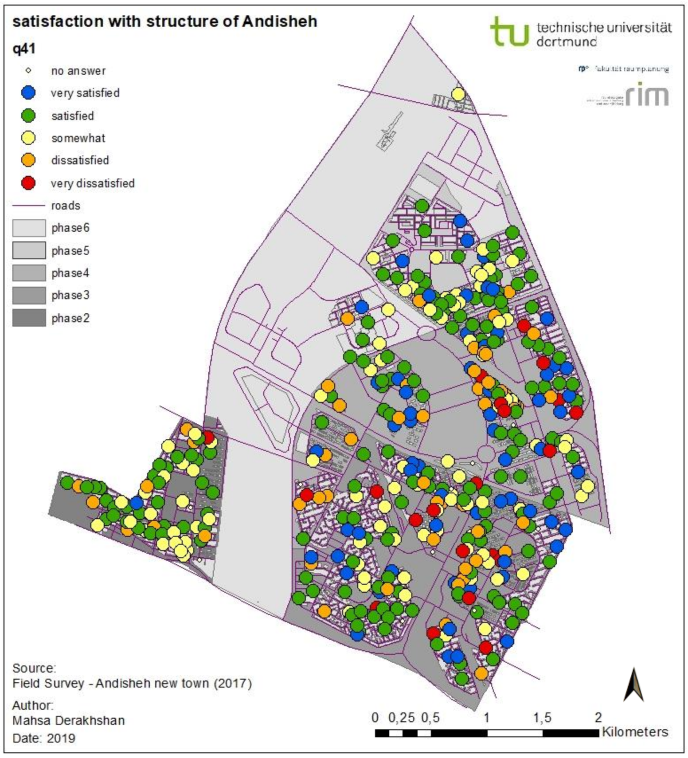


Figure 5.5.8. How residents of Andisheh are satisfied with the structure of this city

Facilities: Satisfaction with Urban Facilities in Andisheh new town

As it can be seen in table 5.5.2, most of the respondents (34.8%), as well as the respondents, live in Phase 2 (52.46%), Phase 3 (42.76%), and Phase 5 (30.51%) are satisfied and 25.21% of respondents of Phase 4 and 42.86% of respondents of Phase 6 are somewhat satisfied with the urban facilities such as street furniture, streetlight, bus shelter and benches in Andisheh new town.

Table 5.5.2. Satisfaction with the facilities of Andisheh new town

Satisfaction with urban facilities															
						Phase									
						2		3		4		5		6	
q79		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	very satisfied	49	11,9	12,5	12,5	7	11.48	16	11.03	18	15.13	8	13.56	0	0.00
	satisfied	142	34,4	36,3	48,8	32	52.46	62	42.76	29	24.37	18	30.51	1	14.29
	somewhat	90	21,8	23,0	71,9	8	13.11	32	22.07	30	25.21	17	28.81	3	42.86
	dissatisfied	50	12,1	12,8	84,7	8	13.11	17	11.72	15	12.61	9	15.25	1	14.29
	very dissatisfied	60	14,5	15,3	100	6	9.84	18	12.41	27	22.69	7	11.86	2	28.57
	Total	391	94,7	100		61	100.00	145	100.00	119	100.00	59	100.00	7	100.00
Missing System		22	5,3												
Total		413	100												

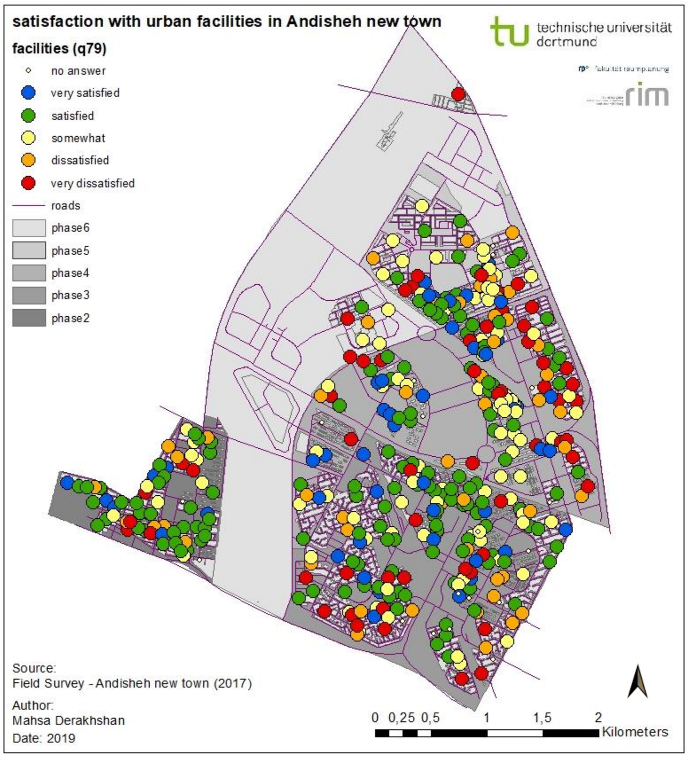


Figure 5.5.9. How satisfied are residents of Andisheh with urban facilities?

Mixed Land Use: Satisfaction with Diversity of Land Uses in Andisheh new town?

In this part, respondents of questionnaires are asked how satisfied they are with the diversity of land uses in the whole city, and through the analyses using SPSS and ArcMap most of them are satisfied with mixed land use.

Table 5.5.3. Satisfaction with the diversity of land uses in Andisheh new town

Satisfaction with mixed land use															
						Phase									
						2		3		4		5		6	
q63		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	very satisfied	56	13,6	14,1	14,1	4	6.56	18	12.33	23	19.01	10	16.39	1	14.29
	satisfied	180	43,6	45,5	59,6	33	54.10	67	45.89	51	42.15	25	40.98	4	57.14
	somewhat	86	20,8	21,7	81,3	11	18.03	34	23.29	28	23.14	11	18.03	2	28.57
	dissatisfied	46	11,1	11,6	92,9	10	16.39	15	10.27	9	7.44	12	19.67	0	0.00
	very dissatisfied	28	6,8	7,1	100	3	4.92	12	8.22	10	8.26	3	4.92	0	0.00
	Total	396	95,9	100		61	100.00	146	100.00	121	100.00	61	100.00	7	100.00
Missing System		17	4,1												
Total		413	100												

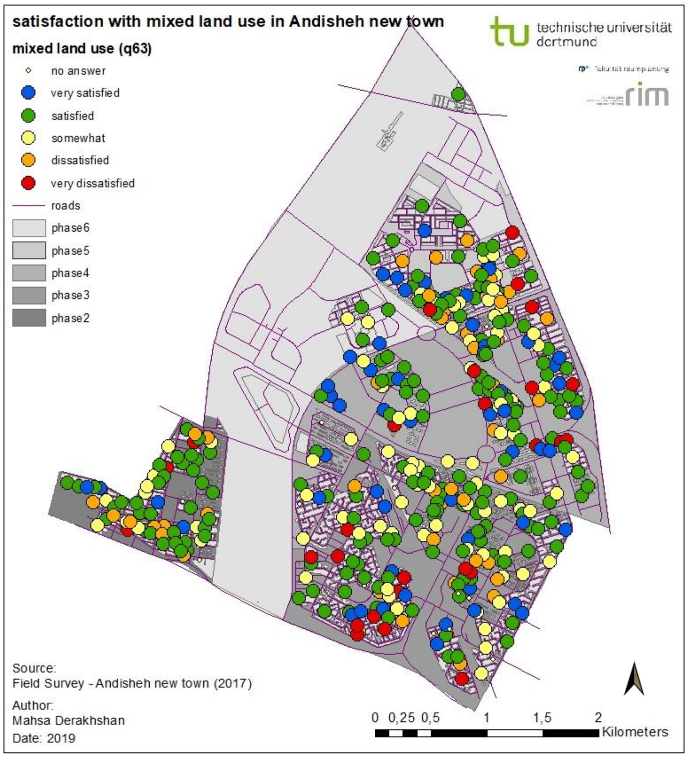


Figure 5.5.10. How satisfied are residents of Andisheh with mixed land use?

5.5.5 Activities

Activities as a component of urban identity is measured through two attributes that are access and social interaction. Satisfaction with access to different places or spaces in Andisheh new town, participation in events in neighborhood and city, relationship with neighbors, and satisfaction with relationships with neighbors are studied in the next parts.

Access: Satisfaction with Access to Various Places or Spaces in Andisheh new town

Considering the result of analyses through SPSS and ArcMap represented in table 5.5.4 most of the residents are somewhat satisfied with the access in the city.

Table 5.5.4. Satisfaction with the access to various places/ spaces in Andisheh new town

Satisfaction with access						Phase										
						2		3		4		5		6	
q78		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	very satisfied	42	10,2	10,5	10,5	7	11.48	8	5.41	15	12.30	11	18.03	1	14.29
	satisfied	159	38,5	39,8	50,4	38	62.30	53	35.81	45	36.89	22	36.07	1	14.29
	somewhat	85	20,6	21,3	71,7	9	14.75	33	22.30	29	23.77	13	21.31	1	14.29
	dissatisfied	72	17,4	18,0	89,7	3	4.92	37	25.00	17	13.93	11	18.03	4	57.14
	very dissatisfied	41	9,9	10,3	100	4	6.56	17	11.49	16	13.11	4	6.56	0	0.00
	Total	399	96,6	100		61	100.00	148	100.00	122	100.00	61	100.00	7	100.00
Missing System		14	3,4												
Total		413	100												

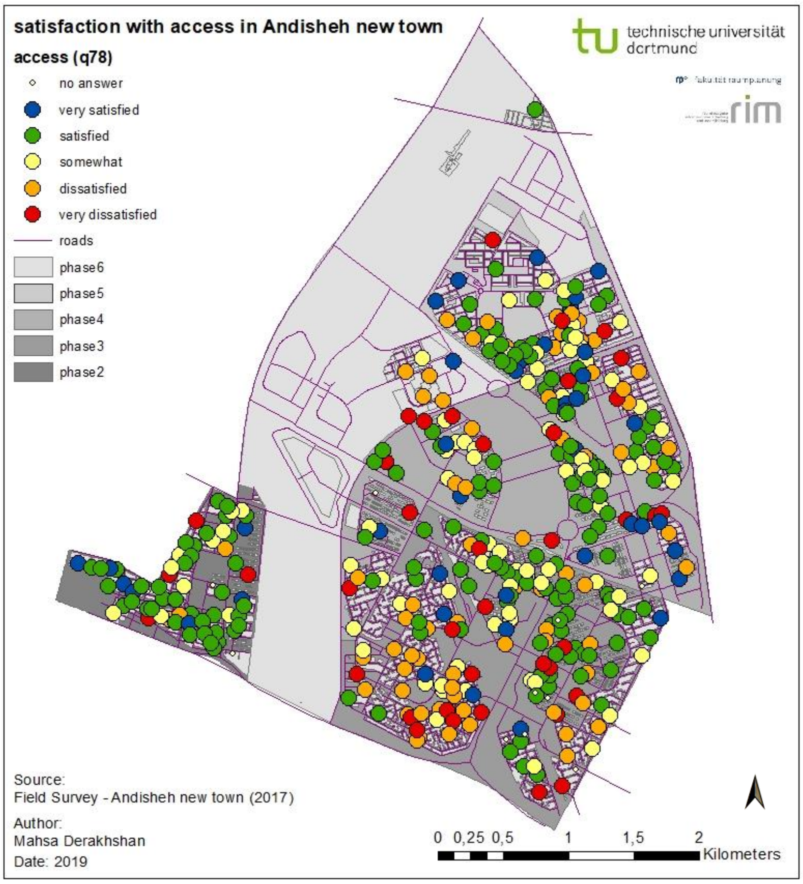


Figure 5.5.11. How satisfied are the residents with access to Andisheh new town?

Social Interaction: Participation in Events in Andisheh new town

Most of the respondents (57.1%) as well as residents of each phase stated that they never participate in any events in this city. (table 5.5.5)

Table 5.5.5. Participation of residents in events in the whole city

Participation in events in the city

q14		Frequency	Percent	Valid Percent	Cumulative	Phase									
						2		3		4		5		6	
						Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	every day	16	3,9	4,0	4,0	1	1.61	7	4.76	7	5.74	0	0.00	1	14.29
	once a week	24	5,8	6,0	10,0	7	11.29	3	2.04	8	6.56	4	6.56	2	28.57
	once a month	51	12,3	12,8	22,8	12	19.35	19	12.93	15	12.30	4	6.56	1	14.29
	once a year	72	17,4	18,0	40,8	13	20.97	29	19.73	20	16.39	10	16.39	0	0.00
	never	236	57,1	59,0	99,8	29	46.77	89	60.54	72	59.02	43	70.49	3	42.86
	Total	400	96,9	100	100	62	100.00	147	100.00	122	100.00	61	100.00	7	100.00
Missing System		13	3,1												
Total		413	100												

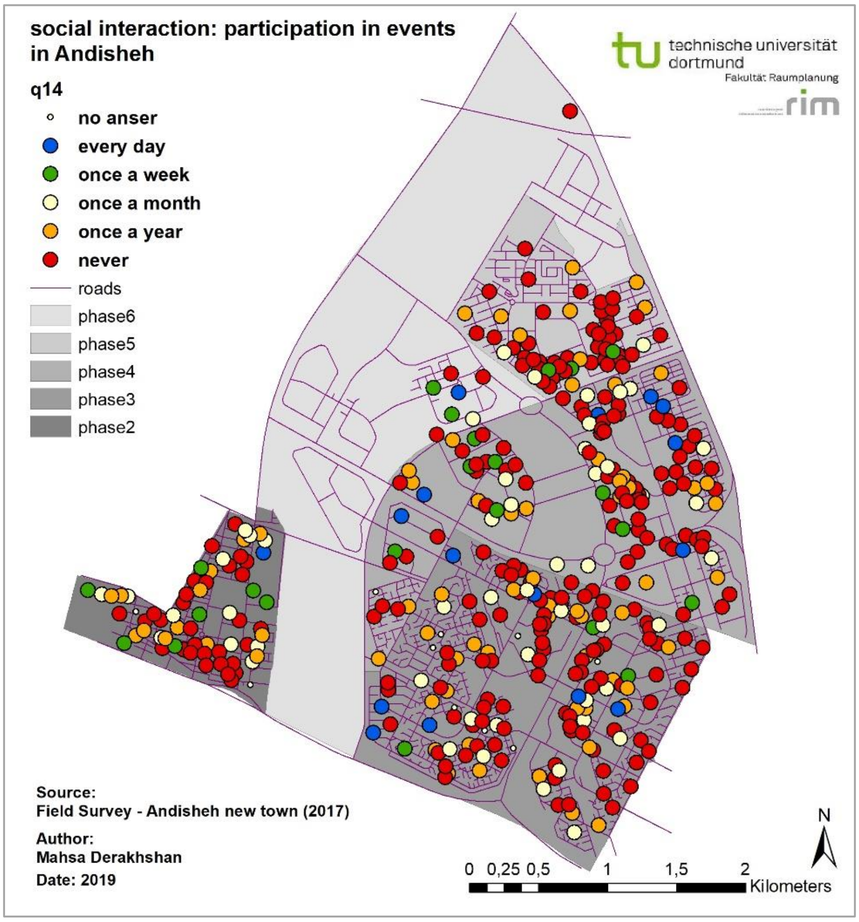


Figure 5.5.12. How often do the residents of Andisheh new town participate in the events in this city?

Social Interaction: Participation in Events in Neighborhood

The result shows that most of the respondents (49.6%) do not ever participate in any event in their neighborhoods. To compare with their participation in events in the city, it can be understood that residents prefer to attend some events in their neighborhood rather than the whole city.

Table 5.5.6. Participation of residents in events in the neighborhood

Participation in neighborhood															
						Phase									
						2		3		4		5		6	
q13		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	every day	10	2,4	2,5	2,5	0	0.00	3	2.04	6	4.96	0	0.00	1	14.29
	once a week	49	11,9	12,3	14,8	15	24.19	14	9.52	12	9.92	5	8.20	3	42.86
	once a month	75	18,2	18,8	33,6	13	20.97	23	15.65	29	23.97	10	16.39	0	0.00
	once a year	59	14,3	14,8	48,4	11	17.74	18	12.24	19	15.70	11	18.03	0	0.00
	never	205	49,6	51,4	99,7	23	37.10	89	60.54	55	45.45	35	57.38	3	42.86
	Total	399	96,6	100	100	62	100.00	147	100.00	121	100.00	61	100.00	7	100.00
Missing System		14	3,4												
Total		413	100												

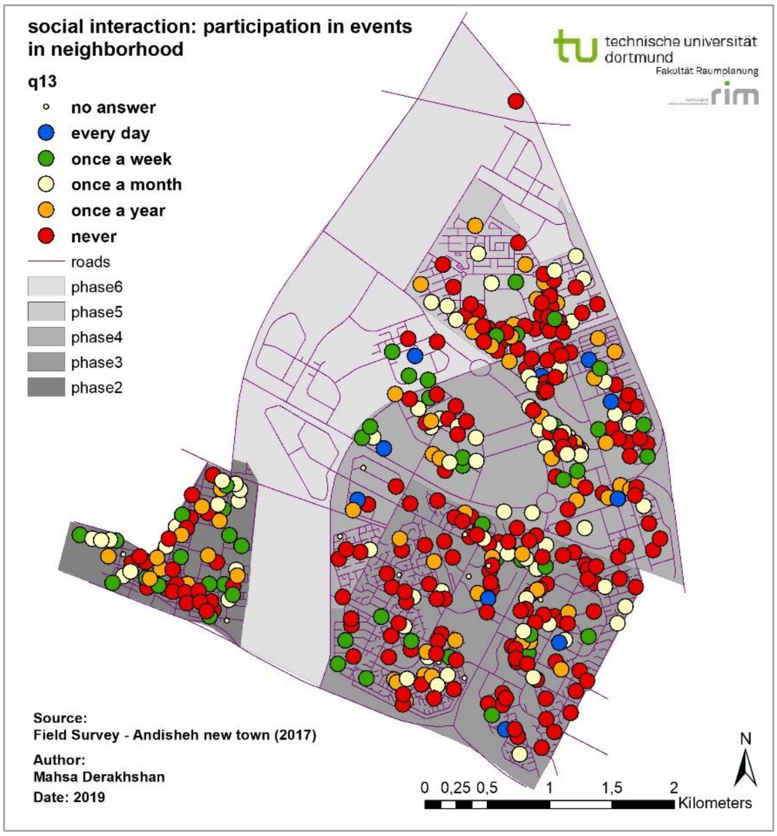


Figure 5.5.13. How often do the residents of Andisheh new town participate in the events in neighborhoods?

Social Interaction: Relationship with Neighbors

Relationships with neighbors is another question asked residents of Andisheh new town. The result of the analysis shows that 40.9% of respondents meet or visit their neighbors and spend time with them once a week.

Table 5.5.7. Relationships with neighbors

Relationship with neighbors															
						Phase									
						2		3		4		5		6	
q12		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	every day	90	21,8	22,3	22,3	8	12.70	40	26.67	31	25.20	7	11.48	4	57.14
	once a week	169	40,9	41,8	64,1	21	33.33	55	36.67	52	42.28	38	62.30	3	42.86
	once a moth	40	9,7	9,9	74,0	18	28.57	9	6.00	9	7.32	4	6.56	0	0.00
	once a year	23	5,6	5,7	79,7	5	7.94	12	8.00	5	4.07	1	1.64	0	0.00
	never	82	19,9	20,3	100	11	17.46	34	22.67	26	21.14	11	18.03	0	0.00
	Total	404	97,8	100		63	100.00	150	100.00	123	100.00	61	100.00	7	100.00
Missing System		9	2,2												
Total		413	100												

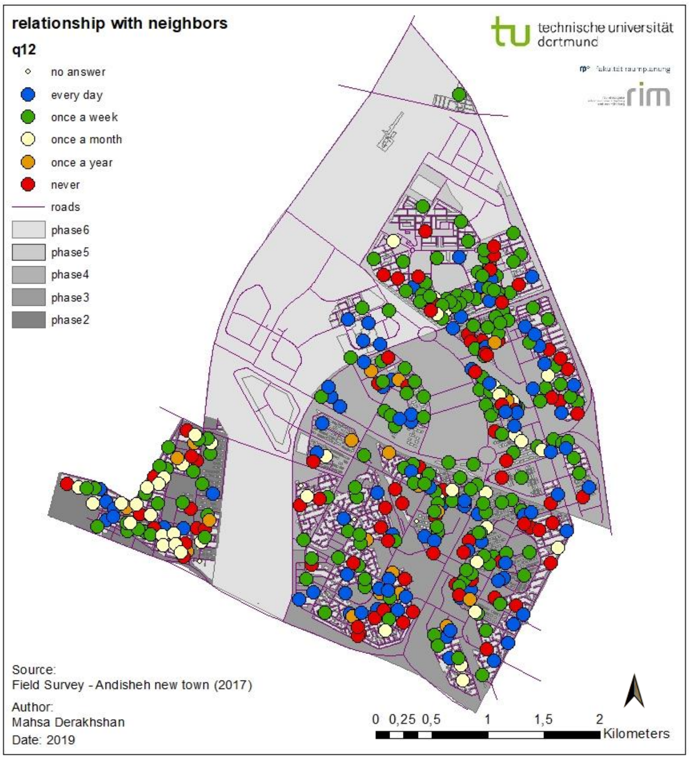


Figure 5.5.14. How often do the residents of Andisheh new town spend time with their neighbors?

5.5.6 Meaning

In this research, the meaning is measured through these attributes: symbols and signs, value, memory, attraction, and legibility.

Symbols and Signs: Specific Building/ Buildings to Address or Find the Route

To find out how people perceive the layout of Andisheh and the image of their city, the question “Is there any specific building/ buildings that you use for addressing or finding your route?” is asked respondents of questionnaires. The result shows that 40.1% of respondents remind many or so many specific buildings to find their route. The following table and map represent that respondents of Andisheh and each phase have how many specific buildings in their minds.

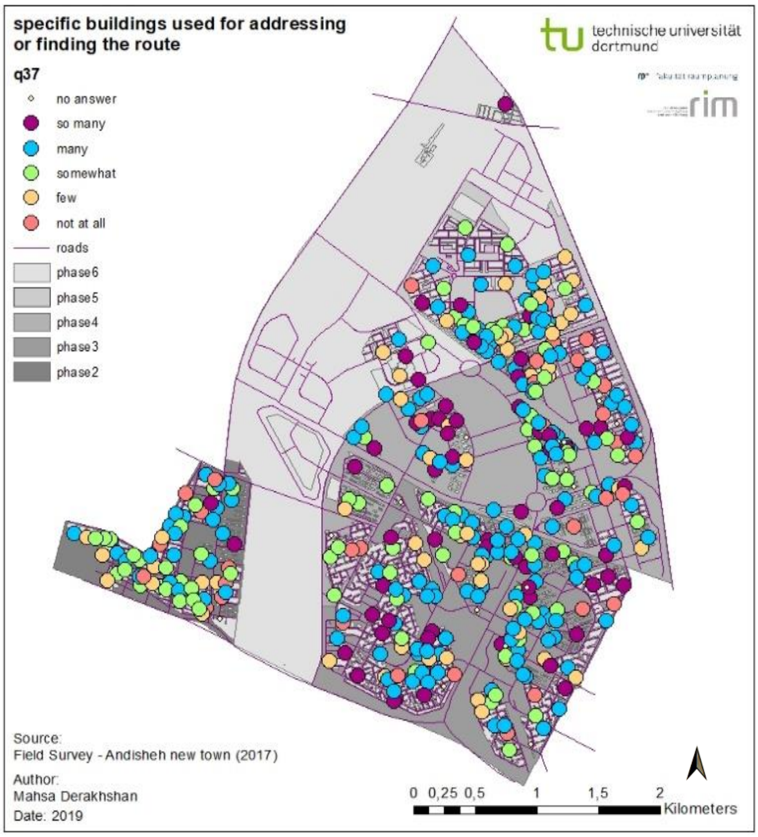


Figure 5.5.15. How residents use specific buildings for addressing or finding the route

Table 5.5.8. Specific buildings used for addressing or finding the route

Specific building/ buildings to address or find the route																
						Phase										
						2		3		4		5		6		
q37		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	so many	60	14,5	15,3	15,3	1	1.59	28	19.31	23	19.83	5	8.20	3	42.86
	many	157	38,0	40,1	55,4	22	34.92	64	44.14	44	37.93	26	42.62	1	14.29
	somewhat	83	20,1	21,2	76,5	22	34.92	23	15.86	22	18.97	15	24.59	1	14.29
	few	57	13,8	14,5	91,1	9	14.29	22	15.17	11	9.48	13	21.31	2	28.57
	not at all	35	8,5	8,9	100	9	14.29	8	5.52	16	13.79	2	3.28	0	0.00
	Total	392	94,9	100		63	100.00	145	100.00	116	100.00	61	100.00	7	100.00
Missing System		21	5,1												
Total		413	100												

Value: Special Prideful Feature/ Features in Andisheh new town

In the question: “Is there any special feature/ features in Andisheh new town that you feel prideful?”, respondents are also asked to mention the feature, which they are proud of, but most of the respondents did not answer it. In general interviews with respondents, while filling out the questionnaires, some of them acknowledged that they are proud of the fact that the city is clean and beautiful, quiet and peaceful, as well as its green space.

Table 5.5.9. Special feature/ features that residents feel prideful

Proud of any special feature in Andisheh															
						Phase									
						2		3		4		5		6	
Q38		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	so many	46	11,1	12,3	12,3	1	1.59	16	12.03	29	25.89	0	0.00	0	0.00
	many	107	25,9	28,6	40,9	16	25.40	36	27.07	32	28.57	21	35.59	2	28.57
	somewhat	110	26,6	29,4	70,3	20	31.75	42	31.58	27	24.11	21	35.59	0	0.00
	few	68	16,5	18,2	88,5	24	38.10	18	13.53	12	10.71	10	16.95	4	57.14
	not at all	43	10,4	11,5	100	2	3.17	21	15.79	12	10.71	7	11.86	1	14.29
	Total	374	90,6	100		63	100.00	133	100.00	112	100.00	59	100.00	7	100.00
Missing System		39	9,4												
Total		413	100												

Although, 26.6% and 25.9% of respondents (most of them) indicate that there are somewhat or many features of Andisheh new town that they are proud of, most of the respondents of Phase 2 (38.10%) and Phase 6 (57.14%) state that there are few prideful features in this city. The following table and map show the result (table 5.5.9 and figure 5.5.16).

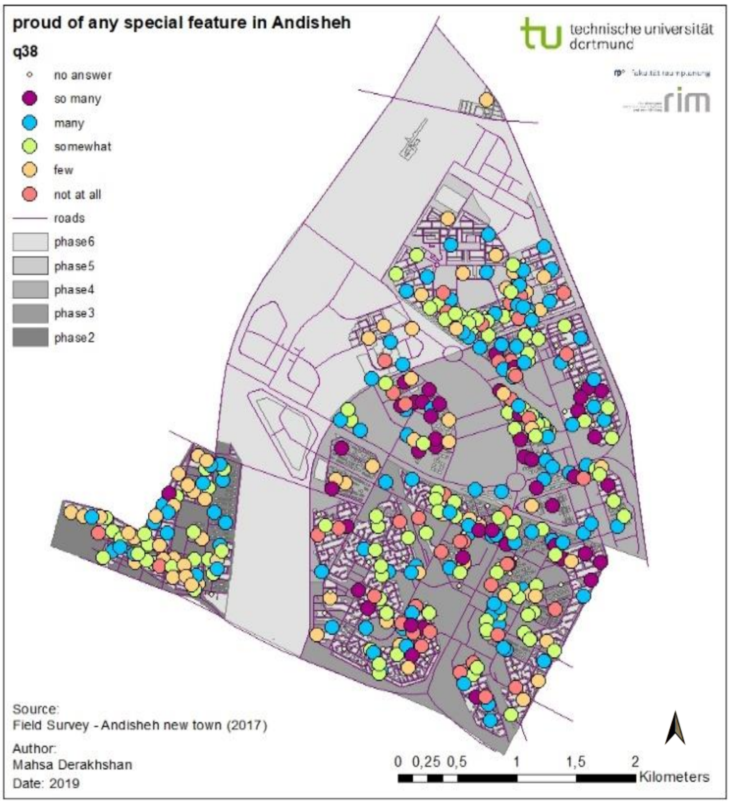


Figure 5.5.16. How residents of Andisheh think about special prideful features

Memory: Memorable Place in Andisheh new town

Respondents are asked to define if there is any memorable place that they have a special feeling about it, as it can be seen in table 5.5.10, there are few memorable places in Andisheh new town, as well as, Phase 2, Phase 3, and Phase 4. Based on the opinion of most of the residents, there is not any memorable place in Phase 5 and there are many memorable places in Phase 6.

Table 5.5.10. Memorable places in Andisheh new town

The memorable place that gives residents a special feeling									
					Phase				
q39	Freq	Perc	Valid	Cum	2	3	4	5	6

						Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	so many	16	3,9	4,3	4,3	0	0.00	5	3.68	10	9.62	1	1.67	0	0.00
	many	69	16,7	18,7	23,0	20	32.26	20	14.71	19	18.27	10	16.67	0	0.00
	somewhat	75	18,2	20,3	43,4	8	12.90	30	22.06	23	22.12	12	20.00	2	28.57
	few	112	27,1	30,4	73,7	23	37.10	41	30.15	31	29.81	16	26.67	1	14.29
	not at all	97	23,5	26,3	100	11	17.74	40	29.41	21	20.19	21	35.00	4	57.14
	Total	369	89,3	100		62	100.00	136	100.00	104	100.00	60	100.00	7	100.00
Missing System		44	10,7												
Total		413	100												

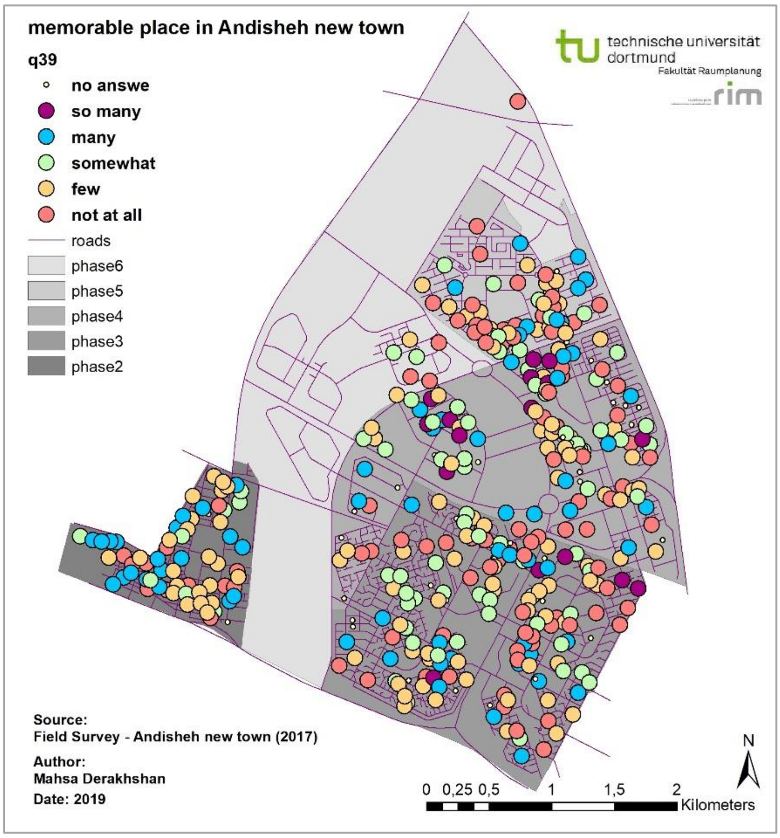


Figure 5.5.17. How residents of Andisheh think about the memorable places in this city

Attraction: Attractive Place/ Space in Andisheh new town

Although most of the respondents of Andisheh new town (33.5%) expressed that there are few attractive places/spaces in this city, they have mentioned various shopping complexes such as the main CBD, Bazar-e Irani-Eslami,

Arghavan and Negarestan, different public green spaces including Park-Jangali, Boostan-Chamran, Boostan-Hafez, and the entrance square of the city are attractive places.

Table 5.5.11. Attractive places/spaces in Andisheh new town

Attractive places or spaces															
					Phase										
					2		3		4		5		6		
q40		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	so many	22	5,3	5,8	5,8	3	4.76	7	5.19	8	7.14	4	6.56	0	0.00
	many	66	16,0	17,5	23,3	17	26.98	16	11.85	22	19.64	10	16.39	1	14.29
	somewhat	60	14,5	15,9	39,2	8	12.70	20	14.81	18	16.07	12	19.67	2	28.57
	few	155	37,5	41,0	80,2	29	46.03	59	43.70	37	33.04	26	42.62	4	57.14
	not at all	75	18,2	19,8	100	6	9.52	33	24.44	27	24.11	9	14.75	0	0.00
	Total	378	91,5	100		63	100.00	135	100.00	112	100.00	61	100.00	7	100.00
Missing System		35	8,5												
Total		413	100												

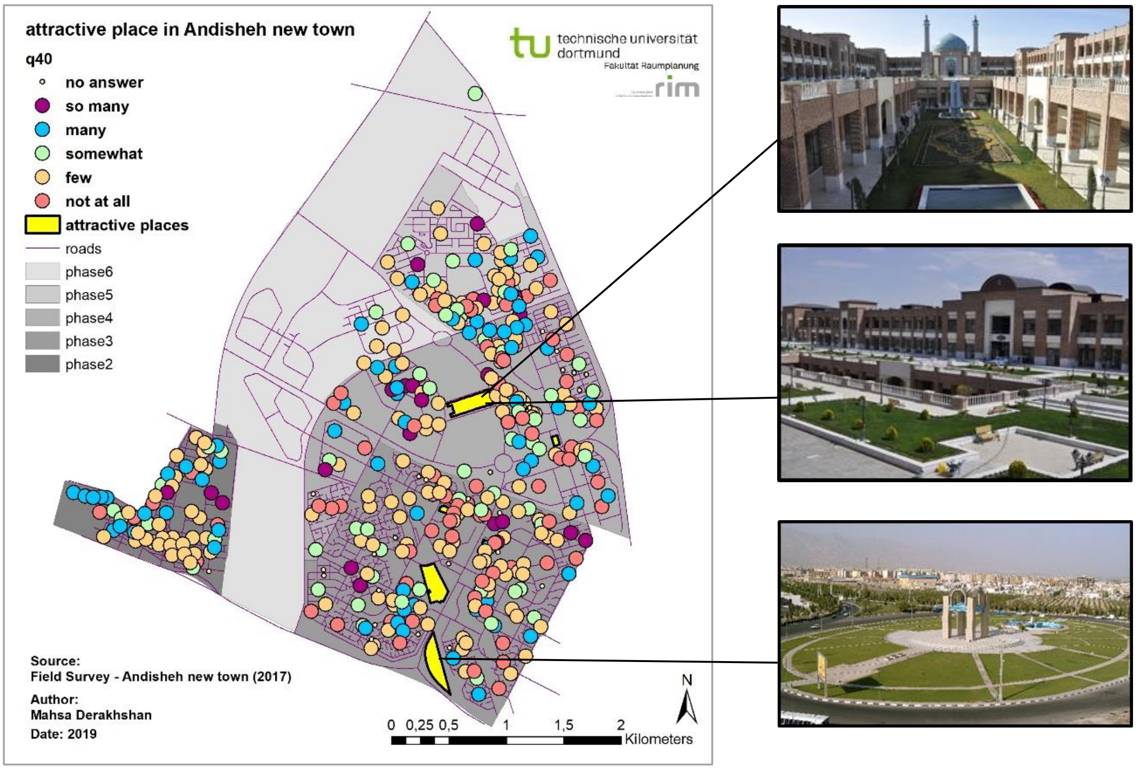


Figure 5.5.18. Map of how residents of Andisheh think about attractive places in this city and photos of the most attractive places: main CBD, Bazar-e Irani-Eslami, the entrance square

Legibility: Possibility to Find the Route in Andisheh

The indicator of legibility is a subjective indicator that is a component of urban identity and expresses meaning. Respondents are asked how it is possible to find their route in Andisheh new town. The questionnaires are analyzed through SPSS and ArcMap (10.2) and the result is presented in the following table 5.5.12 and map 5.5.19. As it can be seen in the table, most of the respondents of Andisheh (45,0%), Phase2

(58.82%), Phase3 (37.33%), Phase4 (50.82%), and Phase5 (42.62%) stated that it is easy to find their route in this city. However, residents of Phase6 (71.43%) find it very easy.

Table 5.5.12. Possibility to find the route in Andisheh new town

legibility															
						Phase									
						2		3		4		5		6	
q36		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	very easy	121	29,3	30,0	30,0	15	22.06	46	30.67	36	29.51	19	31.15	5	71.43
	easy	186	45,0	46,2	76,2	40	58.82	56	37.33	62	50.82	26	42.62	2	28.57
	neither easy nor difficult	69	16,7	17,1	93,3	5	7.35	38	25.33	17	13.93	9	14.75	0	0.00
	difficult	18	4,4	4,5	97,8	3	4.41	5	3.33	3	2.46	7	11.48	0	0.00
	very difficult	9	2,2	2,2	100	5	7.35	5	3.33	4	3.28	0	0.00	0	0.00
	Total	403	97,6	100		68	100.00	150	100.00	122	100.00	61	100.00	7	100.00
Missing System		10	2,4												
Total		413	100												

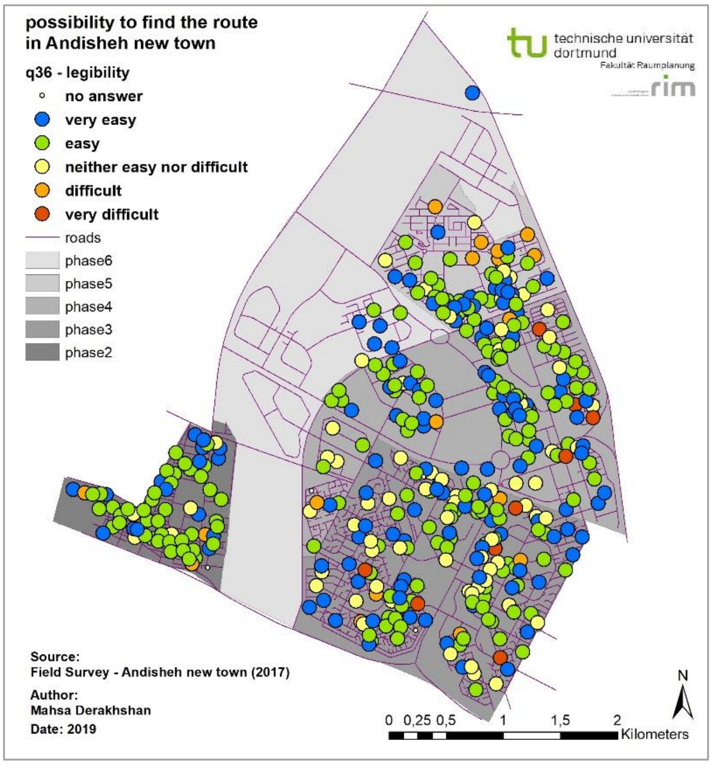


Figure 5.5.19. How residents of Andisheh find their route in their city

The Space Syntax analysis By UCL software predicts the legibility by analyzing the correlation between integration and connectivity. The closer the value of R^2 is to one, shows more legibility (Tarashi, 2018). R2 represents the correlation between connectivity and integration that is legibility. Based on the Space Syntax analysis paths that have the most legibility are shown on the map.

Figure 5.5.20. Legibility in Andisheh new town through Space Syntax Analysis, Depthmap software (scatter plot) – researcher

The amount of R^2 value is 0.477, which shows many streets in this city are not intelligible. The compression of the bottom of this graph also indicates that there are many illegible paths; however, the scattered points at the top of the graph show that there are high legible routes in Andisheh new town as well.

Analyzing the relationships between Objective and Subjective layout

To answer the 4th hypothesis **(H4)** that is "**measures of activities, meaning, and physical setting are in correlation**", Structural Equation Model (SEM) is applied to evaluate the relation between subjective indicators of layout. It includes subjective measures of meaning: attraction, memory, value, symbols and signs, and legibility, subjective measures of activities: the relationship between neighbors, and participation in events in the city and neighborhood, and subjective measures of physical setting: satisfaction with structure, urban facilities, mixed-land use, and access.

Structural equation modeling used 12 manifest subjective variables derived from the field survey to measure 3 latent subjective variables (subjective layout).

To examine the hypothesis and to find out the correlation two hypotheses are defined:

- H_0: there is no correlation between meaning, activities, and physical setting.

- H_1: there is a correlation between meaning, activities, and physical setting.

Table 5.5.13. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
meaning ⟷ activities	0.12	3.001	0.043	increasing
meaning ⟷ physical setting	0.04	0.782	0.434	no correlation
activities ⟷ physical setting	0.00	0.003	0.997	no correlation

to examine the correlation between meaning and activities, the t-value is more than 1.96 and the p-value is less than 0.05, it can be concluded that the H_0 is rejected. Therefore, there is a correlation between meaning and activities. The positive path coefficient indicates a positive correlation and a direct relationship between these two indicators. However, to examine the correlations between physical setting and meaning, as well as physical setting and activities, the t-value in both correlations is less than 1.96 and the p-value in both correlations is more than 0.05. Therefore, H_0 is not rejected here, and there is no correlation between physical setting and meaning, and physical setting and activities.

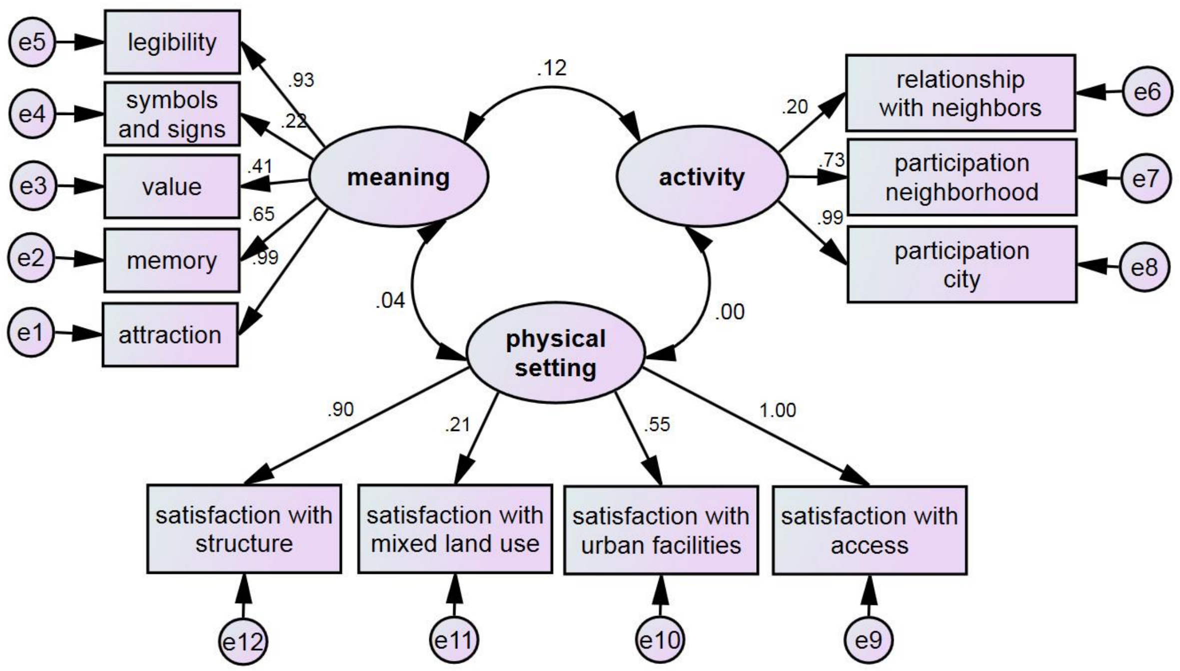


Figure 5.5.21. Structural Equation Modelling: path analysis model to investigate the relationship between subjective indicators of layout: meaning, activities, and physical setting

In this model, the root mean square error of approximation (RMSEA) is 0.062, and the chi-squared test (X^2/ df) is 2.560. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.951, adjusted goodness of fit index (AGFI) is 0.925, comparative fit index (CFI) is 0.966, normed fit index (NFI) is 0.945, non-normed fit index or Tucker-Lewis index is 0.956, and incremental fit index is 0.966, these values of indices indicate the good fit of the model.

Table 5.5.14. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.062
chi-squared test (x^2 / df)	< 3	2.560
goodness of fit index (GFI)	≥0.90	0.951
adjusted goodness of fit index (AGFI)	≥0.90	0.925
comparative fit index (CFI)	≥0.90	0.966
normed fit index (NFI)	≥0.90	0.945
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.956
incremental fit index (IFI)	≥0.90	0.966

5.6 Analysis of accessibility to selected land uses of Andisheh new town

Accessibility to land uses in this research is measured using Space Syntax and through the questionnaires applying the ArcGIS method to geocode data from respondents based on their addresses. First utilizing Space Syntax Analysis and Depthmap software are described. Afterward, the accessibility to the land uses and satisfaction with them based on the respondents of questionnaires are explained. The following structural model shows the objective and subjective indicators of accessibility in this research.

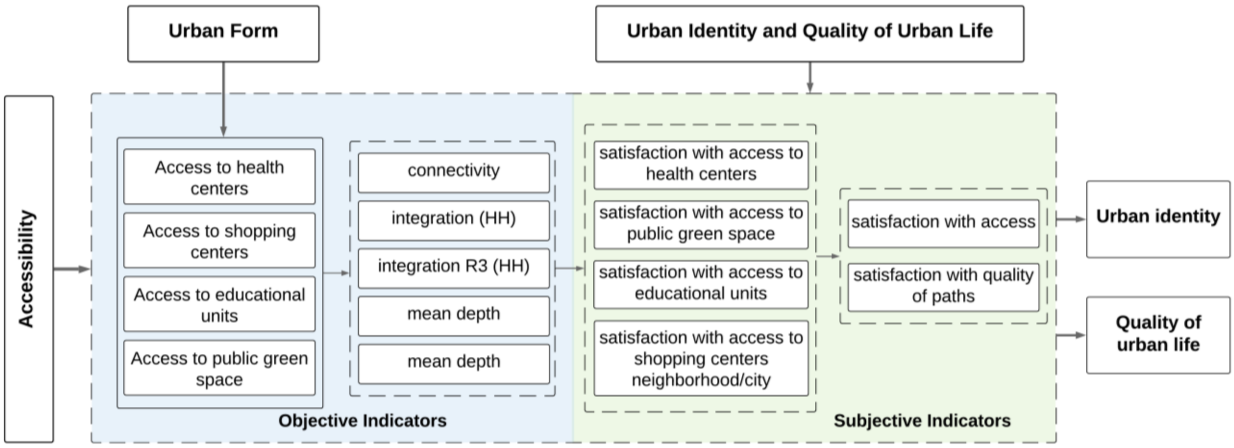


Figure 5.6.1. Structural model of indicators accessibility in this research – source: researcher

5.6.1 Preparing the map to analyze accessibility through Space Syntax

In this study, Depthmap software is applied to analyze the spatial configuration through the axial map to find out the access to selected land uses by measuring various indicators of Space Syntax. The main goal of using the Space Syntax method in this study is to investigate the indicators of connectivity, global and local integration, as well as mean depth and total depth; moreover to compare the accessibility of streets around the selected land uses. As explained before, the measure of connectivity indicates the connection of a street to other surrounded streets, mean depth shows how deep a space is to reach, and integration indicates the ability of urban form to encourage people to have the mobility that can be by car or on foot.

The presented axial map in this part is produced in the following steps:

The first step is to draw dxf map: A dxf map is produced by the researcher through hand-drawing: fewest lines that represent roads in AutoCAD software. For each road, the longest line is drawn and lines should intersect each other. In addition to the roads of Andisheh new town, the roads around this city in a radius of 3 Km are also drawn to have a more accurate analysis. This map is made up of 1969 lines.

The drawn map should be saved in .dxf format, so it can be used in the UCL Depthmap program. The next step is to convert dxf map to axial map and analyze axial map: dxf map should be converted to axial map in Depthmap software, through Tools menu: run graphic analysis. The new axial map has already the measures of connectivity. To analyze other measures such as degree of integration and mean depth other operations should be applied. Graph analysis is done with radius n and 3 (km). The analyses with radius n represent global integration and global mean depth; therefore local analyses are more accurate on an urban scale. By UCL software a wide range of analyses can be occurred such as legibility that can be predicted by analyzing the correlation between integration and connectivity and applied to investigate urban image.

The next two maps present a drawn map through AutoCAD and an axial map in Depthmap software.

Figure 5.6.2. Drawn lines of roads of Andisheh new town in AutoCAD before importing it to the Depthmap software

Figure 5.6.3. Map of connectivity of Andisheh new town after importing it to Depthmap and converting to axial map

5.6.2 Connectivity, integration, and mean depth in Andisheh new town

Depthmap analysis of connectivity value as well as global and local integration (HH) values and mean depth value are presented in the following maps. As can be seen in the map 5.6.5 and 5.6.6, there is more Integration (HH) in the local scale (R=3) analysis in comparison with the global Integration (HH).

Based on the Depthmap analysis Kharazmi Street seems to be the most connected road in the whole city (value of connectivity=25.00). It shows that this street also has the highest local and global integration (HH) degree, and the lowest mean depth value.

Figure 5.6.4. Depthmap analysis of connectivity value of Andisheh new town – source: researcher

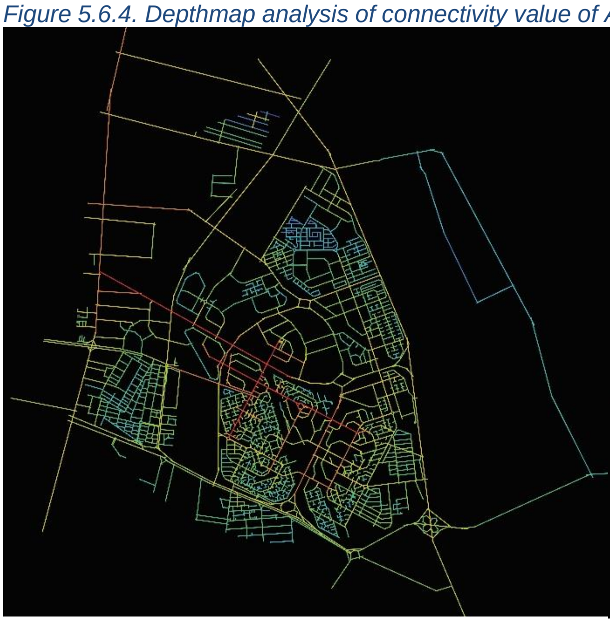


Figure 5.6.5. Depthmap analysis of global integration (HH) value of Andisheh new town– source: researcher

Figure 5.6.6. Depthmap analysis of local integration (HH) R3 value of Andisheh new town- researcher

Figure 5.6.7. Depthmap analysis of mean depth value of Andisheh new town– source: researcher

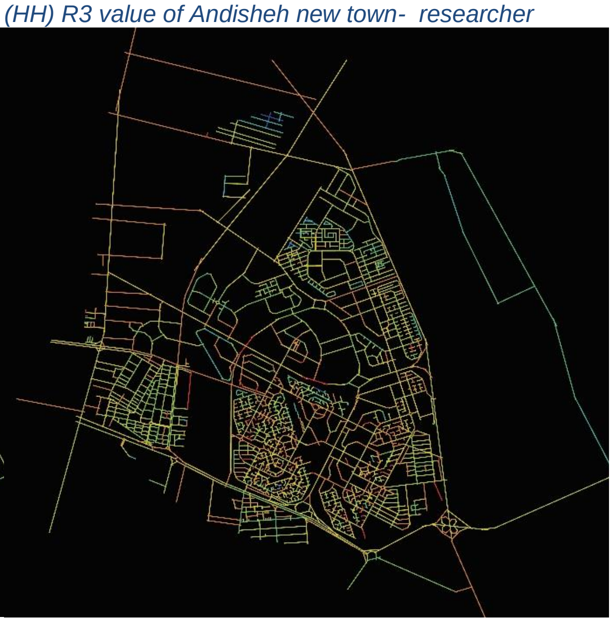


Figure 5.6.8. Depthmap analysis of mean depth (R3) value of Andisheh new town– source: researcher

Table 5.6.1. Highest values of measurement of connectivity and integration (HH) and lowest values of mean depth through Space Syntax analysis using Depthmap

measures	Connectivity	global Integration (HH)		local Integration (HH) R3	Mean depth		Mean depth R3
Street names	Kharazmi – Motahari	Kharazmi–Motahari	West Ferdowsi	Kharazmi–Motahari	West Ferdowsi	Kharazmi–Motahari	Erfan
value	25.00	1.37	1.37	3.67	7.08	7.07	1.50

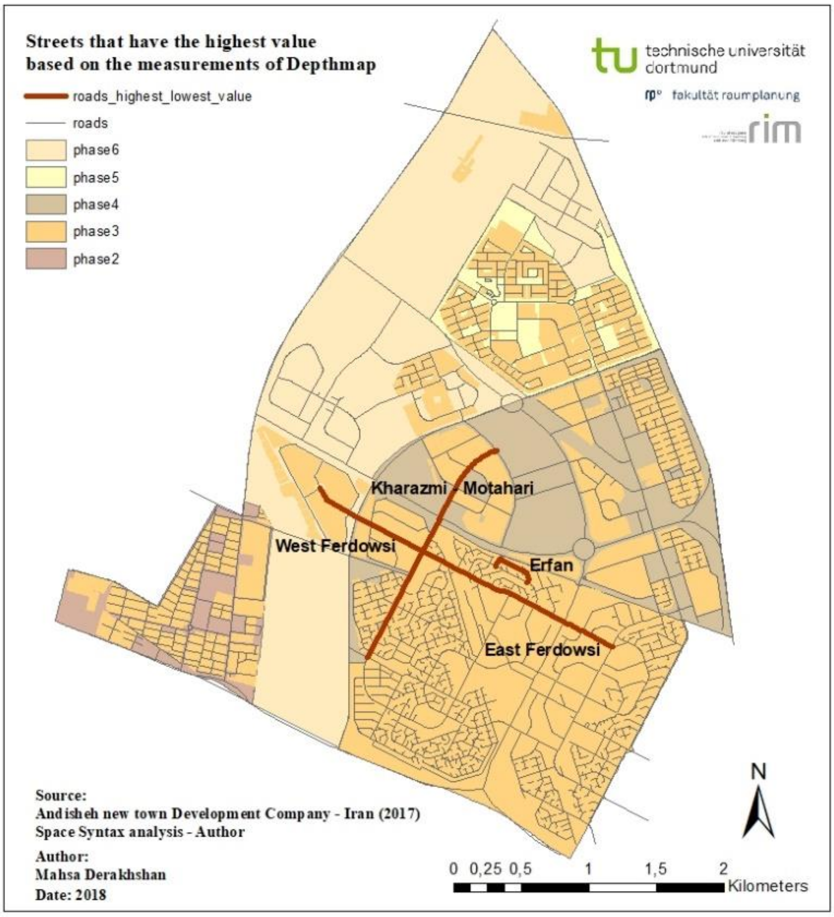


Figure 5.6.9. Location and names of the streets with the highest value in Depthmap

Which streets of Andisheh new town are used more by respondents of questionnaires?

The respondents are asked through questionnaires to mention the street or streets they use more; considering their answers and the number of streets that have been repeated, the following table and map are prepared. The main features of each street are also asked. People stated the features of Azadi Blvd., to be the main street, access to all other streets, wide width, access to shopping centers, access to health centers, availability of taxi stations, and surrounded by greenery. The other features that affect using other streets are the availability of taxi stations (North Tohid and South Tohid), access to CBD, or shopping centers (Yadegare Emam Blvd., Niloofar Blvd. South), access to shopping centers for daily needs (East Shahrdari).

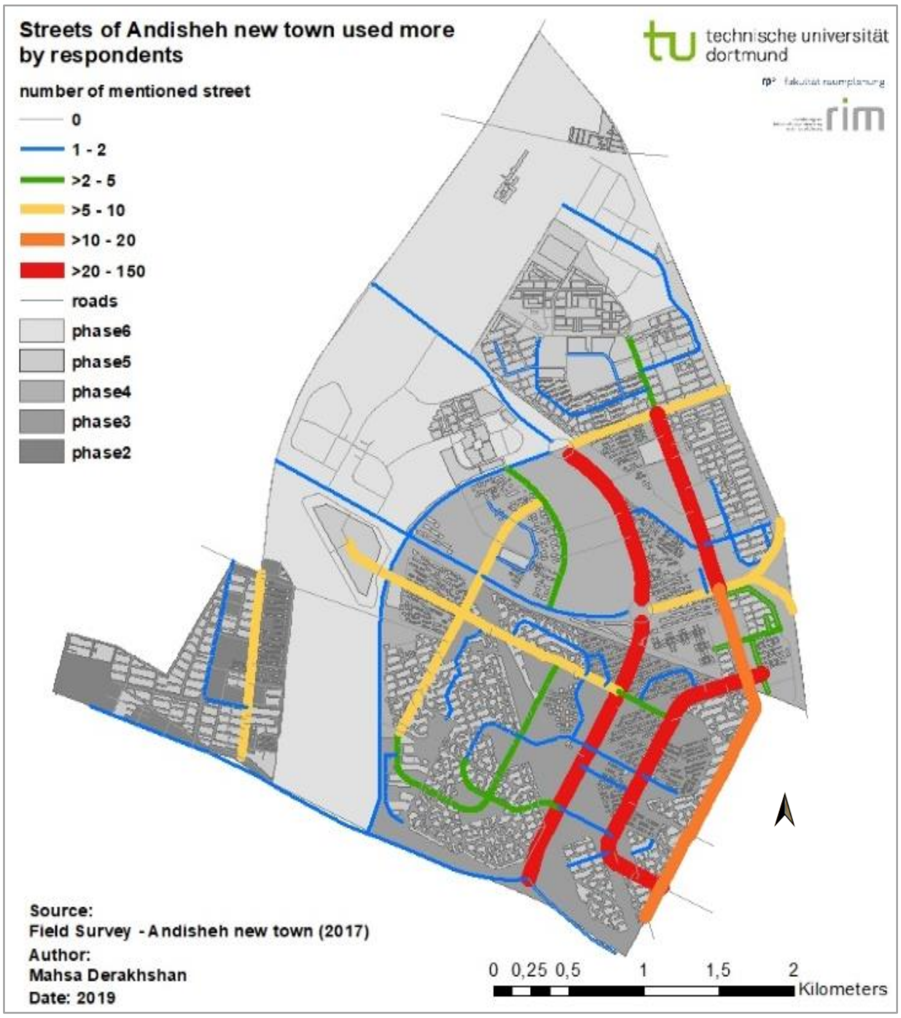


Figure 5.6.10. The streets used more by respondents through the questionnaires - source: researcher

To compare the result of Depthmap analysis and streets used more by residents the following table – table 5.6.2 – is prepared.

Table 5.6.2. Depthmap values of streets are used more by residents through Depthmap - source: researcher

Streets used by residents		Depthmap values				
Names of streets	F	connectivity	global Integration (HH)	local Integration (HH) R3	Mean depth	Mean depth R3
Azadi Blvd. South	165	10.00	1.273	2.804	7.563	2.523
Valiasr	30	11.33	1.104	2.749	8.664	2.449
North Tohid	23	11.00	1.076	2.863	8.766	2.583
South Tohid	12	11.00	1.030	2.694	9.107	2.511
East Golha Blvd.	10	6.00	1.037	2.208	9.058	2.559
West Ferdowsi	9	14.00	1.374	3.210	7.079	2.506
East Shora Blvd.	7	6.00	1.094	2.412	8.836	2.609
Motahari - Kharazmi	7	25.00	1.376	3.674	7.069	2.418
Niloofar Blvd. South	7	14.50	1.006	2.696	9.295	2.345
Boostan	5	7.25	1.073	2.621	8.844	2.510
Yadgare Emam Blvd.	5	3.40	1.013	1.754	9.326	2.395
Chamran	4	9.60	1.025	2.632	9.314	2.327
Dr. Hesabi	3	7.00	1.112	2.909	8.510	2.491
Emam Khomeini Blvd.	3	11.00	1.075	2.863	8.766	2.583
East Ferdowsi	3	10.00	1.323	2.886	7.313	2.521
Azadi Blvd. North	2	3.00	1.084	2.262	8.653	2.531

West Shora Blvd.	2	3.66	1.167	1.937	8.134	2.535

The analysis shows people use the streets with high amounts of integration value of the axial lines of the Andisheh new town. The most used streets are the main streets, which are usually wider than other routes. Less used streets are the secondary routes that are mainly located in the neighborhoods and their function is to be collectors that transfer the traffic to the main routes.

In the next parts, the measures of Space Syntax for selected land uses are analyzed through UCL Depthmap. The pattern of these measures shows each measure varies between different roads in Andisheh new town.

The objective of this section is to investigate the accessibility to four land uses including healthcare centers, educational units, public green spaces, and shopping centers by Space Syntax method therefore to measure the variables of space syntax, each land use is considered separately; connectivity, integration (HH) and mean depth are measured based on land use map in ArcMap and Depthmap.

The following five maps are prepared through the space syntax analysis.

Figure 5.6.11. Connectivity

Figure 5.6.12. Integration (HH)

Figure 5.6.13. Integration(HH) R3

Figure 5.6.14. Mean depth

Figure 5.6.15. Mean depth R3

To measure the variables of Depthmap all of these measures surrounded each place are considered and are written in a table, then the average amount of them is calculated and this final amount is imported in ArcGIS and connect to related land use. As an illustration, the Space Syntax analyses of some land uses are presented, then the table of Space Syntax analysis of all of the land uses and the degree of variables are shown.

5.6.3 Accessibility of shopping centers in Andisheh new town

Sadaf shopping center, which locates in phase three near the most connected and integrated road of this city, has the highest average value of connectivity (14.00), moreover, it has the most amount of local integration (HH) R3 value that is 3.118. Bazar-Zeitoon in Phase four has the most value of global integration (HH), which is 1.321 in Andisheh new town.

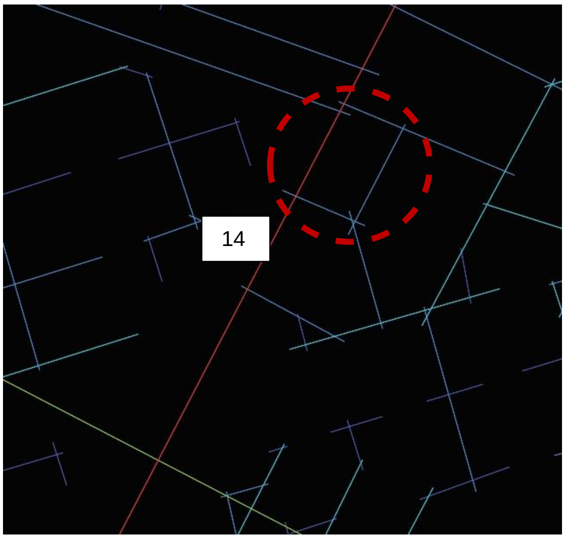


*Figure 5.6.16. The value of connectivity of Depthmap analysis of the **Sadaf** that is the most connected shopping center in Andisheh new town.*

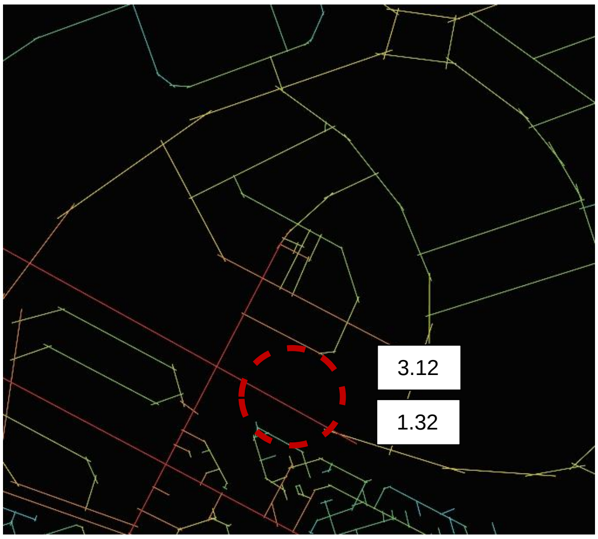


*Figure 5.6.17.The most value of integration (HH) of Depthmap analysis in Andisheh new town: **Bazar-Zeitoon***

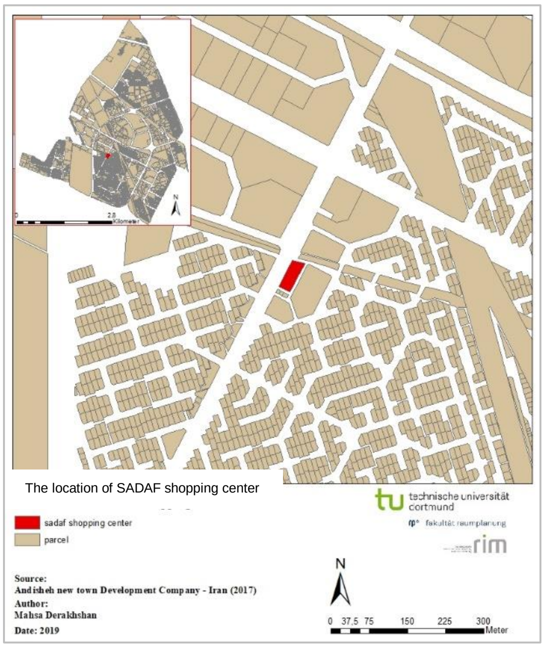


*Figure 5.6.18. The location of **Sadaf** shopping center in Andisheh new town*

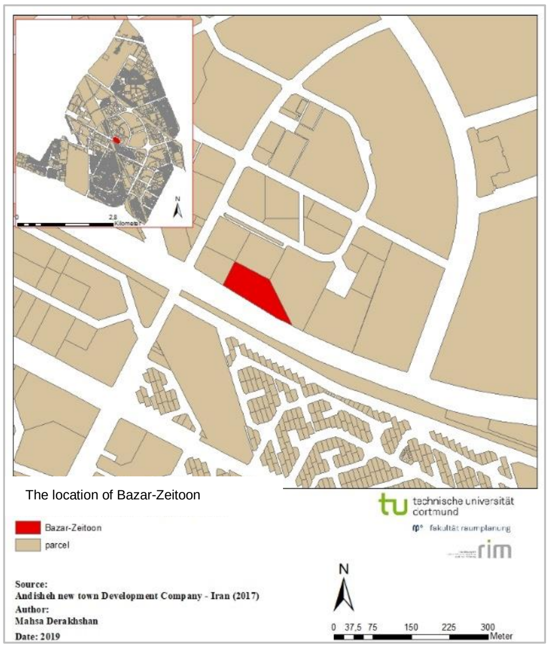


*Figure 5.6.19. The location of the shopping center of **Bazar- Zeitoon** in Andisheh new town*

The least average value of connectivity is 2.00; Golestan1 and Golestan2 in phase two of Andisheh new town have this value. The shopping center Golestan1 also has the lowest value of local integration (HH) R3 that is 1.023. Bazar- Golha in Phase 2 has the least average value of integration (HH), which is 0.751.

Analyzing the value of mean depth shows that Bazar-Golha has the most value of mean depth (12.139) and the least local mean depth R3 (2.341). In addition to the most value of integration (HH), Bazar Zeitoon has the least value of mean depth. City Star in Phase 3 has the highest value of local mean depth R=3.

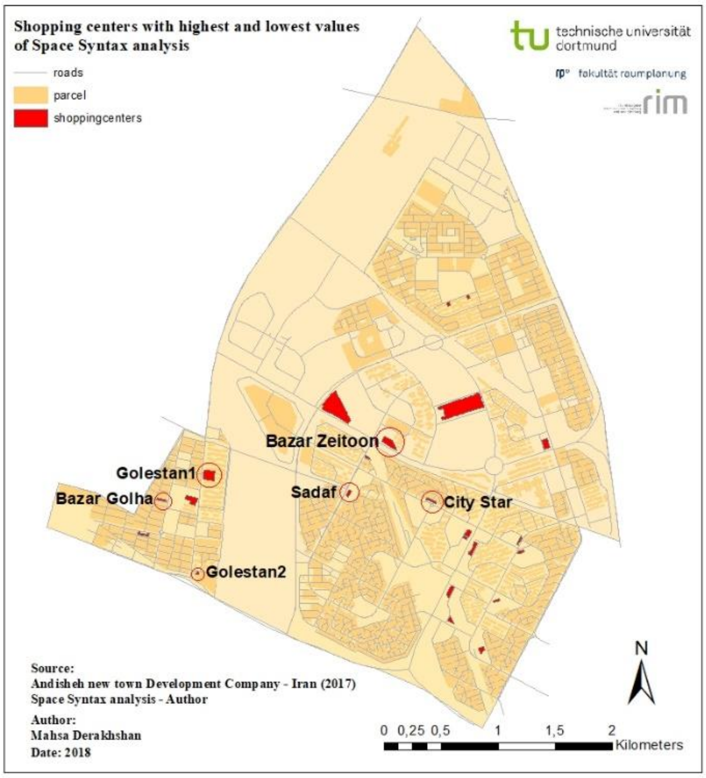


Figure 5.6.20. Shopping centers with the highest and lowest values of Space Syntax analysis

The following table detailed the average value of each measure of Space Syntax analysis of shopping centers in Andisheh new town. The highest and lowest values of each column are colored red and blue in order.

Table 5.6.3. Space Syntax analysis of shopping centers through Depthmap UCL software - researcher

Names of shopping centers In Andisheh new town	**Phase**	**Value of Space Syntax analysis**				
		Connectivity	Integration(HH)	Integration(HH) R3	Mean depth	Mean depth R3
Bazar-e Irani - Eslami	4	3.20	0.967	1.531	9.643	2.381
Bazar Zeitoon	4	9.00	**1.321**	3.039	7.322	2.599
Bazar Bozorg-Andisheh	3	5.33	1.134	2.247	8.429	2.608
Bazar Rooz-Niloofar	2	11.00	0.899	2.457	10.380	2.369
Bazar Golha	2	8.25	0.751	2.372	**12.139**	2.341
Bazare mahalli	3	9.50	1.183	2.742	8.074	2.529
Bazare Mive-Tarebar	3	4.00	1.103	2.055	8.596	2.651
City Star	3	5.25	1.269	2.317	7.592	**2.672**
Golestan	3	4.00	0.885	1.814	10.338	2.520
Arghavan	4	7.50	1.073	2.558	8.791	2.571
Boostan	3	10.00	1.148	2.704	8.138	2.522
Parshin	3	13.50	1.278	3.076	7.569	2.556
Tirajeh	3	9.00	1.271	2.771	7.572	2.541
Sadaf	3	**14.00**	1.281	**3.118**	7.557	2.546
Kosar	5	3.00	0.811	1.402	11.302	2.353
Yas	5	3.00	0.811	1.402	11.302	2.353
Golestan 1	2	**2.00**	0.910	1.023	10.179	2.438
Golestan 2	2	**2.00**	0.820	1.847	11.180	2.643
Mahestan	4	5.00	1.244	2.304	7.737	2.649
Milad	3	5.50	1.188	2.278	8.063	2.615
Negarestan	3	10.00	1.273	2.804	7.564	2.523
Negin	3	11.50	1.223	2.955	7.831	2.482
City Center2	2	5.00	0.769	2.082	11.864	2.511

Satisfaction with the access to shopping centers

How residents of Andisheh are satisfied with the access to the shopping centers is another question of questionnaires. As can be seen in table 5.6.4, most respondents are neither satisfied nor dissatisfied or satisfied with the access to shopping centers.

Table 5.6.4. Satisfaction with the access to shopping centers of Andisheh new town based on questionnaire through SPSS and ArcMap- researcher

Satisfaction with the access to shopping centers															
						Phase									
						2		3		4		5		6	
q67		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	very satisfied	80	19,4	20,2	20,4	8	13.33	31	21.09	29	23.97	12	19.67	0	0.00
	satisfied	171	41,4	43,1	63,5	31	51.67	66	44.90	46	38.02	23	37.70	5	71.43
	neither satisfied nor dissatisfied	82	19,9	20,7	84,1	12	20.00	30	20.41	24	19.83	14	22.95	2	28.57
	dissatisfied	39	9,4	9,8	94,0	6	10.00	13	8.84	13	10.74	7	11.48	0	0.00
	very dissatisfied	24	5,8	6,0	100	3	5.00	7	4.76	9	7.44	5	8.20	0	0.00
	Total	397	96,1	100		60	100.00	147	100.00	121	100.00	61	100.00	7	100.00
Missing System		16	3,9												
Total		413	100												

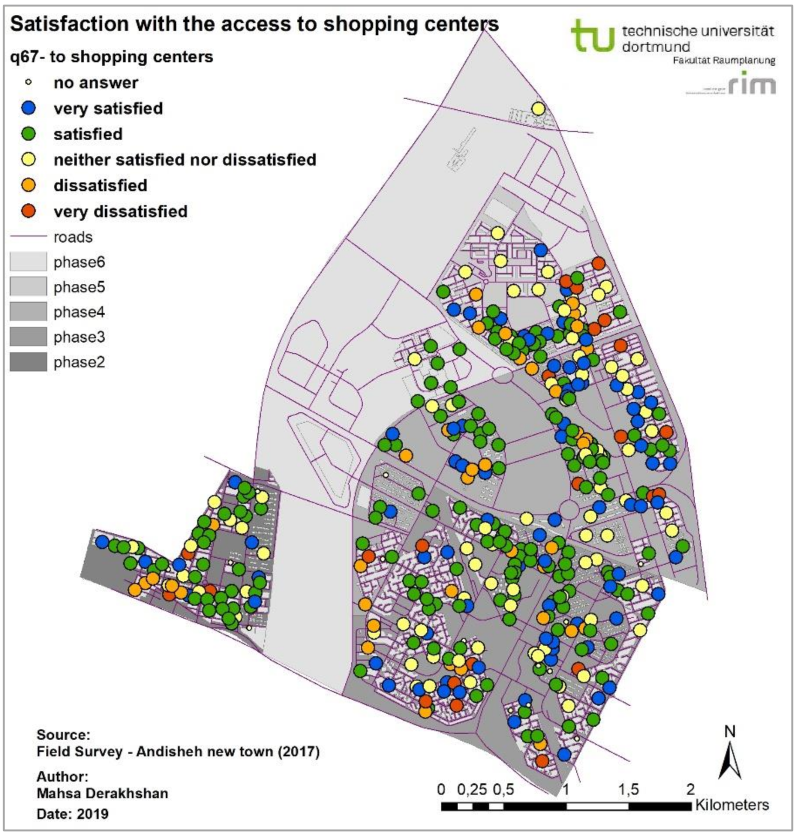


Figure 5.6.21. Satisfaction with access to shopping centers of Andisheh new town

Satisfaction with the access to centers providing daily necessities

The results represent that most of the respondents of questionnaires (38.7%) are satisfied with the access to centers to provide their daily needs (table 5.6.5).

Table 5.6.5. Satisfaction with the access to the centers providing daily needs based on the questionnaire through SPSS and ArcMap- researcher

Satisfaction with the access to centers to provide daily needs																
						Phase										
						2		3		4		5		6		
q66		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Valid	very satisfied	69	16.7	17.6	17.6	8	12.90	33	22.60	20	16.53	8	13.33	0	0.00	
	satisfied	160	38.7	40.7	58.3	36	58.06	52	35.62	48	39.67	20	33.33	4	57.14	
	neither satisfied nor dissatisfied	107	25.9	27.2	85.5	11	17.74	35	23.97	38	31.40	20	33.33	3	42.86	
	dissatisfied	39	9.4	9.9	95.4	2	3.23	19	13.01	8	6.61	10	16.67	0	0.00	
	very dissatisfied	18	4.4	4.6	100	5	8.06	7	4.79	7	5.79	2	3.33	0	0.00	
	Total	393	95.2	100		62	100	146	100	121	100	60	100	7	100	
Missing System		20	4.8													
Total		413	100													

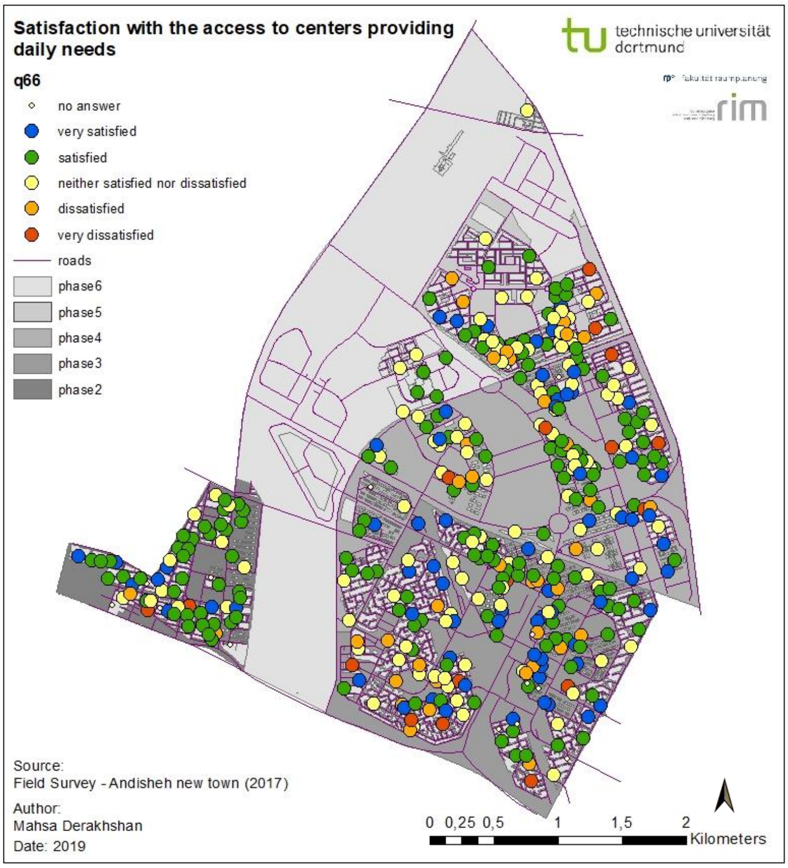


Figure 5.6.22. Satisfaction with access to the centers providing daily needs

5.6.4 Accessibility of educational centers in Andisheh new town

Farhangian high school located in Phase 4 is the most connected educational center in Andisheh new town. The average value of connectivity of surrounded streets around this place is 15.00. Presented in map 5.6.23 this high school is near the most connected street, which has a value of connectivity of 25.00. Based on the Space Syntax analysis, this high school also has the most average degree of integration (HH) that is 1.285, and local integration (HH) R3 that is 3.244, additionally, it has the lowest value of mean depth (7.467); it means that this school is more visible for residents and is the most accessible school.

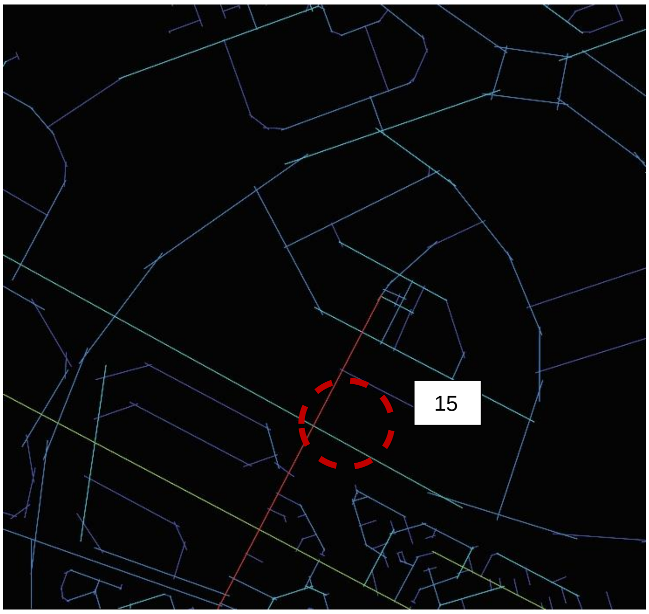


*Figure 5.6.23. The value of connectivity of Depthmap analysis of **Farhangian** high school, which has the most degree of connectivity and integration (HH) in Andisheh new town.*

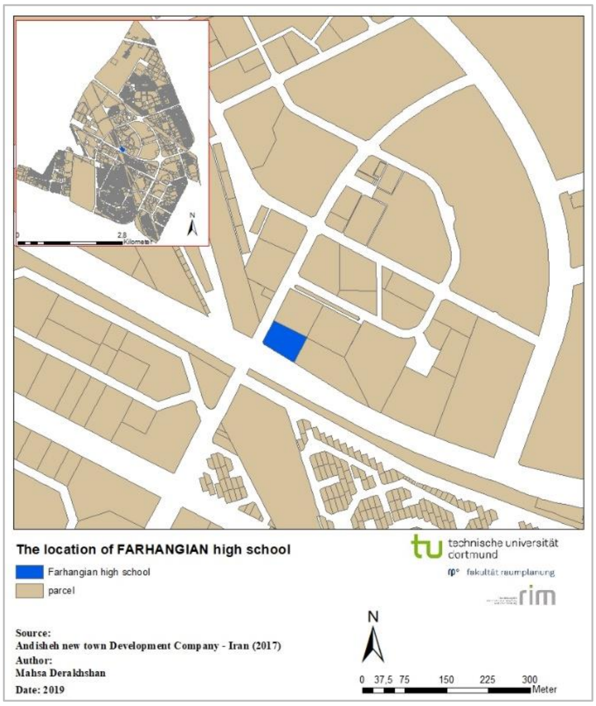


Figure 5.6.24. Location of Farhangian high school in Andisheh new town

The primary school of Hakim has the second-highest value of connectivity and local integration (HH) after Farhangian high school. The amount of connectivity value is 14.00 (map 5.5.25 and 5.5.27) and local integration is 3.191. The next highest value of integration (HH) is 1.154 that belongs to the primary school of Ansarolmahdi in Phase 3 (figures 5.6.26 and 5.6.28).

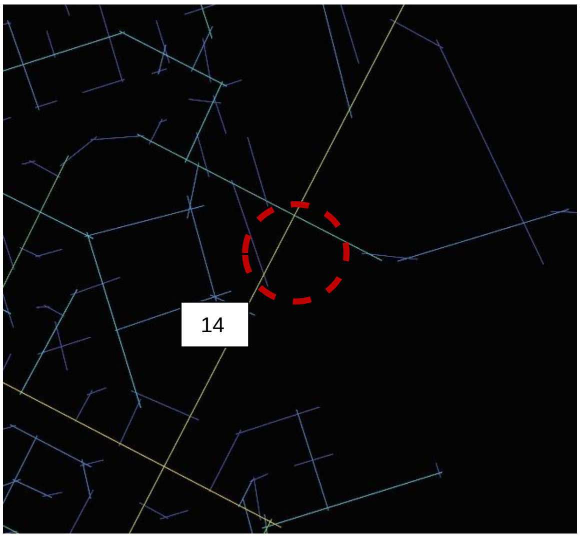


Figure 5.6.25. The value of connectivity of Depthmap analysis of the primary school of **Hakim**, where is one of the most connected places in Andisheh new town

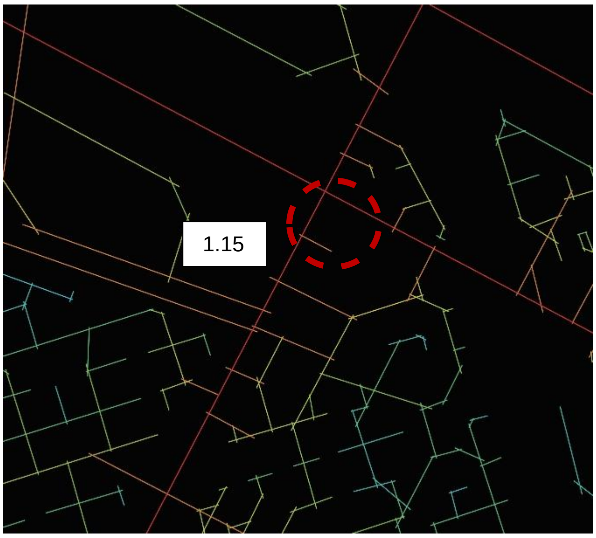


Figure 5.6.26. The value of integration (HH) of Depthmap analysis of the primary school of **Ansarolmahdi**, which is the second-highest integrated school in Andisheh new town

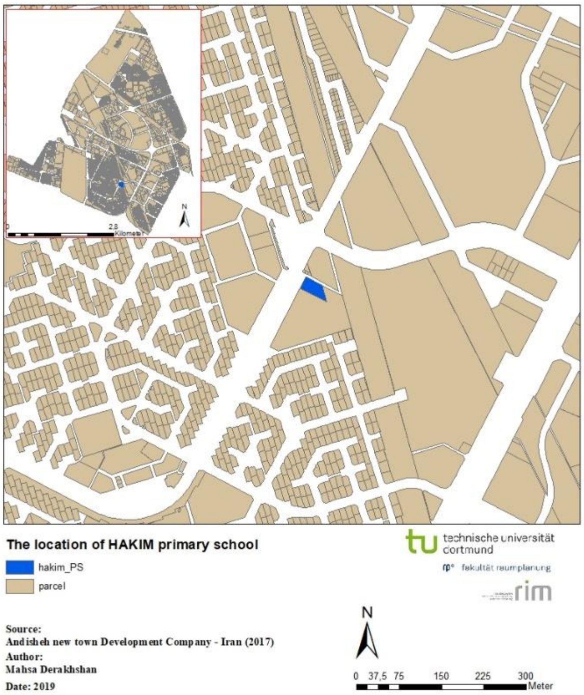


Figure 5.6.27. Location of primary school of **Hakim** in Andisheh new town

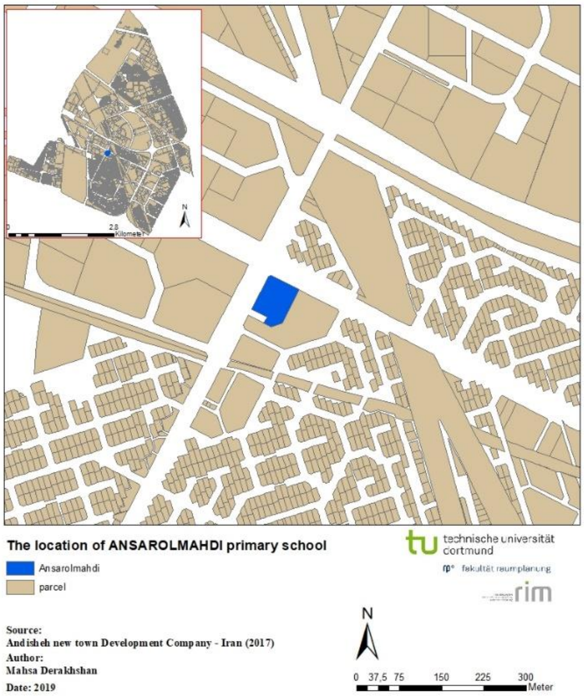


Figure 5.6.28. Location of primary school of **Ansarolmahdi** in Andisheh new town

The kindergarten of Panj (map 5.6.29 and 5.6.31) with the highest value of mean depth (12.322) and primary school of Bahar with the highest local mean depth value (2.706) are the deepest educational centers in Andisheh new town. The high school of Sherkat-Omran has the lowest value (1.035) of local integration (HH) R3 (figures 5.6.30 and 5.6.32).

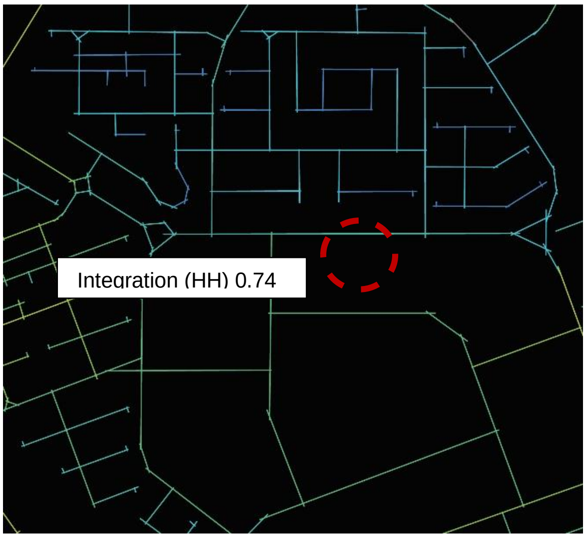


*Figure 5.6.29. Depthmap analysis: the value of integration (HH) of the kindergarden **Panj,** which has the least value of integration (HH) and the most value of mean depth in Andisheh new town*

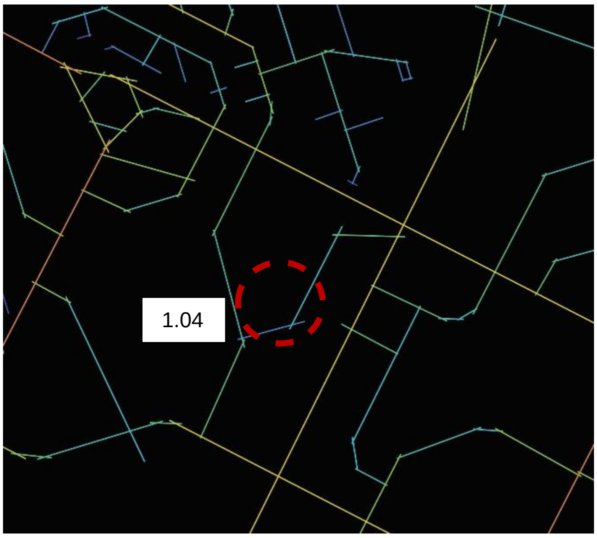


*Figure 5.6.30. The value of local integration (HH) of Depthmap analysis shows the high school of **Sherkat-Omran** has the least value*

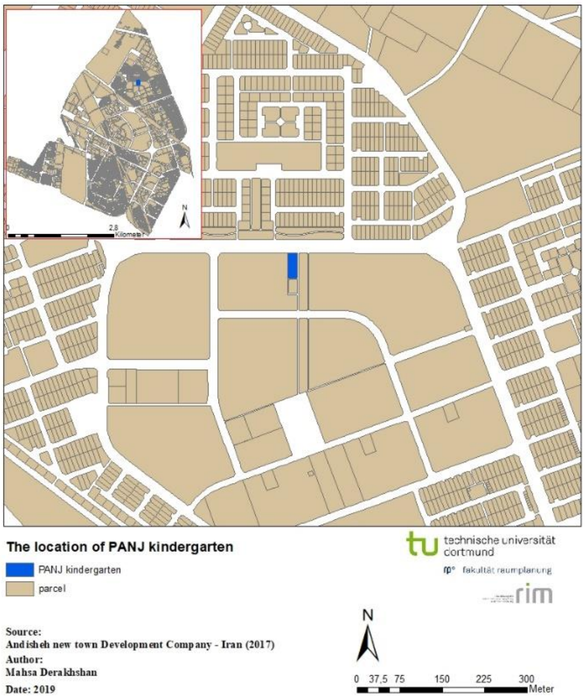


*Figure 5.6.31. Location of kindergarden of **Panj** in Andisheh new town*

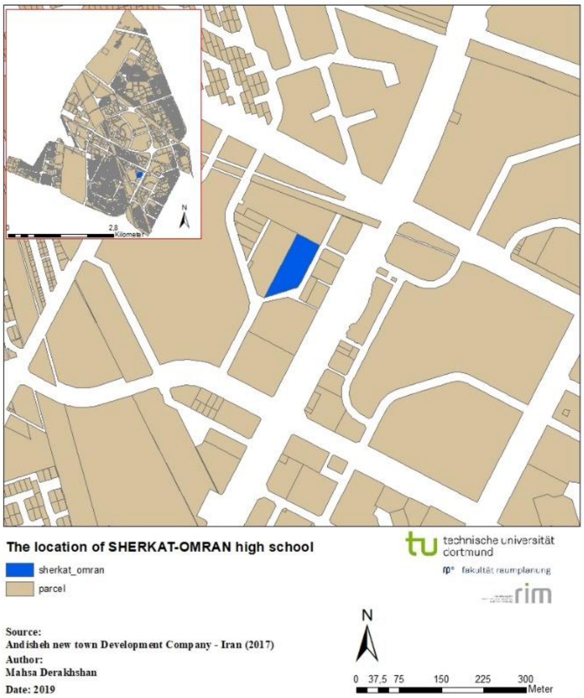


*Figure 5.6.32. Location of high school of **Sherkat-Omran** in Andisheh new town*

The following map - map 5.6.33 - shows the educational centers with the highest and lowest value of Depthmap analysis and the table below – table 5.6.6 - represents the average of different values of Space Syntax analysis of streets surrounding various educational centers in Andisheh new town

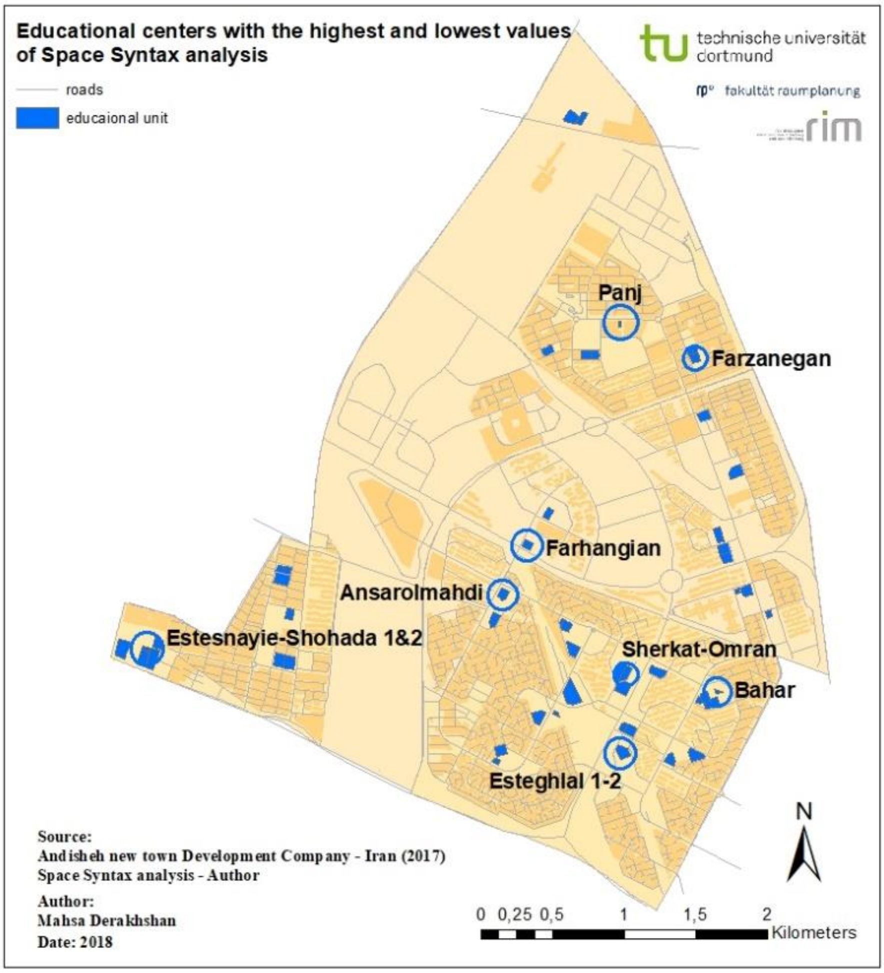


Figure 5.6.33. Educational centers with the highest and lowest values of Space Syntax analysis

Table 5.6.6. Space Syntax analysis of the educational units through Depthmap UCL software - researcher

Names of educational centers in Andisheh new town	Phase	Value of Space Syntax analysis				
		Connectivity	Integration(HH)	Integration(HH) R3	Mean depth	Mean depth R3
Valiasr_PS/Baghiatallah_HS	6	6.00	1.054	2.218	8.882	2.500
Mersad_PS&HS	6	6.00	1.054	2.218	8.882	2.500
Kindergarden_Panj	5	7.00	0.738	2.307	**12.322**	2.375
Misagh_GS	5	3.50	0.809	1.816	11.319	2.493
Armaghan_GS	5	7.00	0.845	2.345	10.362	2.320
Miaad_PS	5	8.00	0.910	2.289	10.188	2.325
Kharazmi	5	4.00	0.941	2.366	9.831	2.575
Fadak_HS	5	6.50	0.894	2.407	10.312	2.412
Farzanegan_HS	5	9.00	0.848	2.448	10.794	2.250
Ebtekar_HS	4	7.33	0.982	2.471	9.484	2.562
Darolfonoon_HS	4	6.00	0.868	2.086	10.593	2.441
Alborz_HS	4	4.00	0.963	1.982	9.625	2.654
Chamran_HS	4	3.00	0.935	1.737	9.892	2.598
Andisheh_HS	4	4.00	0.962	1.847	9.664	2.543
Khalije_Fars	4	3.00	1.146	2.403	8.247	2.693
Farhangian_HS	4	**15.00**	**1.285**	**3.244**	7.467	2.520
Ghadir_PS	4	8.00	1.105	2.766	8.519	2.544
Kindergarden_Chahar	4	9.00	1.075	2.662	8.737	2.500
Saramad_HS	4	7.00	0.994	2.472	9.356	2.465
Atiyeh_PS	3	4.83	1.107	2.061	8.593	2.563
Niki_PS	3	6.33	1.104	2.294	8.593	2.598
Setayesh_PS	3	3.67	1.054	1.872	8.926	2.611
Bahar_PS	3	2.00	1.027	1.601	9.094	**2.706**
Ayine_Tarbiat_HS	3	3.20	1.002	1.826	9.334	2.598
Salehan	3	7.00	1.049	2.409	8.947	2.515
Esteghlal_1-2_HS	3	2.00	0.928	1.091	9.960	2.569

Esteghlal_GS	3	5.00	1.056	2.260	8.865	2.563
Danesh_PS	3	7.00	1.179	2.587	8.064	2.553
Parvin_Etesami_1_HS	3	4.33	1.055	1.863	9.007	2.479
Parvin_Etesami_2_HS	3	6.00	1.064	2.202	8.834	2.596
Parham_PS	3	9.00	1.177	2.323	8.162	2.574
Pooyandegan_HS	3	2.50	0.958	1.227	9.689	2.402
Sherkat_Omran_HS	3	2.00	0.941	1.035	9.839	2.395
Khaje_Nasiredin	3	9.00	1.177	2.323	8.162	2.574
Ansarolmahdi_PS	3	13.33	1.263	3.054	7.624	2.546
Ansarolhosein_PS	3	4.40	1.037	2.017	9.048	2.601
12Ordibehesht_HS	3	5.60	1.005	2.238	9.201	2.577
Hakim_PS	3	14.00	1.154	3.191	8.212	2.411
Haniyeh_PS	3	5.33	0.865	2.128	10.685	2.560
Amoozesh3	3	5.00	0.870	2.261	10.585	2.571
Samari_HS	2	10.00	1.053	2.747	8.924	2.429
Hadaf_HS	2	5.00	0.997	2.486	9.353	2.535
Dr.Hashtroodi_HS	2	4.67	0.901	2.040	10.308	2.450
Estesnayie_Shohada_1&2	2	2.00	0.809	1.438	11.285	2.450
Moslemebne_Aghil_HS	2	4.00	0.863	1.741	10.648	2.561
Amoozesh2	2	4.67	0.865	1.966	10.637	2.603
Molana_GS	2	8.33	0.793	2.528	11.520	2.307
Kharazmi_HS	2	5.00	0.775	2.259	11.748	2.346
Hor_PS	2	9.00	0.792	2.466	11.525	2.316
Ayandegan_HS	2	5.00	0.828	2.414	11.073	2.323
Hakim_Sohrevardi_GS&HS	2	7.67	0.896	2.341	10.315	2.437
Ghalam_PS	2	4.33	0.839	2.153	10.945	2.434
Sama_University	3	6.33	1.050	2.090	8.965	2.522
Sama_University2	3	12.00	1.185	2.956	8.037	2.491

Satisfaction with the access to educational units in Andisheh new town

Table 5.6.7 is prepared using SPSS and ArcMap and represents that most of the respondents are neither satisfied nor dissatisfied with the access to educational centers in Andisheh new town.

Table 5.6.7. Satisfaction with the access to the educational units based on the questionnaire through SPSS and ArcMap- researcher

Satisfaction with the access to educational units															
						Phase									
						2		3		4		5		6	
q73		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	very satisfied	19	4.6	4.9	4.9	2	3.33	6	4.23	5	4.24	6	10.17	0	0.00
	satisfied	105	25.4	27.2	32.1	13	21.67	52	36.62	26	22.03	12	20.34	2	28.57
	neither satisfied nor dissatisfied	162	39.2	42.0	74.1	13	21.67	51	35.92	66	55.93	28	47.46	4	57.14
	dissatisfied	78	18.9	20.2	94.3	30	50.00	21	14.79	15	12.71	11	18.64	1	14.29
	very dissatisfied	22	5.3	5.7	100	2	3.33	12	8.45	6	5.08	2	3.39	0	0.00
	Total	386	93.5	100		60	100	142	100	118	100	59	100	7	100
Missing System		27	6.5												
Total		413	100,0												

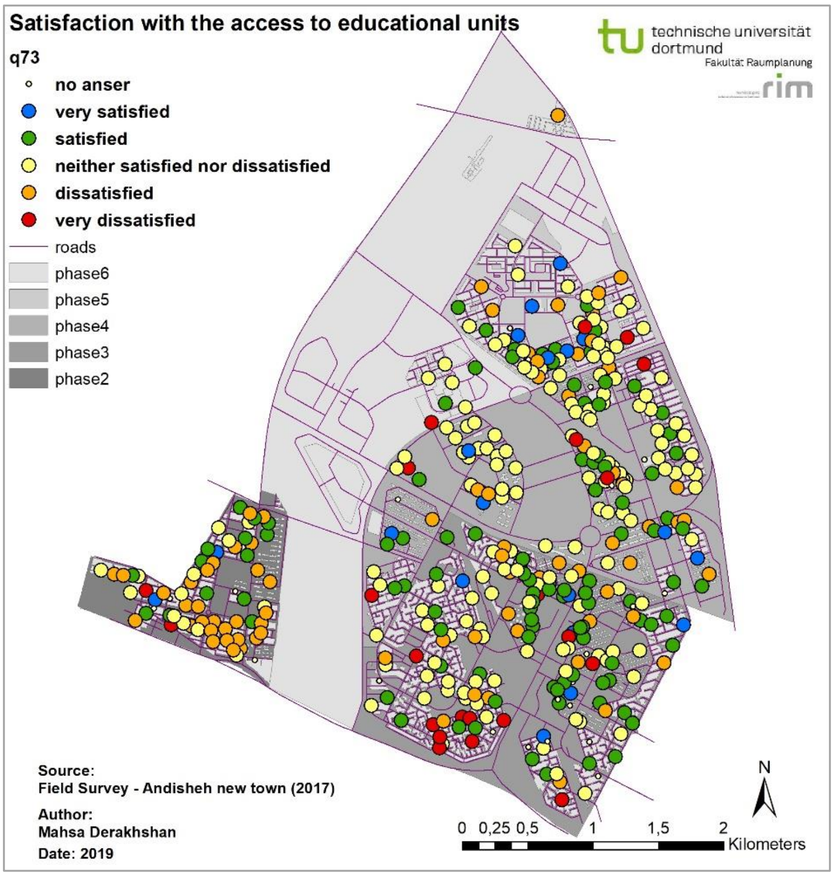


Figure 5.6.34. Satisfaction with access to the educational units in Andisheh new town

5.6.5 Accessibility of Healthcare Centers in Andisheh New Town

As it is presented in map 5.6.35, Bahar Clinic is one of the healthcare centers in Andisheh new town near the most connected road of this city (25.00). Through Depthmap analysis, the average connectivity degree of its surrounding streets is 12.00; this value is still the highest amount of connectivity of a healthcare unit in this city. So this clinic is the most visible one in Andisheh new town.

The other analysis of Space Syntax is related to the depth of spaces that leads to integration and depth value of different spaces. Integration is measured based on the liner depth of a space from other surrounding spaces. The average value of global integration (HH) and local integration (HH) R3 of the streets surrounding Bahar Clinic are 1.219 and 2.918, these values are the most value of integration (HH) in Andisheh new town. In other words, Bahar Clinic has the most accessibility, therefore more people are encouraged to go there.

Through the Space Syntax analysis of Healthcare centers in Andisheh new town, the health center of Emam-Reza located in Phase 5 is the least accessible. It is not visible to residents; people need a longer time in access to this deep place. That is because not only the degree of connectivity (3.50) but also the values of global and local integration (HH) (0.739 and 1.327) are the lowest amount. (Figures 5.6.37 and 5.6.38)

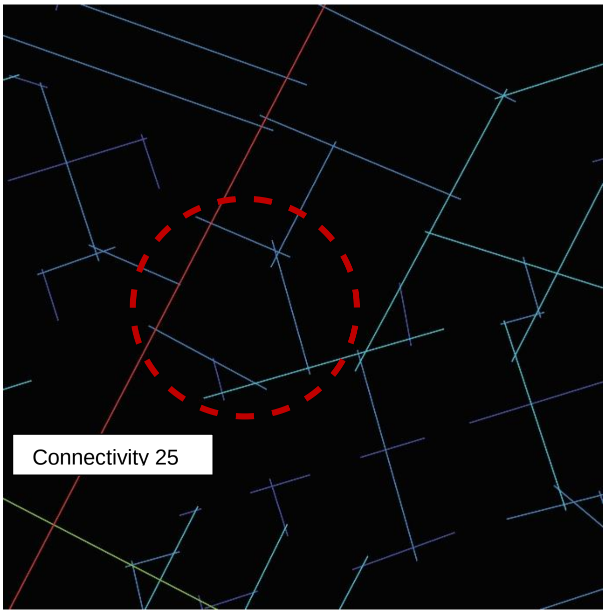


*Figure 5.6.35. The value of connectivity of Depthmap analysis of **Bahar Clinic**, one of the health centers of Andisheh new town, which has the most connectivity, integration (HH) and integration (HH) R3.*

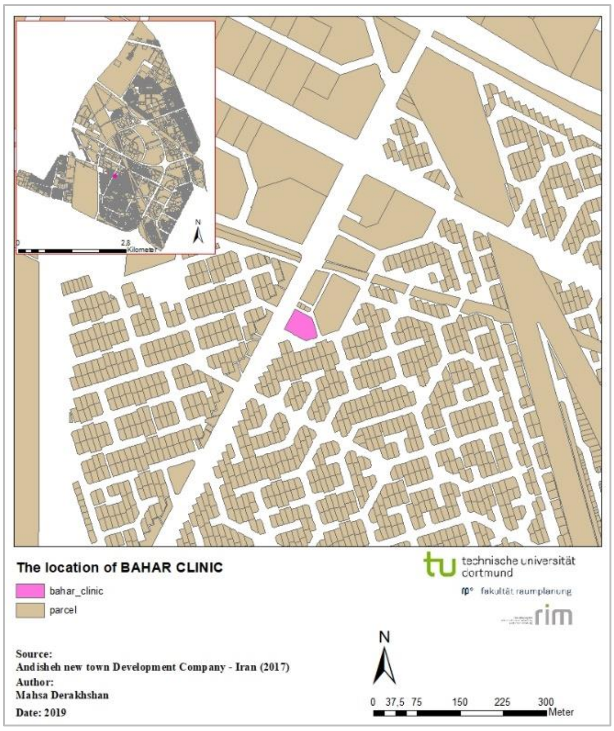


*Figure 5.6.36. Location of **Bahar Clinic** in Andisheh*

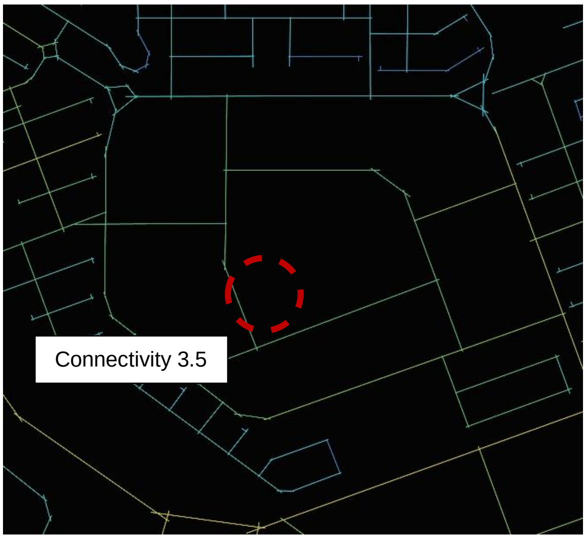


*Figure 5.6.37. The value of integration of Depthmap analysis of health center of **Emam-Reza**, which has the lowest degree of connectivity and global and local integration (HH)*

*Figure 5.6.38. The value of mean depth of Depthmap analysis of health center of **Emam-Reza** that has the highest degree of mean depth*

In addition, the health center of Emam-Reza has the highest value of mean depth (12.246). While this value refers to the number of turns of streets or spaces that people have to pass through, the highest amount of it means that this place is less accessible.

Farhangian Clinic with a value of 2.586 of local mean depth (R3) is the least accessible health center in Andisheh new town. The medical complex of Sina has the lowest value of mean depth (8.089) and the Emergency center in phase 3 has the least value of local mean depth (R3) (2.309); less mean depth means less depth, therefore people are more encouraged to refer to these centers.

The following map – figure 5.6.39 - presents the health centers with the highest and lowest values of Space Syntax analysis and table 5.6.8 shows the values of connectivity, global integration (HH), local integration (HH) R3, mean depth and mean depth R3 of Space Syntax analysis of health care centers in Andisheh new town. Red numbers show the highest and blue numbers present the lowest value of each measure.

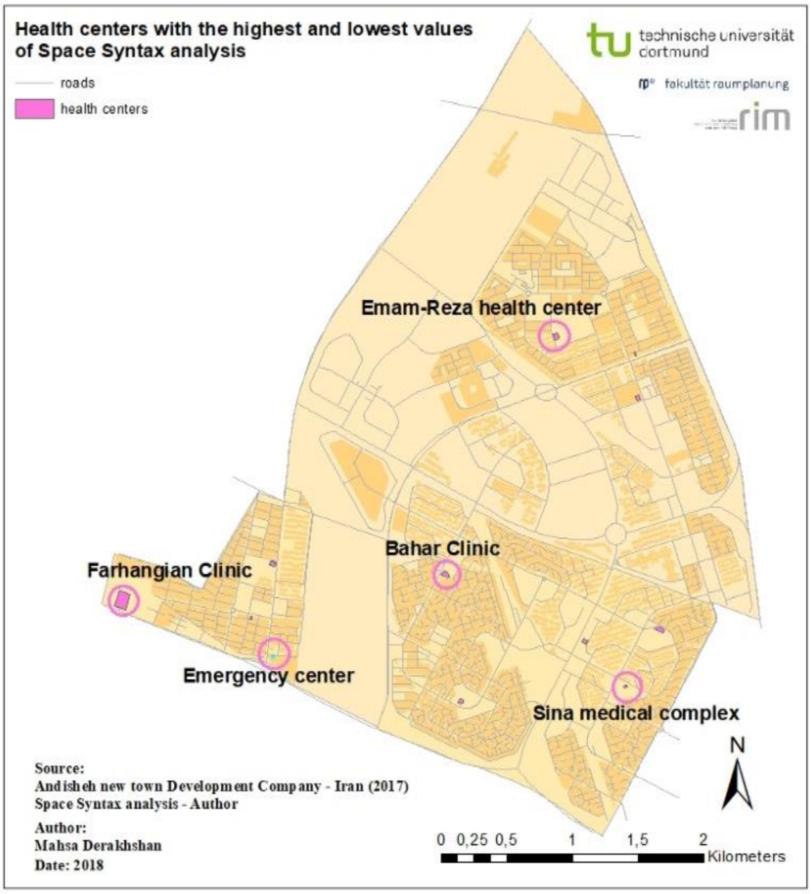


Figure 5.6.39. Health centers with the highest and lowest values of Space Syntax analysis

Table 5.6.8. Space Syntax analysis of the health centers in Andisheh new town through Depthmap UCL software - researcher

Health centers In Andisheh new town	Phase	Value of Space Syntax analysis				
		Connectivity	Integration(HH)	Integration(HH) R3	Mean depth	Mean depth R3
Bahar Clinic	3	**12.00**	**1.219**	**2.918**	8.352	2.576
Sina Medical Complex	3	10.50	1.174	2.884	8.089	2.471
Kasra Clinic	2	9.50	0.905	2.649	10.197	2.343
Markaz Behdasht Health center	4	9.00	1.008	2.800	9.257	2.476
Hakim Medical Complex	3	8.00	1.110	2.327	8.481	2.552
Shabane roozi Andisheh Clinic	3	6.00	1.096	2.011	8.703	2.468
Tavanbakhshi Center	3	5.50	0.918	2.439	10.049	2.579
Emergency Center	2	5.50	0.824	2.085	11.085	2.309
Mojtame Pezeshki Medicalcomplex	2	5.00	0.858	2.390	10.682	2.459
Ebn e Sina Medical complex	5	5.00	0.919	2.171	10.278	2.483
Farhangian Clinic	2	4.00	0.986	2.254	9.427	**2.586**
Emam Reza health center	5	3.50	0.739	1.327	**12.246**	2.526

Satisfaction with the access to health centers

According to the analysis of questionnaires through SPSS and ArcMap, 46.8% of respondents are neither satisfied nor dissatisfied with the access to health centers in Andisheh new town.

Table 5.6.9. Satisfaction with the access to health centers in Andisheh new town based on the questionnaires, analyzed through SPSS and ArcMap - researcher

Satisfaction with the access to health centers																
q76						Phase										
						2		3		4		5		6		
		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	
Valid	very satisfied	25	6.1	6.3	6.3	1	1.64	7	4.73	9	7.38	8	13.11	0	0.00	
	satisfied	138	33.4	34.6	40.9	16	26.23	57	38.51	50	40.98	15	24.59	0	0.00	
	neither satisfied nor dissatisfied	124	30.0	31.1	71.9	30	49.18	37	25.00	29	23.77	23	37.70	5	71.43	
	dissatisfied	80	19.4	20.1	92.0	11	18.03	30	20.27	24	19.67	13	21.31	2	28.57	
	very dissatisfied	32	7.7	8.0	100.0	3	4.92	17	11.49	10	8.20	2	3.28	0	0.00	
	Total	399	96.6	100.0		61	100.00	148	100.00	122	100.00	61	100.00	7	100.00	
Missing System		14	3.4													
Total		413	100.0													

The map 5.6.40 represents the location of respondents of questionnaires and how they are satisfied with the access to the health centers.

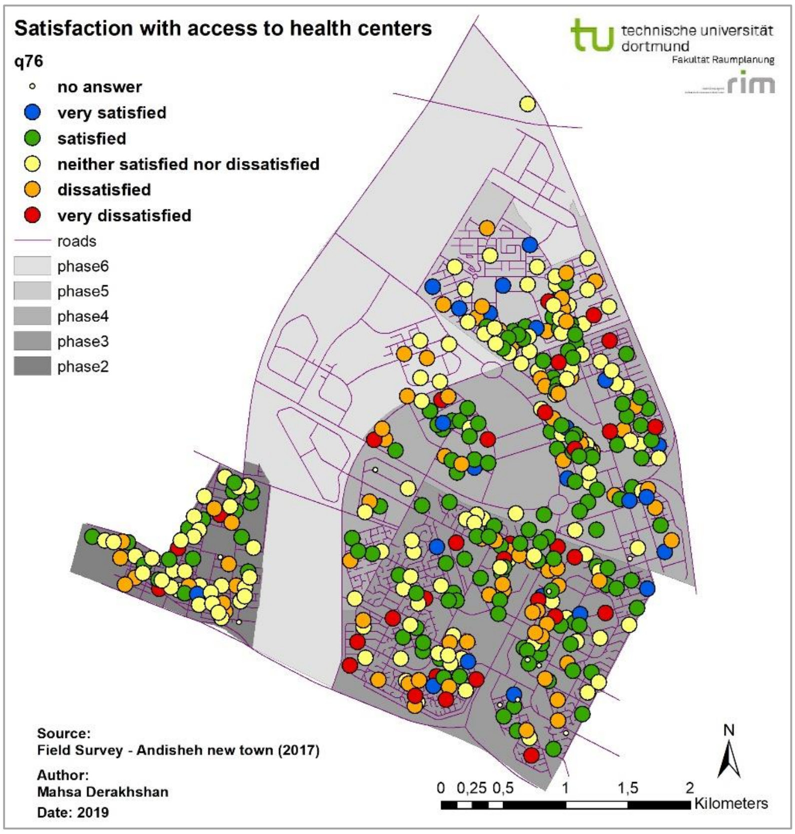


Figure 5.6.40. Satisfaction with access to health centers in Andisheh new town

5.6.6 Accessibility of green spaces and parks in Andisheh new town

Due to the Depthmap analysis of green spaces and parks of Andisheh new town, Sadaf Park has the highest value of connectivity (9.50), integration (HH) (1.198), and local integration (HH) (2.765), also the lowest degree of mean depth that is 8.042. This park is located in Phase 3 (figures 5.6.41, 5.6.42, and 5.6.43).

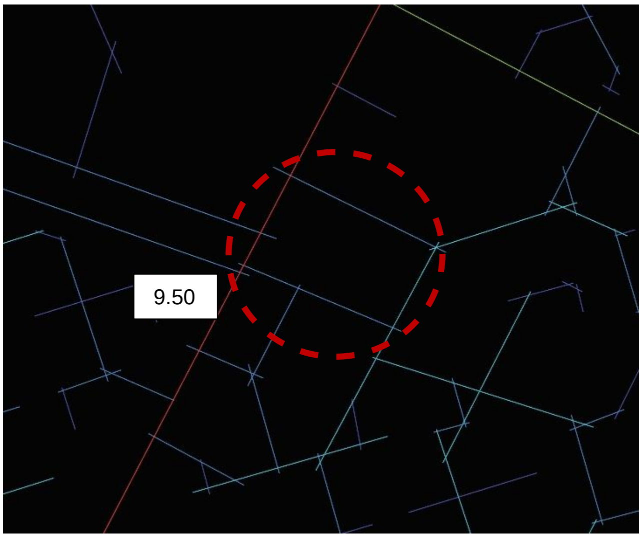


*Figure 5.6.41. **Sadaf Park** in Phase 3 has the highest value of connectivity through Space Syntax analysis*

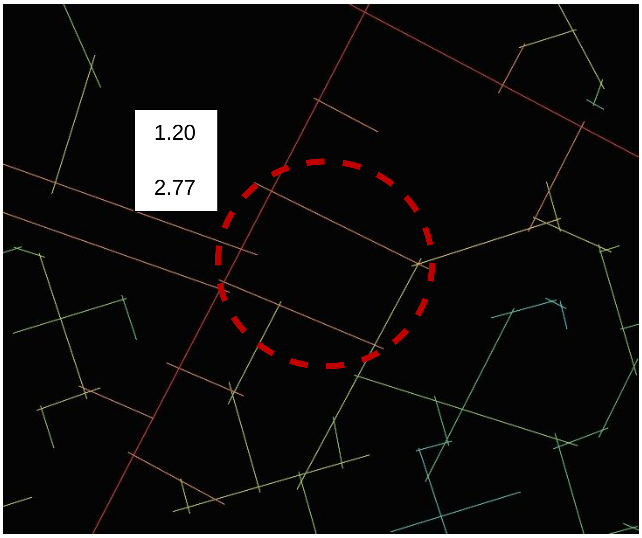


*Figure 5.6.42. **Sadaf Park** in Phase 3 has the highest value of integration (HH) through Space Syntax analysis*

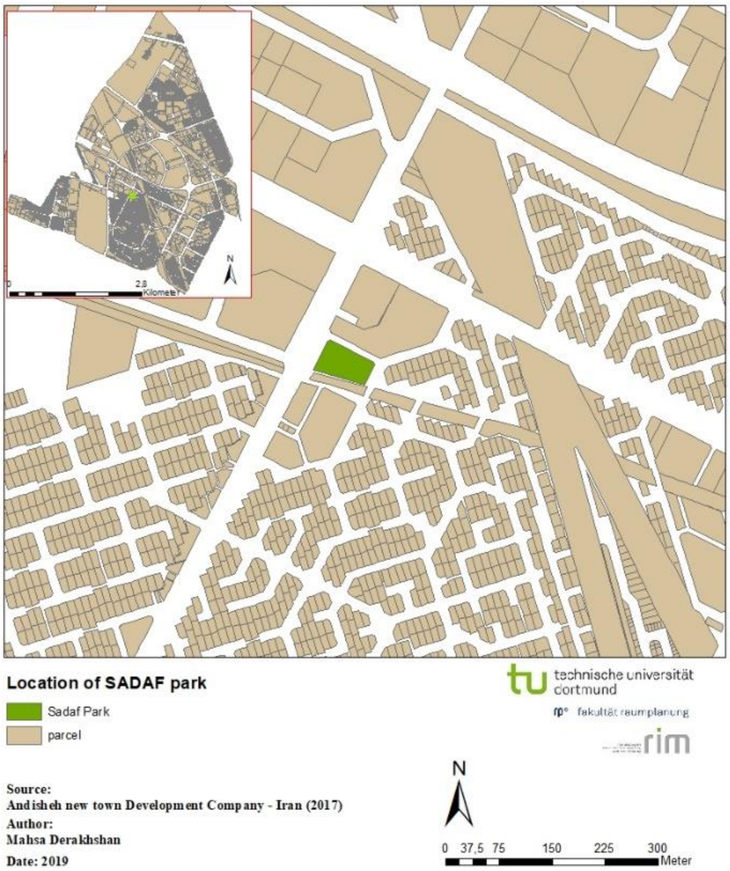


*Figure 5.6.43. Location of **Sadaf Park** in Andisheh new town*

Golestan Park in Phase 3 has the lowest average value of connectivity, which is 2.75. The lowest amount of global and local integration (HH) is for Madar (Banowan) Park 0.706 and 1.303. This park has the highest degree of mean depth: 12.884 but the lowest value of mean depth: 2.208. Park-Jangali2 hast the highest value of mean depth (R=3) that is 2.677.

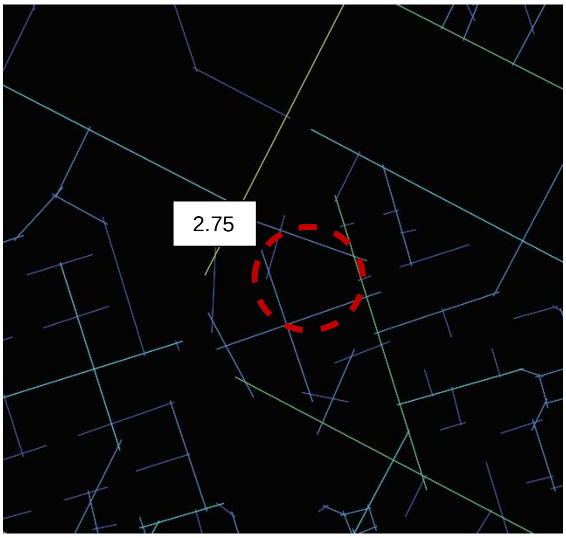


*Figure 5.6.44. **Golestan Park** has the lowest value of connectivity through Space Syntax analysis*

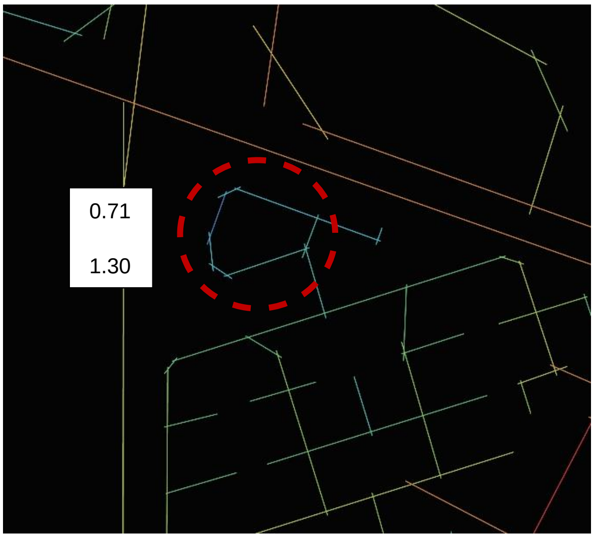


*Figure 5.6.45. **Madar (Banowan) Park** has the lowest value of integration (HH) through Space Syntax analysis*

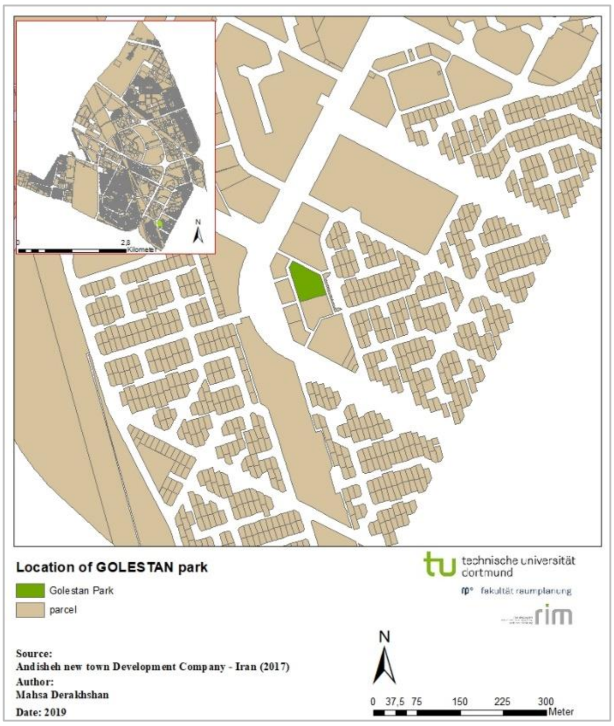


Figure 5.6.46. Location of **Golestan Park** in Andisheh

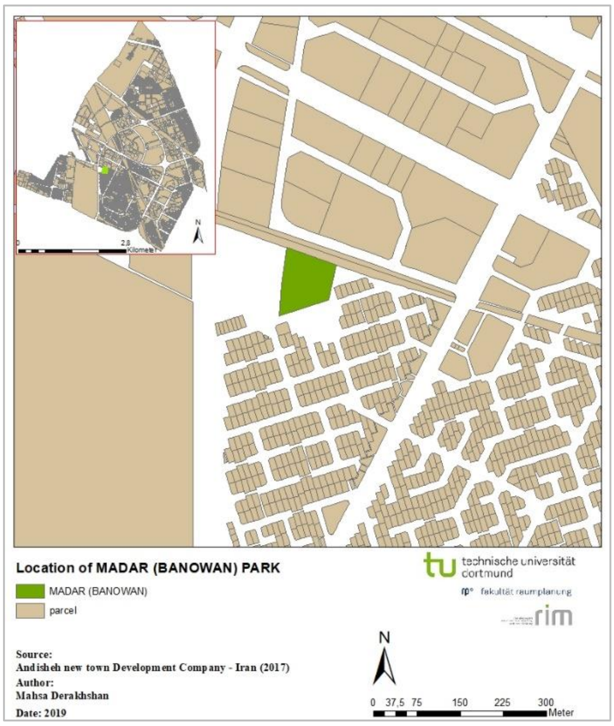


Figure 5.6.47. Location of **Madar (Banowan) Park**

Table 5.6.10 represents the values of connectivity, global integration (HH), local integration (HH) R3, mean depth and mean depth R3 of Space Syntax analysis of public green spaces in Andishe new town and map 5.6.48 shows the green spaces with highest and lowest values of Space Syntax analysis.

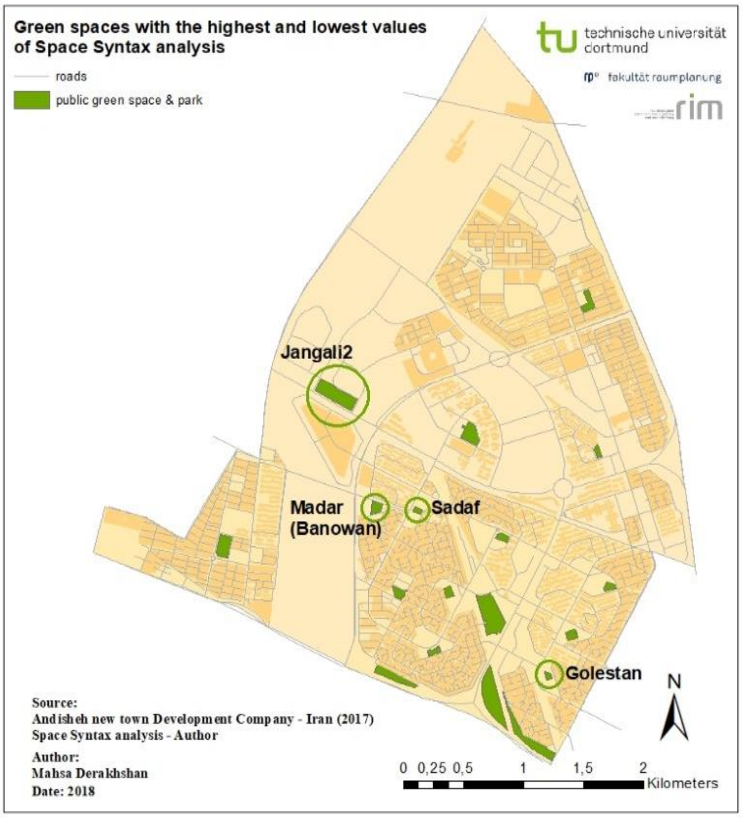


Figure 5.6.48. Public green spaces and parks with the highest and lowest values of Space Syntax analysis

The following table presents the detailed value of Space Syntax analysis of green spaces and parks in Andisheh new town.

Table 5.6.10. Space Syntax analysis of green spaces and parks in Andisheh new town

Names of green spaces and parks in Andisheh new town	phase	Value of Space Syntax analysis				
		Connectivity	Integration(HH)	Integration(HH) R3	Mean depth	Mean depth R3
Boostan_Azadegan	4	3.71	1.063	1.944	8.907	2.563
Park_Alborz	4	3.75	0.884	1.746	10.476	2.467
Park_Be'sat	4	3.75	0.884	1.746	10.475	2.467
Park_Jangali3	3	5.00	1.094	2.044	8.704	2.542
Boostan_Shohada_hastei	3	3.80	0.871	1.864	10.620	2.490
Boostan_Khayyam	3	4.00	0.990	1.874	9.495	2.531
Boostan_Chamran	3	5.86	1.183	2.301	8.065	2.612
Boostan_Hafez	3	5.67	1.075	2.235	8.880	2.570
Boostan_Dr.Hesabi	4	3.75	0.884	1.746	10.476	2.467
Park_Jangali2	6	4.25	1.153	2.091	8.294	**2.671**
Park_Madar(Banowan)	3	3.00	0.706	1.303	**12.884**	2.208
Park_Nastaran	2	8.00	0.924	2.740	9.416	2.373
Park_Mashhadi	3	9.00	0.894	2.507	10.348	2.549
Park_Golestan	3	2.75	0.968	1.819	9.701	2.585
Boostan_BuAli-Sina	3	4.25	0.923	1.801	10.054	2.587
Park_Emam	3	4.333	1.006	2.087	9.321	2.620
Park_Sadaf	3	**9.50**	**1.198**	**2.765**	8.042	2.547
Park_Ahmadi-Roshan	3	4.50	1.107	2.111	9.481	2.556

Satisfaction with access to public green spaces and parks

The analysis of questionnaires through SPSS and ArcMap states that most of the respondents are neither satisfied nor dissatisfied (26.4%) or satisfied (36.3%) with access to green spaces and parks of Andisheh new town (table 5.6.11).

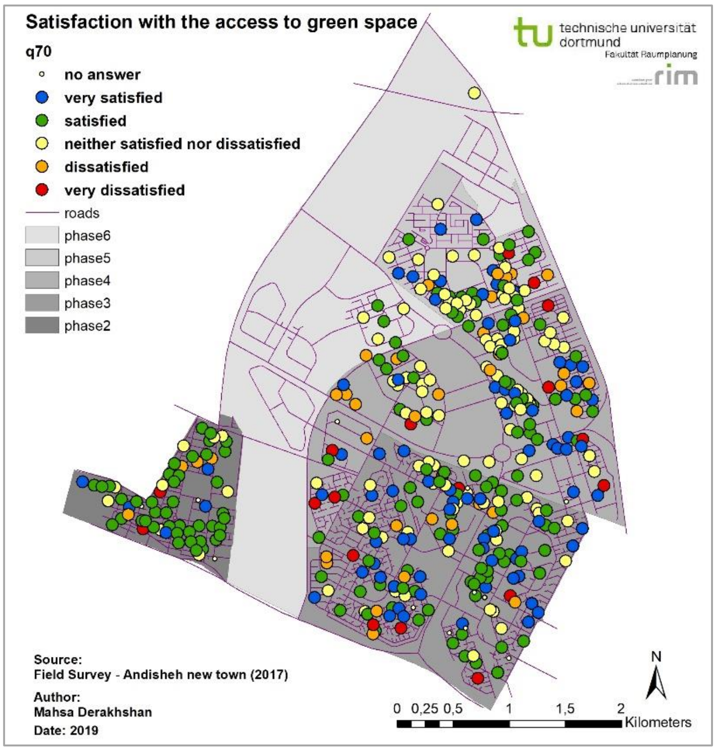


Figure 5.6.49. Satisfaction with access to public green spaces and parks

Moreover, most of the respondents of Phase 2 (67.21%) and Phase 3 (39.46%) are satisfied with the access.

Table 5.6.11. Satisfaction with the access to public green spaces and parks in Andisheh new town based on questionnaire, analyzed through SPSS and ArcMap - researcher

Satisfaction with access to green spaces and parks															
						Phase									
						2		3		4		5		6	
q70		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	very satisfied	81	19.6	20.4	20.6	5	8.20	40	27.21	25	20.49	11	18.33	0	0.00
	satisfied	150	36.3	37.7	58.3	41	67.21	58	39.46	32	26.23	16	26.67	3	42.86
	neither satisfied nor dissatisfied	109	26.4	27.4	85.7	9	14.75	31	21.09	41	33.61	24	40.00	4	57.14
	dissatisfied	38	9.2	9.5	95.2	4	6.56	11	7.48	16	13.11	7	11.67	0	0.00
	very dissatisfied	19	4.6	4.8	100.0	2	3.28	7	4.76	8	6.56	2	3.33	0	0.00
	Total	398	96.4	100.0		61	100.00	147	100.00	122	100.00	60	100.00	7	100.00
Missing System		15	3.6												
Total		413	100.0												

Accessibility of four Land Uses through Space Syntax Analysis

The Space Syntax analysis indicates that the value of connectivity is different in various spaces depending on their location and their surrounding streets. The most connected places of each land use are described above, to compare the value of the whole land uses, the high school Farhangian in Phase4 seems to be the most connected place with connectivity 15.00; this place is one of the educational centers in Andisheh new town. In other words, this school is the most visible place through the other selected land uses. The shopping center of Sadaf and the primary school of Hakim have higher connectivity

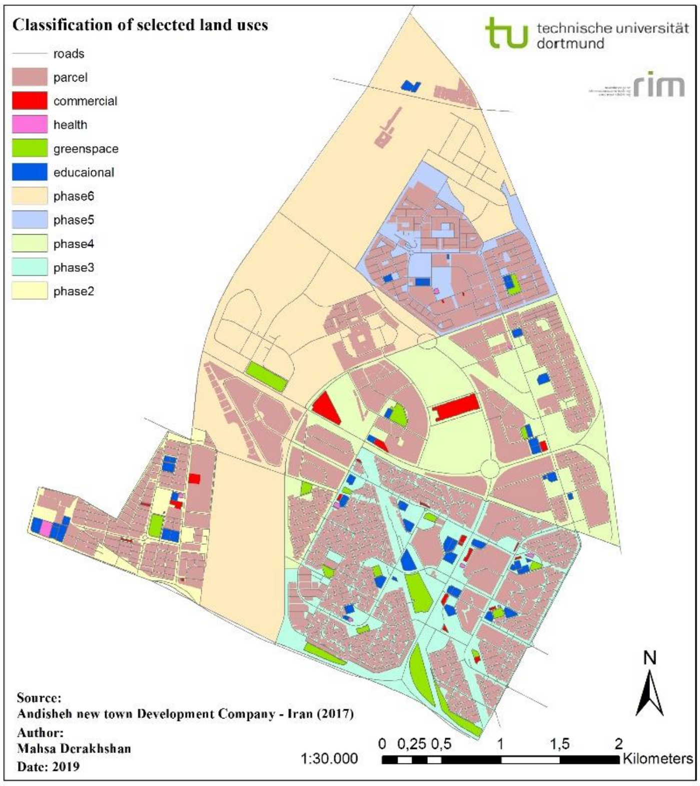


Figure 5.6.50. Classification of selected land uses based on values of Depthmap through Space Syntax analysis & ArcGIS

(14.00) in comparison with other land uses. Primary school Bahar, high schools Esteghlal, Sherkat-Omran and Estesnayie-Shohada, shopping centers Golestan1 and Golestan2 with the connectivity value 2.00 are the least connected therefore the least visible and uses in Andisheh new town.

Based on Space Syntax analysis, the shopping center Bazar-Zeitoon has the most integration (HH) value (1.321) in Andisheh new town. This center that provides the daily needs of residents is the most accessible center between other selected land uses. The high school of Farhangian (1.285) and shopping center Sadaf (1.281) and Parshin (1.278) are more integrated, so more accessible land uses in comparison with other land uses. The Park- Madar (Banowan) in Phase 3 is the least integrated land use (0.706); the users of this park are only women, despite the lowest accessibility, many women refer to this park every day. The kindergarten Panj in Phase 5 (0.738) and the health center of Emam-Reza (0.739) have a lower amount of integration (HH) compare to other land uses.

Through Space Syntax analysis, high school Farhangian has the most value of local integration (HH) R=3 (3.244). This school is located in Phase 4, this school is one of the best schools in the region, and many students from Andisheh new town and other cities near the Andisheh study there. The primary school Hakim (3.191) and shopping center of Sadaf (3.118) have a higher value of local integration (HH) R=3, therefore more accessible in comparison with other selected land uses. The shopping center Golestan2 in Phase 2 has the lowest value (1.023), and high school Sherkat-Omran (1.035) and Esteghlal (1.091) have the lower value of local integration.

Space analysis regarding to depth map shows the least value of mean depth is 7.322 for Bazar-Zeitoon in Phase 4 and the least value of local mean depth is 2.208 for Madar (banowan) park in Phase 3. Madar (Banowan) park has the most amount of integration (HH) (12.884) and the primary school of Bahr in Phase 2 has the highest degree of local mean depth R3.

Analyzing the relationships between Objective and Subjective Accessibility to various Land uses in Andisheh new town.

To find out the answer to the 5th hypothesis, that is “**higher objective measures of accessibility predicts higher subjective measures of accessibility**”, the most accessible land uses through Space Syntax analysis, which indicate objective accessibility are compared with the most accessible land uses based on people's perception that implies subjective accessibility.

To analyze it, the land uses including shopping centers, health centers, educational units, and green spaces mentioned by people in the questionnaire are considered, because both subjective and objective accessibility can be measured through them. In the attribute table of the questionnaire, the columns containing the values of Space Syntax based on centers used by residents are added to assess the objective accessibility and satisfaction with the accessibility. The structural equation model is applied to evaluate the relationship between objective and subjective measures of access to land uses.

Objective measures of access include the values calculated using Space Syntax (SSX values) that are connectivity, integration (HH), and integration (HH) R3 of health centers, shopping centers, educational units, and green spaces. Subjective measures of access are satisfaction with health centers, satisfaction with shopping centers in neighborhoods and cities, satisfaction with educational units, and satisfaction with green spaces.

SEM used 5 manifest subjective variables derived from the field survey to measure 1 latent subjective variable (satisfaction with access), and 12 manifest objective variables, which are summarized in 4 variables to measure 1 objective variable (objective access).

To examine the hypothesis and to find out the correlation two hypotheses are defined:

- H_0: there is no correlation between objective access and subjective access.
- H_1: there is a correlation between objective access and subjective access.

Table 5.6.12. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
objective access ⟶ subjective access	0.00	0.039	0.969	no correlation

Considering the t-value that should be more than 1.96 and it is 0.039, the p-value, which should be less than 0.05 to be significant and it is 0.969, it can be concluded that the H_0 is not rejected. Therefore, there is not any correlation between objective accessibility and satisfaction with accessibility.

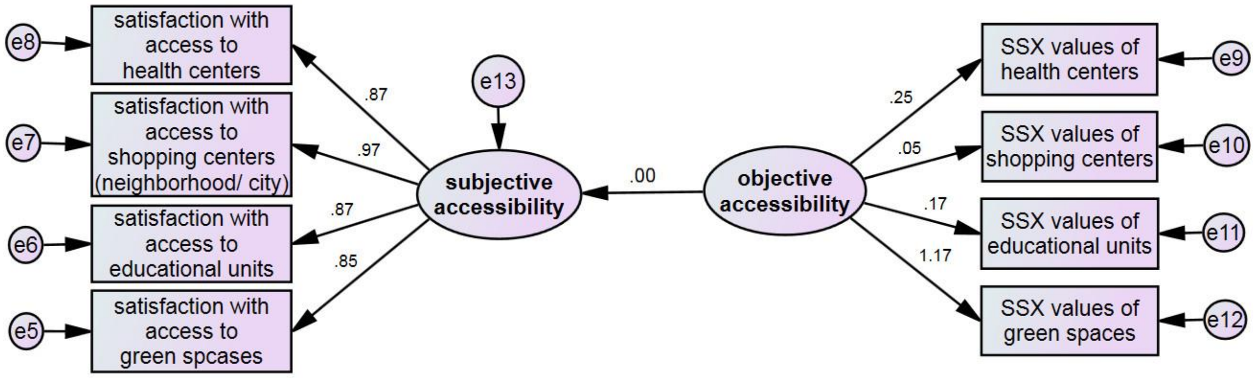


Figure 5.6.51. Structural Equation Modelling: path analysis model to investigate the relationship between objective accessibility and subjective accessibility

In this model, the root mean square error of approximation (RMSEA) is 0.070, and the chi-squared test (X^2/ df) is 1.091. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.987, adjusted goodness of fit index (AGFI) is 0.976, comparative fit index (CFI) is 0.999, normed fit index (NFI) is 0.987, non-normed fit index or Tucker-Lewis index is 0.998, and incremental fit index is 0.999, these values of indices indicate the good fit of the model.

Table 5.6.13. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.070
chi-squared test (x^2 / df)	< 3	1.091
goodness of fit index (GFI)	≥0.90	0.987
adjusted goodness of fit index (AGFI)	≥0.90	0.976
comparative fit index (CFI)	≥0.90	0.999
normed fit index (NFI)	≥0.90	0.987
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.998
incremental fit index (IFI)	≥0.90	0.999

Analyzing the relationships between the mean depth of land uses and satisfaction with land uses in Andisheh new town.

To examine the 6th hypothesis, that is “**higher objective measures of mean depth to land uses predicts lower satisfaction with land uses**”. To analyze it, mean depth and mean depth R3 of land uses including shopping centers, health centers, educational units, and green spaces mentioned by people in the questionnaire are considered. In the attribute table of the questionnaire, the columns containing the values of Space Syntax based on centers used by residents are added to assess the objective mean depth and satisfaction with the accessibility. The structural equation model is applied to evaluate the relationship between objective measures of mean depth and subjective measures of land uses.

Objective measures mean depth values that are calculated through Space Syntax that include mean depth and mean depth R3 of health centers, shopping centers, educational units, and green spaces. Subjective measures are satisfaction with health centers, satisfaction with shopping centers in neighborhood and city, satisfaction with educational units, and satisfaction with green spaces.

SEM used 7 manifest subjective variables derived from the field survey to measure 1 latent subjective variable (satisfaction with land use), and 8 manifest objective variables, which are summarized in 4 variables to measure 1 objective variable (objective mean depth).

To examine the hypothesis and to find out the correlation two hypotheses are defined:

- H_0: there is no correlation between the mean depth of land uses and satisfaction with land uses.
- H_1: there is a correlation between the mean depth of land uses and satisfaction with land uses.

Table 5.6.14. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
mean depth → satisfaction with land use	- 0.22	-2.089	0.037	decreasing

Considering the t-value that is -2.089, and the p-value, which is 0.037 that is less than 0.05, it can be concluded that the H_0 is rejected. Therefore, there is a negative correlation between mean depth and satisfaction with land uses. It is concluded that a higher mean depth of land uses predicts lower satisfaction with land uses.

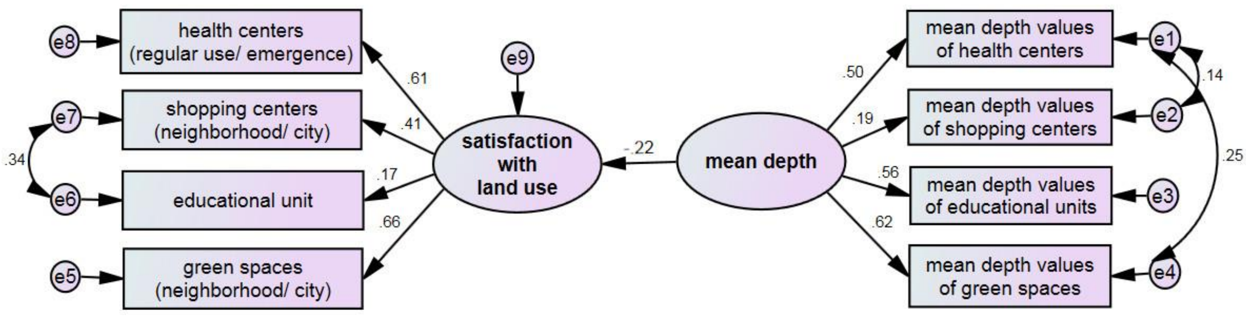


Figure 5.6.52. Structural Equation Modelling: path analysis model to investigate the relationship between objective accessibility and subjective accessibility

In this model, the root mean square error of approximation (RMSEA) is 0.00, and the chi-squared test (X^2/ df) is 0.655. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.994, adjusted goodness of fit index (AGFI) is 0.986, comparative fit index (CFI) is 1.00, normed fit index (NFI) is 1.00, non-normed fit index or Tucker-Lewis index is 1.00, and incremental fit index is 1.00, these values of indices indicate the good fit of the model.

Table 5.6.15. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.00
chi-squared test (x^2 / df)	< 3	0.655
goodness of fit index (GFI)	≥0.90	0.994
adjusted goodness of fit index (AGFI)	≥0.90	0.986
comparative fit index (CFI)	≥0.90	1.00
normed fit index (NFI)	≥0.90	1.00
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	1.00
incremental fit index (IFI)	≥0.90	1.00

5.7 Analysis of other Indicators related to Urban Identity and Quality of Urban Life?

In the last part of the analyses, the questions that define the sense of place and belonging to the place, which determine urban identity and satisfaction with living in Andisheh, which represents the quality of urban life, are analyzed through SPSS and ArcMap based on questionnaires and geocoded addresses of respondents. These indicators define urban identity and quality of urban life, therefore, they are considered in analyses of the next part (5.7).

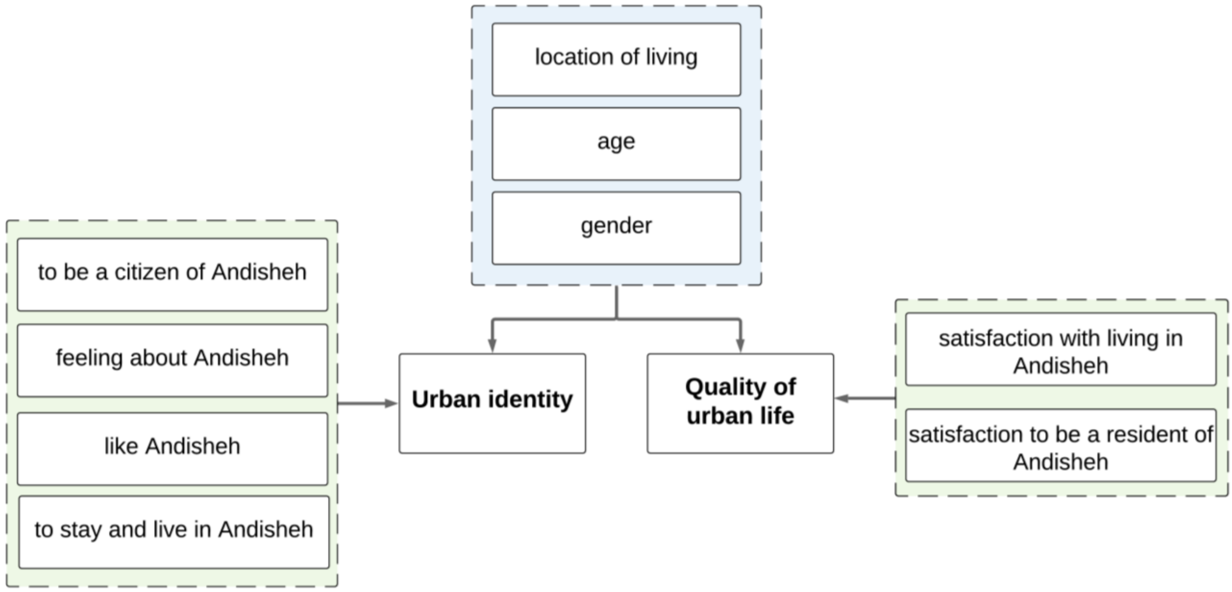


Figure 5.7.1. Structural model of indicators related to urban identity and quality of urban life in this research – source: researcher

Satisfaction with Living in Andisheh

“How satisfied are you with living in Andisheh new town?”, the most percentage of classification is for the 42.6% of respondents as well as 50.79% of respondents of Phase2, 44.97% of respondents of Phase3, and 40.98% of Phase4 and Phase5, who are satisfied with living in this city. 42.86% of respondents of Phase6 are somewhat satisfied with living in this city.

Table 5.7.1. Satisfaction with living in Andisheh new town

satisfaction with living in Andisheh						Phase 2		Phase 3		Phase 4		Phase 5		Phase 6	
q47		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	very satisfied	69	16.7	17.2	17.2	4	6.35	23	15.44	26	21.31	14	22.95	2	28.57
	satisfied	176	42.6	43.8	60.9	32	50.79	67	44.97	50	40.98	25	40.98	2	28.57
	somewhat	128	31.0	31.8	92.8	25	39.68	45	30.20	36	29.51	19	31.15	3	42.86
	dissatisfied	16	3.9	4.0	96.8	2	3.17	9	6.04	3	2.46	2	3.28	0	0.00
	very dissatisfied	13	3.1	3.2	100.0	0	0.00	5	3.36	7	5.74	1	1.64	0	0.00
	Total	402	97.3	100.0		63	100.00	149	100.00	122	100.00	61	100.00	7	100.00
Missing System		11	2.7												
Total		413	100.0												

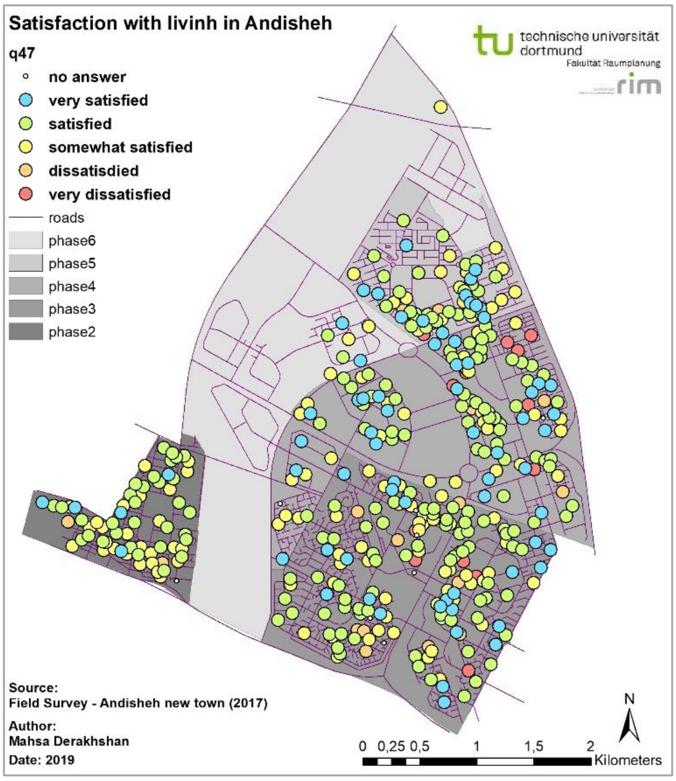


Figure 5.7.2. How residents are satisfied with living in Andisheh?

To be recognized as a citizen of Andisheh

“How would you like to be recognized as a citizen of Andisheh new town?”, this question shows if people know themselves as residents or citizens of this city, which represents the sense of belonging and urban identity. Considering the result of the analysis, 84.8% of respondents are somewhat satisfied, satisfied, or very satisfied with being a citizen of this city.

Table 5.7.2. To be recognized as a citizen of Andisheh

To be known as a citizen															
						Phase									
						2		**3**		**4**		**5**		**6**	
q48		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	very satisfied	61	14.8	15.3	15.3	0	0.00	23	15.65	27	22.13	7	11.48	4	57.14
	satisfied	147	35.6	36.8	52.0	25	39.68	58	39.46	44	36.07	18	29.51	2	28.57
	somewhat	131	31.7	32.8	84.8	22	34.92	44	29.93	36	29.51	29	47.54	0	0.00
	dissatisfied	41	9.9	10.3	95.0	15	23.81	16	10.88	6	4.92	3	4.92	1	14.29
	very dissatisfied	20	4.8	5.0	100.0	1	1.59	6	4.08	9	7.38	4	6.56	0	0.00
	Total	400	96.9	100.0		63	100.00	147	100.00	122	100.00	61	100.00	7	100.00
Missing System		13	3.1												
Total		413	100.0												

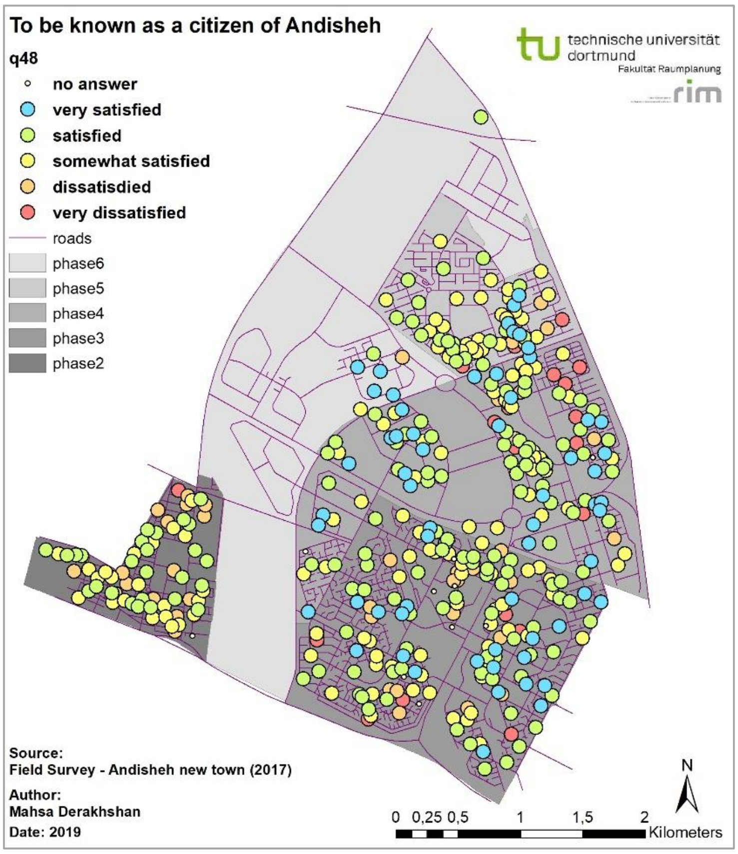


Figure 5.7.3. How would respondents like to be recognized as a citizen of Andisheh?

Do you like Andisheh new town?

57.4% of respondents like Andisheh very much or much. 57.14% of respondents of Phase6 like this city very much. 45.16% of respondents of Phase2, 36.36% of respondents of Phase3, and 40.35% of respondents of Phase4 like Andisheh much. Most of the residents of Phase5 do not have any special feelings to their city.

Table 5.7.3. How do respondents like Andisheh?

do you like Andisheh															
Q46						Phase									
						2		3		4		5		6	
		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	very strong	72	17.4	18.7	18.7	3	4.84	27	18.88	31	27.19	7	11.86	4	57.14
	much	149	36.1	38.7	57.4	28	45.16	52	36.36	46	40.35	22	37.29	1	14.29
	rather	109	26.4	28.3	85.7	19	30.65	35	24.48	26	22.81	27	45.76	2	28.57
	a little	33	8.0	8.6	94.3	9	14.52	16	11.19	6	5.26	2	3.39	0	0.00
	not at all	22	5.3	5.7	100.0	3	4.84	13	9.09	5	4.39	1	1.69	0	0.00
	Total	385	93.2	100		62	100.00	143	100.00	114	100.00	59	100.00	7	100.00
Missing System		28	6.8												
Total		413	100,0												

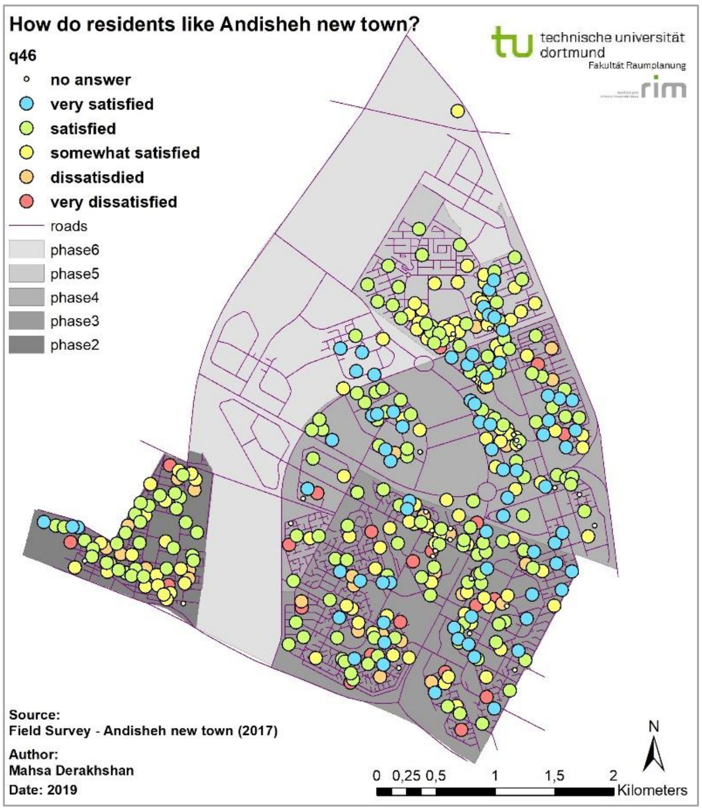


Figure 5.7.4. How do respondents like Andisheh new town?

Which sentence does represent the feeling about Andisheh new town?

54.5% of respondents have selected the second sentence, which is: “I like Andisheh, but if I would find a better situation, I would leave”. It is observed that except Phase 6, residents of the other phases, waiting for a better opportunity to leave this city. it is noticeable that from Phase 2 to Phase 5 the percentage and the number of people who have chosen this sentence are increased.

Table 5.7.4. How do respondents feel about Andisheh new town?

feeling about Andisheh																
						Phase										
						2		3		4		5		6		
q45		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
valid	I like Andisheh and I stay here forever	82	19.9	20.9	20.9	11	17.74	26	17.81	27	22.88	14	23.33	4	57.14
	I like Andisheh, but if I would find a better situation, I would leave	225	54.5	57.3	78.1	27	43.55	84	57.53	72	61.02	39	65.00	3	42.86
	I do not have any feeling about Andisheh	40	9.7	10.2	88.3	10	16.13	15	10.27	8	6.78	7	11.67	0	0.00
	I do not like Andisheh, but I have a good situation here	22	5.3	5.6	93.9	9	14.52	7	4.79	6	5.08	0	0.00	0	0.00
	I do not like Andisheh and I will leave here as soon as possible	24	5.8	6.1	100	5	8.06	14	9.59	5	4.24	0	0.00	0	0.00
	Total	393	95.2	100		62	100	146	100	118	100	60	100	7	100
Missing System		20	4.8												
Total		413	100												

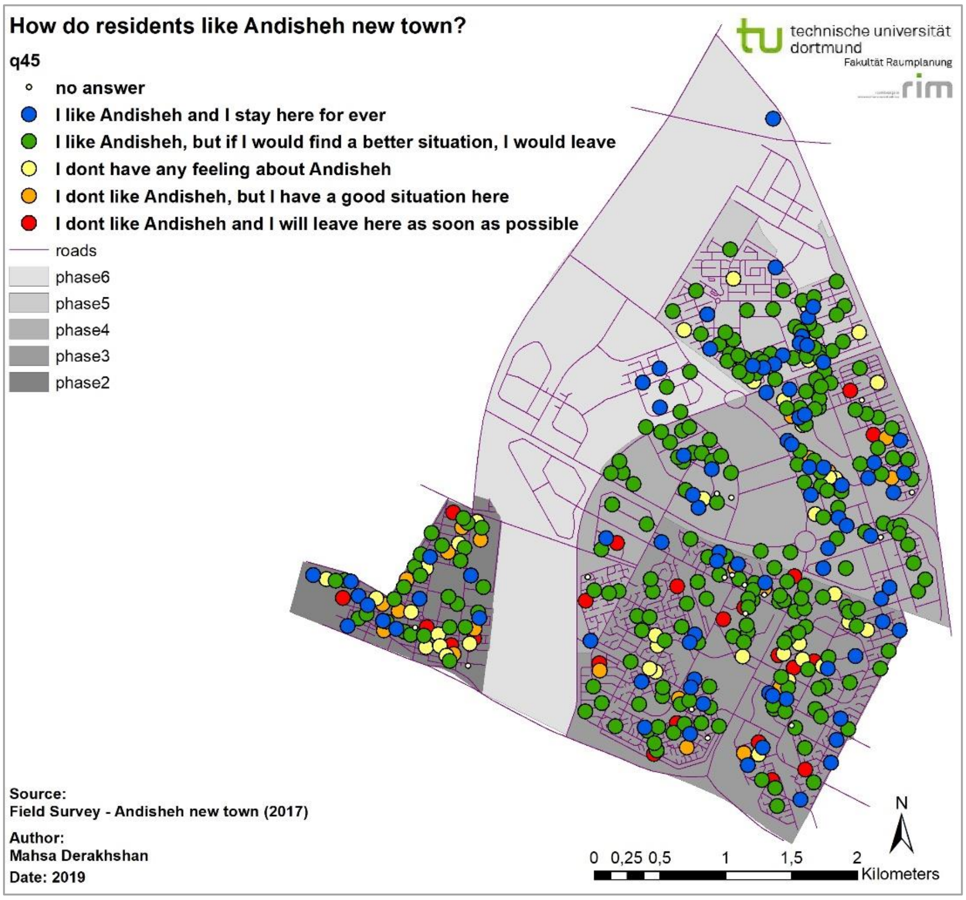


Figure 5.7.5. Which sentence does represent the feeling of residents about Andisheh new town?

5.8 Analyzing the Relationships between subjective and objective Indicators

To analyze the relationship between objective indicators, the 7th hypothesis, and to analyze the relationship between subjective indicators, the 8th hypothesis is defined.

Analyzing the relationship between objective measures of access, density, housing, and land use

H7: " **there are correlations between objective measures of access, density, housing, and land use.**" Structural Equation Model (SEM) to examine the H7 includes objective measures of **density** includes gross density in neighborhood and city, and net residential density in neighborhood and city, **access** to health centers, green spaces, educational units, and shopping centers through objective indicators of connectivity, integration(HH), and integration (HH) R3, **housing** include housing type, age of the building, number of households in building, area of dwelling units, housing cost (rent or buy), and housing location, and finally, **land use** includes location, proportional amount, and the nearest neighbor ration of health centers, shopping centers, educational units, and green spaces.

Structural equation modeling used 35 objective variables to measure 4 objective variables (objective density, access, housing, and land use).

For the four examined correlations, two hypotheses are considered. H_0 and H_1. In H0, there is no correlation between measures and in H_1 there is a correlation.

Table 5.8.1. Table of path coefficient and its significance.

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
objective access ⟷ objective density	0.00	1.94	0.051	no correlation
objective access ⟷ objective housing	0.48	11.317	0.00	increasing
objective access ⟷ objective land use	0.39	11.026	0.00	increasing
objective landuse ⟷ objective housing	0.52	10.499	0.00	increasing
objective housing ⟷ objective density	0.42	10.685	0.00	increasing
objective landuse ⟷ objective density	-0.61	12.804	0.00	decreasing

The measure of t-value and p-value indicates that the H_0 is accepted, therefore there is no correlation between objective density and objective access. However, in other examined correlations, H_0 is rejected, so, there is a positive correlation between objective housing and objective access, objective housing and objective land use, and objective housing and objective density, as well as, objective access and objective landuse. Moreover, there is a negative correlation between objective land use and objective density.

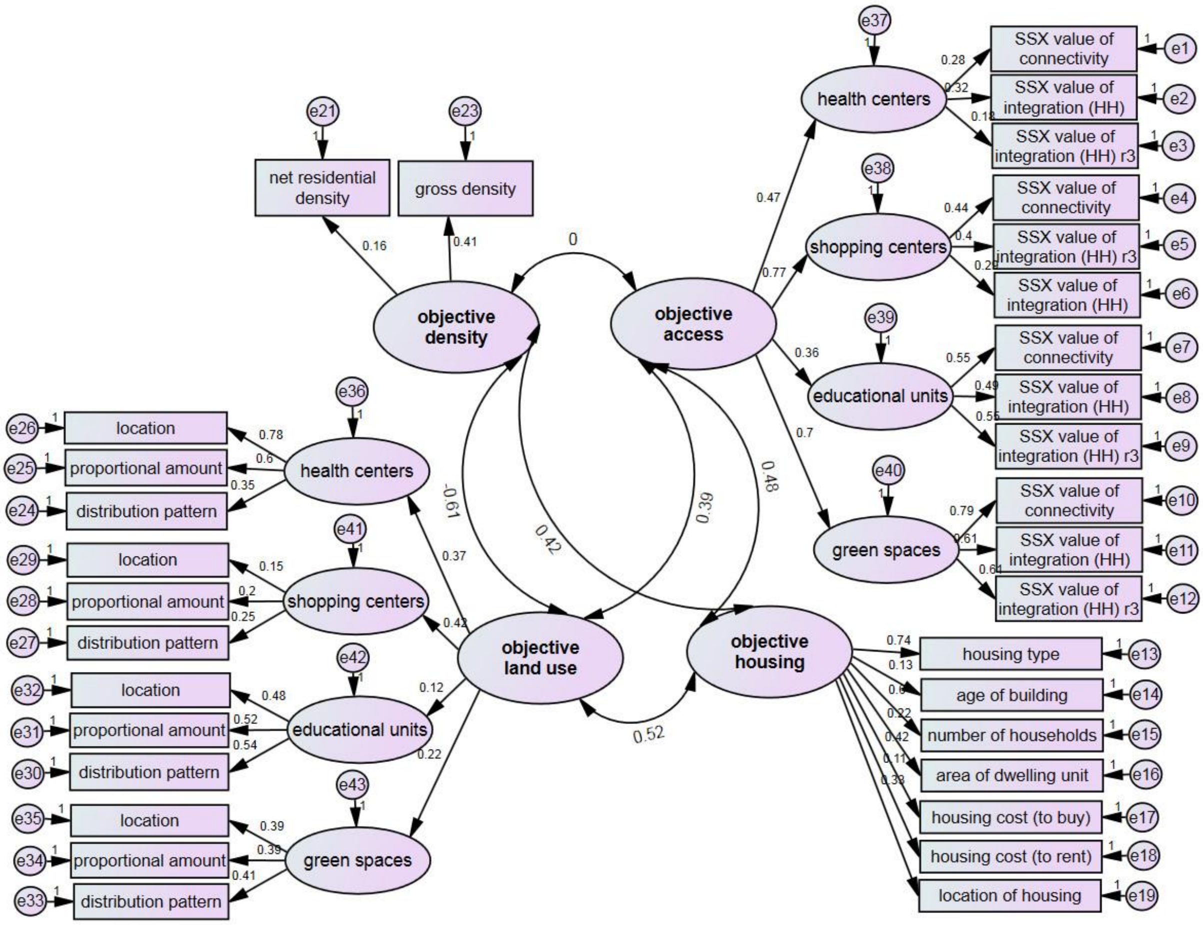


Figure 5.8.1. Structural Equation Modelling: path analysis model to investigate the relationship between objective density, access, land use, and housing

In this model, the root mean square error of approximation (RMSEA) is 0.064, and the chi-squared test (X^2/ df) is 2.072. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.959, adjusted goodness of fit index (AGFI) is 0.929, comparative fit index (CFI) is 0.932, normed fit index (NFI) is 0.904, non-normed fit index or Tucker-Lewis index is 0.918, and incremental fit index is 0.991, these values of indices indicate the good fit of the model.

Table 5.8.2. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.064
chi-squared test (x^2 / df)	< 3	2.072
goodness of fit index (GFI)	≥0.90	0.959
adjusted goodness of fit index (AGFI)	≥0.90	0.929
comparative fit index (CFI)	≥0.90	0.932
normed fit index (NFI)	≥0.90	0.904
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.918
incremental fit index (IFI)	≥0.90	0.991

Analyzing the relationship between subjective measures of access, overcrowding, and layout

H8: " there is a correlation between subjective measures of access, overcrowding, and layout."

Structural Equation Model (SEM) to examine the H8 includes subjective measures of **density** (overcrowding) includes perceived overcrowding in neighborhood and city, and satisfaction with overcrowding in neighborhood and city, subjective **access** includes satisfaction with access to shopping centers in neighborhood and city, public green space, educational unit, health center, quality of paths, and overall satisfaction with access, and subjective **layout** includes the relationship with neighbors, participation in events in the city and neighborhood, legibility, symbols and signs, value, memory, attraction, satisfaction with urban structure, satisfaction with mixed land use, satisfaction with urban facilities, and satisfaction with access.

Structural equation modeling used 23 manifest subjective variables derived from the field survey to measure 3 latent subjective variables (subjective access, subjective layout, and overcrowding).

To examine the correlations, H_0 and H_1 are defined. In H0, there is no correlation between measures and in H_1 there is a correlation.

Table 5.8.3. Table of path coefficient and its significance.

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
sub. access ⟷ overcrowding	0.57	9.550	0.00	increasing
sub. access ⟷ sub. layout	0.77	11.109	0.00	increasing
sub. layout ⟷ overcrowding	0.61	11.704	0.00	increasing

The measure of t-value and p-value indicates that the H_0 in all of the three examined correlations are rejected, therefore it can be concluded that there is a correlation between subjective access and overcrowding, subjective access and subjective layout, and subjective layout and overcrowding. The positive path coefficient indicates a positive correlation and a direct relationship between these indicators.

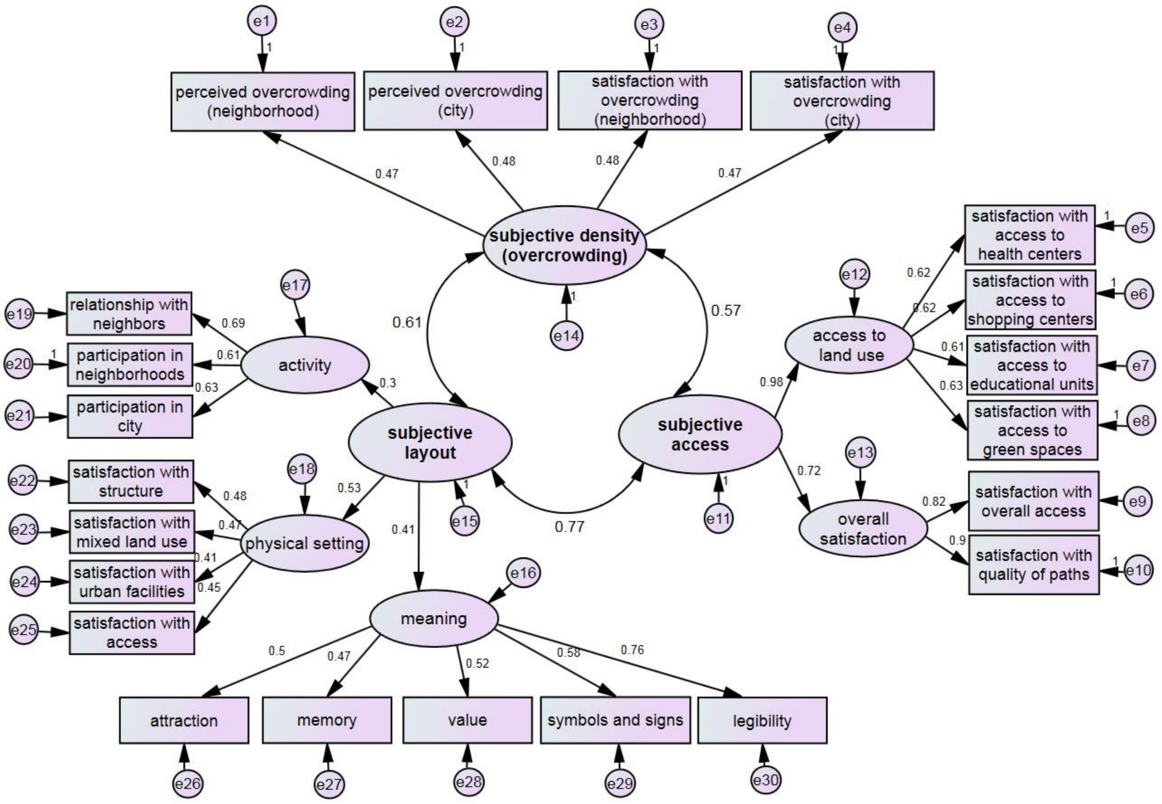


Figure 5.8.2. Structural Equation Modelling: path analysis model to investigate the relationship between subjective density (overcrowding), access, and layout

In this model, the root mean square error of approximation (RMSEA) is 0.051, and the chi-squared test (X^2/ df) is 2.198. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.22, adjusted goodness of fit index (AGFI) is 0.927, comparative fit index (CFI) is 0.994, normed fit index (NFI) is 0.915, non-normed fit index or Tucker-Lewis index is 0.988, and incremental fit index is 0.920, these values of indices indicate the good fit of the model.

Table 5.8.4. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.051
chi-squared test (x^2 / df)	< 3	2.198
goodness of fit index (GFI)	≥0.90	0.922
adjusted goodness of fit index (AGFI)	≥0.90	0.927
comparative fit index (CFI)	≥0.90	0.994
normed fit index (NFI)	≥0.90	0.915
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.988
incremental fit index (IFI)	≥0.90	0.920

5.9 Analyzing the Relationships between Indicators and Urban Identity and Quality of Urban Life in Andisheh new town

In this part relationships between indicators and urban identity as well as the urban quality of life have been examined. :

H9: “lower measures of overcrowding, higher measures of subjective housing, subjective land use, subjective access, and subjective layout predict higher quality of urban life and urban identity”.

To answer the 9th hypothesis **(H9)**, it is divided into the various correlations between measures and UI and QOUL. Structural Equation Model (SEM) is applied to evaluate the relation between subjective indicators and urban identity as well as the quality of urban life. It includes subjective measures of **overcrowding**, **housing**, **land use**, **access**, and **layout** as well as measures of **urban identity** and **quality of urban life**.

Structural equation modeling used 28 manifest subjective variables derived from the field survey to measure 1 latent subjective variable (quality of urban life) and 25 manifest subjective variables also derived from the field survey to measure 1 latent subjective variable (urban identity).

Analyzing the relationship between subjective overcrowding and urban identity and quality of urban life in Andisheh new town

To examine the hypothesis and to find out the correlation two hypotheses are defined:

- H_0 (QOUL): there is no correlation between subjective overcrowding and quality of urban life.
- H_1 (QOUL): there is a correlation between subjective overcrowding and quality of urban life.
- H_0 (UI): there is no correlation between subjective overcrowding and urban identity.
- H_1 (UI): there is a correlation between subjective overcrowding and urban identity.

Table 5.9.1. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
overcrowding (subjective density) → QOUL	- 0.21	-5.035	0.00	decreasing
overcrowding (subjective density) → UI	0.39	7.255	0.00	increasing

to examine the correlation between subjective overcrowding and QOUL, the t-value is more than 1.96, and the p-value, which should be less than 0.05 to be significant, is 0.00; so, it can be concluded that the H_0(QOUL) is rejected. As the t-value of the correlation between subjective overcrowding and UI is also more than 1.96 and the p-value is significant, therefore, H_0(UI) is rejected.

Therefore, there are correlations between subjective overcrowding and QOUL (with negative path coefficient) as well as subjective overcrowding and UI (with positive path coefficient). The positive path coefficient indicates a positive correlation and a direct relationship between these two indicators; accordingly, **higher measures of subjective overcrowding predict higher UI**. The negative path coefficient determines **higher measures of subjective overcrowding predicts lower QOUL**.

Analyzing the relationship between subjective housing and urban identity and quality of urban life in Andisheh new town

To examine the hypothesis and to find out the correlation two hypotheses are defined:

- H_0 (QOUL): there is no correlation between subjective housing and the quality of urban life.
- H_1 (QOUL): there is a correlation between subjective housing and the quality of urban life.
- H_0 (UI): there is no correlation between subjective housing and urban identity.
- H_1 (UI): there is a correlation between subjective housing and urban identity.

Table 5.9.2. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
subjective housing ⟶ QOUL	0.45	10.658	0.00	increasing
subjective housing ⟶ UI	0.64	12.928	0.00	increasing

To examine the correlation between subjective housing and QOUL, the t-value is more than 1.96 and it is 10.658, and the p-value, which should be less than 0.05 to be significant, is 0.00; so, it can be concluded that the H_0(QOUL) is rejected. As the t-value of the correlation between subjective housing and UI is also more than 1.96 and the p-value is significant, therefore, H_0(UI) is rejected.

Therefore, there are correlations between subjective housing and QOUL as well as subjective housing and UI. The positive path coefficient indicates a positive correlation and a direct relationship between these two indicators; accordingly, **higher measures of subjective housing predicts higher UI** as well as **higher QOUL**.

Analyzing the relationship between subjective land use and urban identity and quality of urban life in Andisheh new town

To examine the hypothesis and to find out the correlation two hypotheses are defined:

- H_0 (QOUL): there is no correlation between subjective land use and quality of urban life.
- H_1 (QOUL): there is a correlation between subjective land use and quality of urban life.
- H_0 (UI): there is no correlation between subjective land use and urban identity.
- H_1 (UI): there is a correlation between subjective land use and urban identity.

Table 5.9.3. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
subjective land use → QOUL	0.02	0.508	0.612	no correlation
subjective land use → UI	0.81	13.801	0.00	increasing

To examine the correlation between subjective land use and QOUL, the t-value and the p-value are not significant; so, it can be concluded that the H_0(QOUL) is not rejected. As the t-value of the correlation between subjective land use and UI is more than 1.96 and the p-value is significant, therefore, H_0(UI) is rejected.

Therefore, there is a correlation between subjective land use and UI. The positive path coefficient indicates a positive correlation and a direct relationship between these indicators; hence, **higher measures of subjective land use (satisfaction with land use) predicts higher UI**.

Analyzing the relationship between subjective access and urban identity and quality of urban life in Andisheh new town

To examine the hypothesis and to find out the correlation two hypotheses are defined:

- H_0 (QOUL): there is no correlation between subjective access and quality of urban life.
- H_1 (QOUL): there is a correlation between subjective access and quality of urban life.
- H_0 (UI): there is no correlation between subjective access and urban identity.
- H_1 (UI): there is a correlation between subjective access and urban identity.

Table 5.9.4. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
subjective access → QOUL	0.04	1.059	0.29	no correlation
subjective access → UI	0.34	10.009	0.00	increasing

To examine the correlation between subjective access and QOUL, the t-value is not more than 1.96 and the p-value, which should be less than 0.05 to be significant, is more; so, it can be concluded that the H_0(QOUL) is not rejected. As the t-value of the correlation between subjective access and UI is more than 1.96 and the p-value is significant, therefore, H_0(UI) is rejected.

Therefore, there is a correlation between subjective access and UI. The positive path coefficient indicates a positive correlation and a direct relationship between indicators; accordingly, **higher measures of subjective access predict higher UI**.

Analyzing the relationship between subjective layout and urban identity and quality of urban life in Andisheh new town

To examine the hypothesis and to find out the correlation two hypotheses are defined:

- H_0 (QOUL): there is no correlation between subjective layout and quality of urban life.
- H_1 (QOUL): there is a correlation between subjective layout and quality of urban life.
- H_0 (UI): there is no correlation between subjective layout and urban identity.
- H_1 (UI): there is a correlation between subjective layout and urban identity.

Table 5.9.5. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
subjective layout → QOUL	-0.08	-1.902	0.05	no correlation
subjective layout → UI	0.42	11.021	0.00	increasing

Considering the t-values and p-values of the correlations between subjective layout and QOUL, and subjective layout and UI, it can be concluded that the H_0(QOUL) is not rejected but H_0(UI) is rejected. Hence, the correlation between subjective layout and UI is meaningful. The positive path coefficient indicates a positive correlation and a direct relationship between indicators; therefore, **higher measures of subjective layout predict higher UI**.

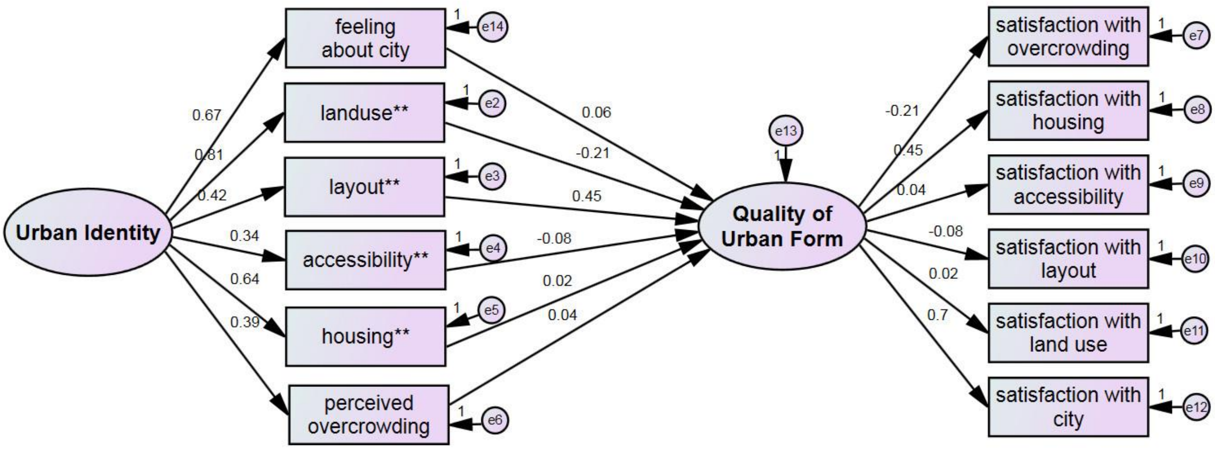


Figure 5.9.1. Structural Equation Modelling: path analysis model to investigate the relationship between subjective indicators of overcrowding, housing, land use, access, and layout and QOUL and UI

In this model, the root mean square error of approximation (RMSEA) is 0.069, and the chi-squared test (X^2/ df) is 2.975. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.952, adjusted goodness of fit index (AGFI) is 0.9156, comparative fit index (CFI) is 0.954, normed fit index (NFI) is 0.934, non-normed fit index or Tucker-Lewis index is 0.932, and incremental fit index is 0.955, these values of indices indicate the good fit of the model.

Table 5.9.6. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.069
chi-squared test (x^2 / df)	< 3	2.975
goodness of fit index (GFI)	≥0.90	0.952
adjusted goodness of fit index (AGFI)	≥0.90	0.915
comparative fit index (CFI)	≥0.90	0.954
normed fit index (NFI)	≥0.90	0.934
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.932
incremental fit index (IFI)	≥0.90	0.955

5.10 Analyzing the Main Hypotheses: Relationships between Urban Identity, Quality of Urban Life, and Urban Form

In the final section of the analysis, the main research hypotheses are examined. These hypotheses are:

HI - "There is a direct and mutual correlation between Urban Identity and Quality of Urban Life in Andisheh new town"

HII - "Urban Form affects Urban Identity and Quality of Urban Life in Andisheh new town"

Structural equation modeling is applied to evaluate the relationship between indicators of urban identity, quality of urban life, and urban form (see 2.5). As it is presented in the following figures (5.10.1, 5.10.2, and 5.10.3), **urban identity** includes indicators of **overcrowding** that are perceived overcrowding in neighborhood and city, an indicator of **housing** that is the number of households in the building, indicators of **accessibility** that are satisfaction with access and satisfaction with the quality of paths, indicators of **layout** that are satisfaction with urban structure, with urban facilities, with mixed land use, and with access, legibility, symbols and signs, memory, value, attraction, relationship with neighbors, and participation in events in neighborhood and city, indicators of availability of **land use** that are the availability of health centers, educational units, shopping centers, and green space, and finally, indicators to measure the **feeling about the city** that is to be a citizen of Andisheh, to stay and live in Andisheh, feeling about Andisheh and how like Andisheh.

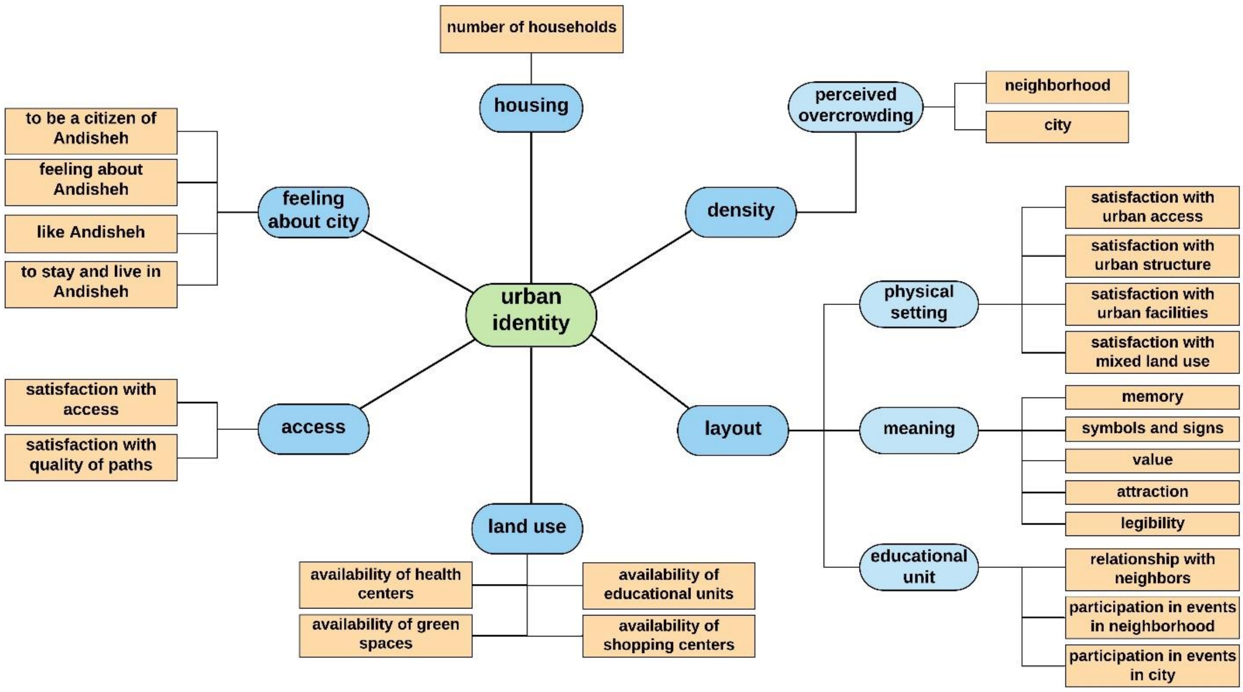


Figure 5.10.1. Indicators of Urban Identity used in SEM in this research

Quality of urban life includes indicators of **overcrowding** that are satisfaction with perceived overcrowding in neighborhood and city, indicators of **housing**, which are housing cost and satisfaction with it, age of building and satisfaction with the quality of the building, number of households in building and satisfaction with it, satisfaction with housing type and area of the dwelling unit and overall satisfaction with housing, indicators of **accessibility** that are satisfaction with access to health centers, to green spaces, to educational units, and to shopping centers, an indicator of the **layout** is satisfaction with structure, indicators of **land use** are satisfaction with health centers, with shopping centers, with educational units and with green spaces, in the end, the indicators of **satisfaction with the city** that are satisfied with living in Andisheh and to be a resident of Andisheh.

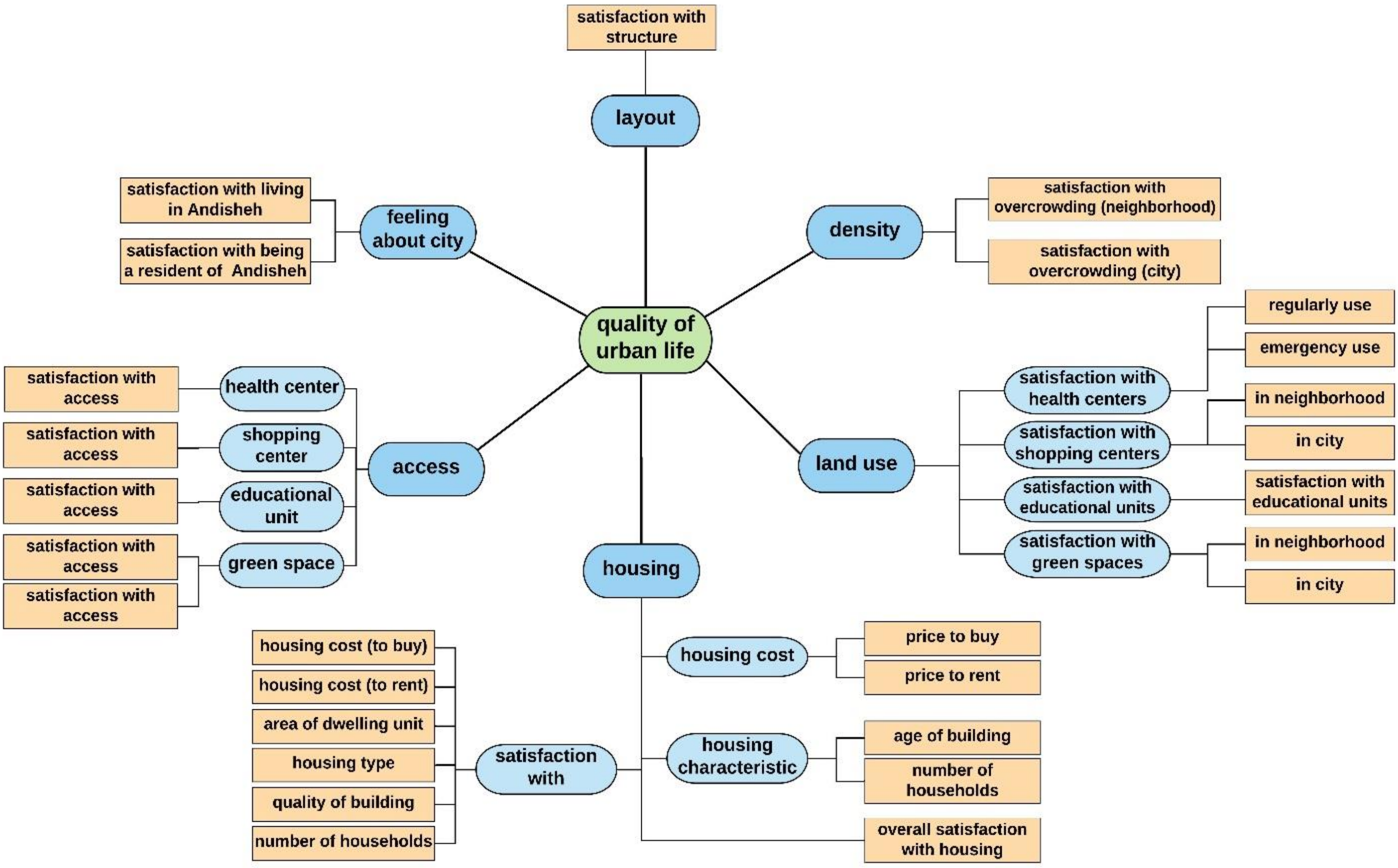


Figure 5.10.2. Indicators of quality of urban life used in SEM in this research

The urban form includes indicators of **density** that are gross density in neighborhood and city and net residential density in neighborhood and city, indicators of **housing** that are location, housing type and area of dwelling unit indicators of **access** that are connectivity, integration (HH), integration (HH) R3, mean depth and mean depth R3 of health centers, shopping centers, educational units, and green spaces, and finally, indicators of **land use** that are location, proportional amount and nearest neighbor ratio (distribution pattern) of health centers, shopping centers, educational units, and green spaces.

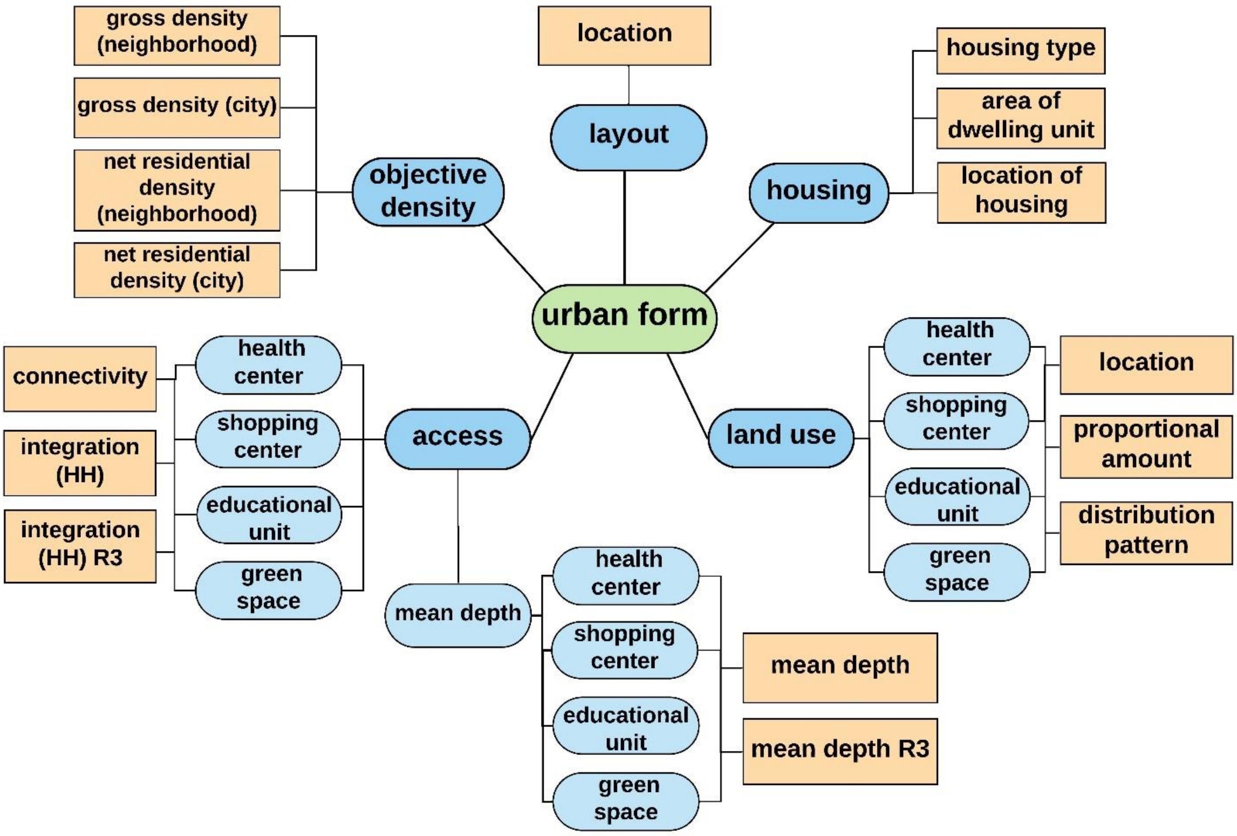


Figure 5.10.3. Indicators of urban form used in SEM in this research

Structural equation modeling used 53 manifest subjective variables derived from the field survey to measure 2 latent subjective variables (urban identity and quality of life), and 40 manifest objective variables to measure 1 objective variable (urban form).

Analyzing the relationship between urban identity and the quality of urban life in Andisheh new town

To examine the first main hypothesis (**HI**) which is "**there is direct and mutual correlation between UI and QOUL in Andisheh new town**", structural equation modeling is applied. SEM used 53 manifest subjective variables derived from the field survey to measure 2 latent subjective variables (urban identity and quality of urban life)[9]. To find out the correlation, two hypotheses are defined:

- H_0: there is no correlation between Urban Identity and Quality of Urban Life.
- H_1: there is a correlation between Urban Identity and Quality of Urban Life.

[9]. The figure I (see attachment) illustrates the manifest subjective and objective variables used in the model HI

Table 5.10.1. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
UI ⟷ QOUL	0.87	-5.490	0.00	increasing

Considering the t-value that should be more than 1.96 or less than -1.96, and the p-value, which should be less than 0.05, it can be concluded that the H_0 is rejected. Accordingly, there is a correlation between UI and QOUL. The positive path coefficient indicates a positive correlation and a direct relationship between these dimensions. Therefore, **there is a direct and mutual correlation between UI and QOUL**.

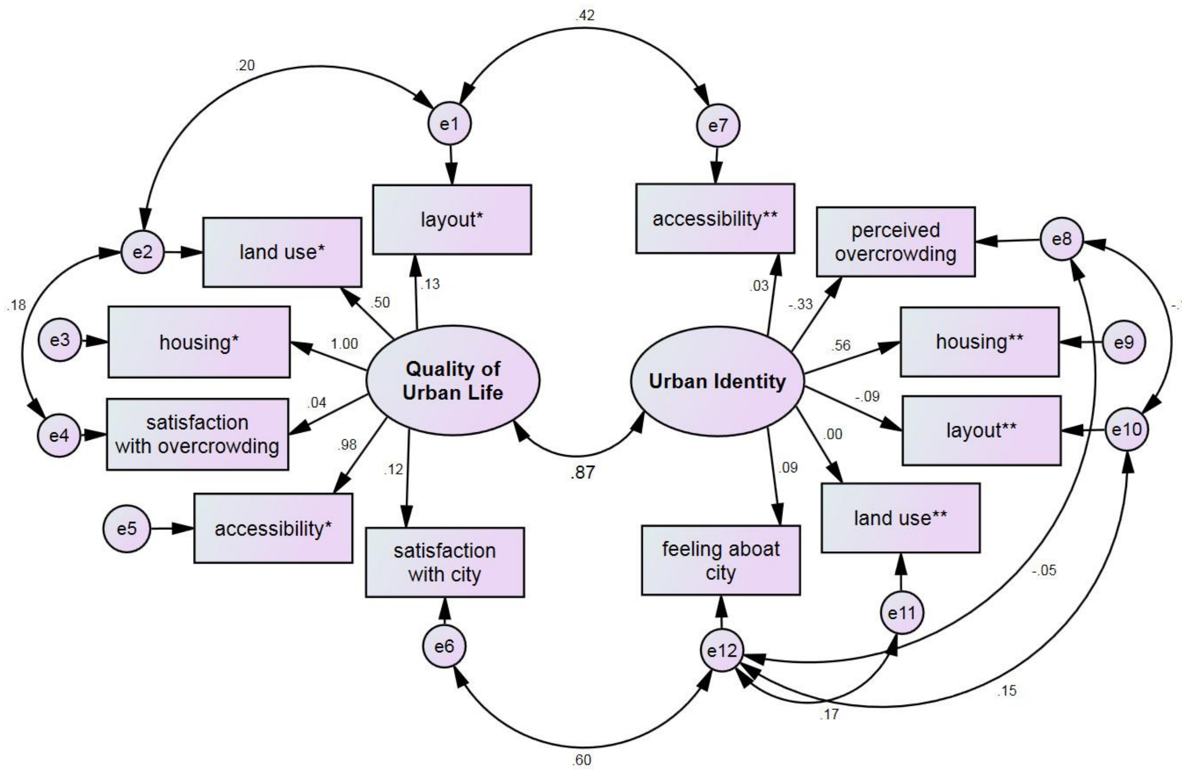


Figure 5.10.4. Structural Equation Modelling: path analysis model to investigate the relationship between QOUL and UI

In this model, the root mean square error of approximation (RMSEA) is 0.068, and the chi-squared test (X^2/ df) is 2.862. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.953, adjusted goodness of fit index (AGFI) is 0.917, comparative fit index (CFI) is 0.957, normed fit index (NFI) is 0.936, non-normed fit index or Tucker-Lewis index is 0.935, and incremental fit index is 0.957, these values of indices indicate the good fit of the model.

Table 5.10.2. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.068
chi-squared test (x^2 / df)	< 3	2.868
goodness of fit index (GFI)	≥0.90	0.953
adjusted goodness of fit index (AGFI)	≥0.90	0.917
comparative fit index (CFI)	≥0.90	0.957
normed fit index (NFI)	≥0.90	0.936
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.935
incremental fit index (IFI)	≥0.90	0.957

Analyzing the relationship between urban identity, quality of urban life and urban form in Andisheh new town

To examine the second main hypothesis (**HII**) that is "**Urban Form affects Urban Identity and Quality of Urban Life in Andisheh new town**" structural equation modeling is applied. SEM used 53 manifest subjective variables derived from the field survey to measure 2 latent subjective variables (urban identity and quality of urban life) and 40 manifest objective variables to measure 1 objective variable (urban form)[10]. To find out the correlation, two correlations are studied. For each correlation, two hypotheses are defined:

- $H_{0\ (1)}$: there is no correlation between Urban Form and Quality of Urban Life.
- $H_{1\ (1)}$: there is a correlation between Urban Form and Quality of Urban Life.

- $H_{0\ (2)}$: there is no correlation between Urban Form and Urban Identity.
- $H_{1\ (2)}$: there is a correlation between Urban Form and Urban Identity.

Table 5.10.3. Table of path coefficient and its significance

Table of path coefficient and its significance				
examined correlation	*path coefficient*	*t-value*	*p-value*	*type of correlation*
Urban Form ⟶ QOUL	-.064	-11.500	0.00	decreasing
Urban Form ⟶ UI	- 1.30	-10.696	0.00	decreasing

[10] . The figure III (see attachment) illustrates the manifest subjective and objective variables used in the model HII

In the first correlation, considering the t-value that should be more than 1.96 and the p-value, which should be less than 0.05 to be significant, it can be concluded that the $H_{0\ (1)}$ is rejected. Hence, there is a correlation between Urban Form and QOUL. The negative path coefficient indicates a negative correlation between these dimensions. Therefore, **there is a negative correlation between Urban Form and QOUL in Andisheh new town**.

The t-value and p-value of the second correlation are also significant, which means $H_{0\ (2)}$ is rejected. Therefore, there is a correlation between Urban Form and Urban Identity. As the correlation is negative, **there is a negative correlation between Urban Form and UI in Andisheh new town**. Therefore, if measures of urban form increase, measures of UI or QOUL decrease.

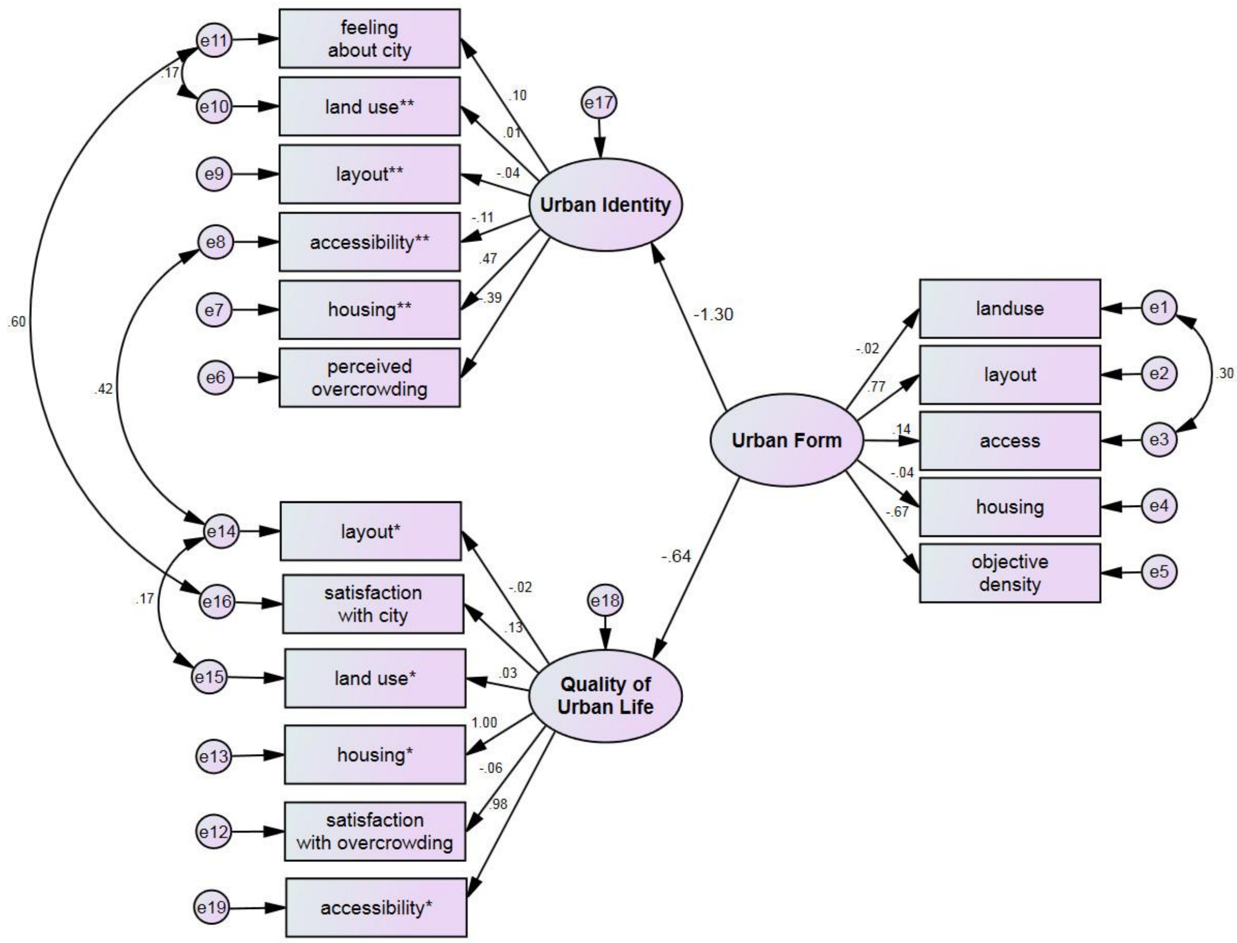


Figure 5.10.5. Structural Equation Modelling: path analysis model to investigate the relationship between QOUL, UI, and Urban Form

In this model, the root mean square error of approximation (RMSEA) is 0.065, and the chi-squared test (X^2/ df) is 2.736. The indices GFI, AGFI, CFI, NFI, TLI, IFI, and RMSEA are varied between 0 to 1, the closer to 1 indicates the better model fit. In this model, the goodness of fit index (GFI) is 0.917, adjusted goodness of fit index (AGFI) is 0.887, comparative fit index (CFI) is 0.918, normed fit index (NFI) is 0.878, non-normed fit index or Tucker-Lewis index is 0.901, and incremental fit index is 0.919, these values of indices indicate the good fit of the model.

Table 5.10.4. The indices of model fit of the path analysis model

The indices of model fit of the path analysis model		
Index	Appropriate limit of statistic	Reported value
root mean square error of approximation (RMSEA)	≤0.08	0.065
chi-squared test (x^2 / df)	< 3	2.736
goodness of fit index (GFI)	≥0.90	0.917
adjusted goodness of fit index (AGFI)	≥0.90	0.887
comparative fit index (CFI)	≥0.90	0.918
normed fit index (NFI)	≥0.90	0.878
Tucker-Lewis index (TLI) or non-normed fit index (NNFI)	≥0.90	0.901
incremental fit index (IFI)	≥0.90	0.919

Chapter 6:

EVALUATION AND CONCLUSION

The following chapter reviews the research questions and hypotheses; moreover, the findings are concluded. The present chapter is based on the previous chapters including the theoretical background and literature review of the quality of urban life, urban identity, and urban physical form in chapter 2. Furthermore, in chapter 3, the study area of Andisheh new town is explained. The research methods provide the methodological framework containing integration of qualitative and quantitative methods, observation, applying software includes GIS, Space Syntax, and SEM through SPSS and AMOS for this research (see chapter 4). In chapter 5, the methods are applied in the study area; moreover, the analyses and results are also presented. Finally, this chapter aims to evaluate hypotheses, answer the research questions, and present findings.

6.1 The Evaluation of Research Hypotheses and Research Questions

The hypotheses of the present research are classified into two categories which are the main hypotheses of the research and subsidiary hypotheses related to each dimension. The hypotheses have been described in the previous chapter (see chapter 2 and 5). In this part, the hypotheses have been reviewed again to conduct the conclusion.

H1: Higher objective measures of density predicts higher subjective measures of overcrowding and lower satisfaction with overcrowding

The correlations are evaluated through the structural equation modeling by assessing objective indicators of density (gross density and net residential density) and subjective indicators of overcrowding (perceived overcrowding and satisfaction with overcrowding in the scales of neighborhood and city) as having been explained in 5.2, the results confirm the correlations between objective density and satisfaction with overcrowding, as well as objective density and perceived overcrowding. Therefore, two correlations of the first hypothesis are confirmed. The path coefficient of the correlation between objective density and satisfaction with overcrowding is -0.53, which means there is an acceptable negative correlation. It indicates that people are not satisfied with the overcrowding, where density is relatively high. The path coefficient of the correlation between objective density and perceived overcrowding is

-0.13, which means there is an acceptable negative correlation. Therefore, if objective density increases by 1 standard deviation, perceived density decreases by 0.13 standard deviation, and satisfaction with overcrowding also decreased by 0.53 standard deviation on average.

H2: objective measures of housing affects satisfaction with housing

The correlation between objective measures of housing and satisfaction with housing in Andisheh new town through the SEM (see 5.3) represents a positive correlation between objective measures of housing and satisfaction with housing, the value of the path coefficient is 0.32 which shows an acceptable correlation. Objective measures of housing include the location of housing, housing type, age of the building, number of households, area of dwelling units, and housing cost. The measure of satisfaction with housing contains satisfaction with housing type, satisfaction with the quality of the building, satisfaction with the number of households, satisfaction with the area of units, satisfaction with housing cost, and overall satisfaction with housing. As a result, the second hypothesis is accepted.

H3: higher objective measures of land use predicts higher satisfaction with land use

The value of the path coefficient between objective measures of land use and satisfaction with land use is -0.03 and the values show an insignificant correlation. Therefore, the results indicate that there is no correlation between objective measures of land use and satisfaction with land use. The objective measure of land use includes the location of land uses, the proportional amount of each land use, and the distribution pattern of each land use, and satisfaction with land use contains satisfaction with health centers, shopping centers, educational units, and public green spaces. As a result, the third hypothesis is not approved. (see 5.4)

H4: measures of activities, meaning, and physical setting are in correlation

The analysis through the SEM represents that there are not any correlations between physical setting and meaning as well as physical setting and activities (see 5.5). Although the value of the path coefficient of correlation of activities and meaning is acceptable, it is weak (0.12). The indicators of activities are relationship with neighbors, participation in events in the neighborhood and city; the indicators of meaning are memory, symbol and sign, value, attraction, and legibility, and the indicators of the physical setting are satisfaction with structure, satisfaction with urban facilities, satisfaction with mixed land use, and satisfaction with access. Accordingly, the correlation between activities and meaning in the 4th hypothesis is accepted.

H5: higher objective measures of accessibility predicts higher subjective measures of accessibility

Through SEM, it is conducted that there is not any significant correlation between objective measures of accessibility and subjective measures of accessibility (see 5.6). As the value of the path coefficient is 0.00 and the values are not significant, there is not any correlation. The objective measure of access involves connectivity, integration (HH), and integration R3 (HH) of health centers, public green spaces, educational units, and shopping centers. The subjective measure of access includes satisfaction with access to health centers, public green spaces, educational units, shopping centers, access, and quality of the paths. Therefore, the 5th hypothesis is not confirmed.

H6: higher objective measures of mean depth to land uses predicts lower satisfaction with land uses

The analysis through the SEM shows a negative acceptable correlation between mean depth and satisfaction with land uses (see 5.6). The value of the path coefficient between the variables is - 0.22. The mean depth includes mean depth and mean depth R3 of health centers, public green spaces, educational units, and shopping centers and satisfaction with these land uses. The result of the analysis confirmed the negative correlation, which indicates that people are less satisfied with the land uses that have more access depth; so, accepts the 6th hypothesis.

H7: there are correlations between objective measures of access, density, housing, and land use.

The structural equation modeling indicates that there are not any correlations between objective measures of access and objective measures of density. There are acceptable positive correlations between objective measures of housing and objective measures of access (the value is 0.48), as well as, objective measures of housing and objective measures of land use (the value is 0.52), also objective measures of housing and objective measures of density (the value is 0.42), moreover objective measures of access and objective measures of land use (the value is 0.39). Furthermore, there is a negative correlation between objective measures of land use and objective measures of density (the value is -.61). (see 5.8)

Although the correlation between objective measures of land use and objective measures of density is negative, this correlation is stronger than the correlations between objective measures of housing and objective measures of access and objective measures of housing and objective measures of land use. The objective measure of access includes connectivity, integration (HH), and integration R3 (HH) of land uses, the objective measure of density contains gross density in the neighborhood and city, the objective measure of housing includes the location of housing, housing type, age of the building, number of households, area of the dwelling unit, and housing cost, and the objective measure of land use includes location, proportional amount, and distribution pattern of land uses. Therefore, the correlations of the 7th hypothesis are accepted.

H8: there is a correlation between subjective measures of access, overcrowding, and layout

The results of the analysis through SEM confirm the hypothesis (see 5.8). The correlation between subjective measures of access (sub. access) and overcrowding, the correlation between subjective measures of layout (sub. layout) and overcrowding, and the correlation between the subjective measures of access and subjective measures of layout are positive. As the values of the path coefficient among sub. access and overcrowding and sub. layout and overcrowding are 0.57 and 0.61, there is an acceptable correlation. The value of the path coefficient between sub. access and sub. layout is 0.77 which indicates an optimum correlation.

The subjective measures of access are satisfaction with access to health centers, public green spaces, educational units, shopping centers, and satisfaction with access and quality of paths. The subjective measures of overcrowding are perceived overcrowding in the neighborhood and city and satisfaction with overcrowding in the neighborhood and city. The subjective measures of the layout are relationships with neighbors, participation in events in the neighborhood and city, memory, symbol and sign, value, attraction, legibility, satisfaction with structure, satisfaction with urban facilities, satisfaction with mixed land use, and satisfaction with access.

In the following table, the variables and the correlations between them are presented from the strongest correlation to the weakest and no correlation.

Table 6.1. The examined correlation between various measures

Table of path coefficient and its significance					
examined correlation		*path coefficient*	*t-value*	*p-value*	*type of correlation*
subjective access	subjective layout	0.77	11.109	0.00	increasing
subjective layout	subjective overcrowding	0.61	11.704	0.00	increasing
objective landuse	objective density	- 0.61	12.804	0.00	decreasing
subjective access	subjective overcrowding	0.57	9.550	0.00	increasing
objective density	satisfaction with overcrowding	- 0.53	-9.632	0.00	decreasing
objective landuse	objective housing	0.52	10.499	0.00	increasing
objective access	objective housing	0.48	11.317	0.00	increasing
objective housing	objective density	0.42	10.685	0.00	increasing
objective access	objective land use	0.39	11.026	0.00	increasing
objective housing	subjective housing	0.32	5.132	0.00	increasing
mean depth	satisfaction with landuse	- 0.22	-2.089	0.03	decreasing
objective density	subjective overcrowding	- 0.13	-2.431	0.015	decreasing
meaning	activities	0.12	3.001	0.043	increasing
meaning	physical setting	0.04	0.782	0.434	no correlation
activities	physical setting	0.00	0.003	0.997	no correlation
objective access	subjective access	0.00	0.039	0.969	no correlation
objective access	objective density	0.00	1.94	0.051	no correlation
objective landuse	subjective landuse	- 0.03	-0.534	0.546	no correlation

As a conclusion of this part, there are several optimum correlations based on the analyses of the present research. First, there is an optimal correlation between subjective measures of access and subjective measures of layout. It indicates that “residents’ satisfaction with access, quality of the paths and access to health centers, shopping centers, educational units, and green space and relation with neighbors, participation in events in neighborhood and city, memory, symbol and sign, value, attraction, legibility, satisfaction with structure, urban facilities, mixed land use, and access” of Andisheh new town are related strongly. The correlation between subjective layout and subjective overcrowding is the second strongest correlation, which means "how residents perceive the overcrowding and how they are satisfied with the overcrowding, affect their relationships with neighbors, participation in events in neighborhood and city, memory, symbol and sign, value, attraction, legibility, satisfaction with structure, urban facilities, mixed land use, and access" of Andisheh new town. The third strongest correlation is between objective measures of land use and objective measures of density, which is negative. It states "the location, proportional amount, and distribution pattern of land uses" and "gross and net residential density" of the neighborhoods of Andisheh new town are related indirectly.

H9: lower measures of overcrowding, higher measures of subjective housing, subjective land use, subjective access, and subjective layout predict the higher quality of urban life and urban identity

Using SEM analysis, the correlations between QOUL and UI and subjective measures are evaluated (see 5.9). Measures of overcrowding include the indicators of perceived overcrowding in the neighborhood and city and satisfaction with overcrowding in the neighborhood and city; subjective measures of housing include satisfaction with housing type, quality of building, number of households, area of the unit, housing cost, and overall satisfaction with housing; subjective measures of land use include the availability of land uses and satisfaction with them; subjective measures of access are satisfaction with access, quality of paths, and satisfaction with access to land-uses; subjective measures of the layout are relation with neighbors, participation in events in neighborhood and city, memory, symbol and sign, value, attraction, legibility, satisfaction with structure, urban facilities, mixed land use, and access.

Considering the results of the analyses there are 2 acceptable correlations between QOUL and other subjective measures. Lower measures of overcrowding predict higher QOUL, while the correlation between overcrowding and QOUL is an acceptable negative correlation with the value of -0.21. The value of the correlation between measures of subjective housing and QOUL is 0.45; the value represents an acceptable positive correlation. The path coefficient among subjective measures of land use (sub. land use) and QOUL is 0.02, between subjective measures of layout (sub. layout) and QOUL, is – 0.08, and between subjective measures of access (sub. access) and

QOUL is 0.04, moreover, the values are not significant, which represent there are not any acceptable correlations.

The correlations between UI and indicators are positive. The correlations among UI and subjective measures of overcrowding (sub. overcrowding), also subjective measures of access (sub. access), and subjective measures of layout (sub. layout) are acceptable correlation with the values of 0.39, 0.34, and 0.42. The correlations between UI and subjective measures of housing (sub. housing) and also between UI and subjective measures of land use (sub. land use) are optimum correlations with the values of 0.64 and 0.81. Therefore, the correlation between UI and subjective measures of land use (sub. land use) is the strongest in comparison with other subjective measures.

The following table shows the correlations between UI and QOUL and subjective measures.

Table 6.2. Path coefficient and its significance of UI, QOUL, and subjective measures

examined correlation		***path coefficient***	***t-value***	***p-value***	***type of correlation***
UI	subjective land use	0.81	13.801	0.00	increasing
UI	subjective housing	0.64	12.928	0.00	increasing
UI	subjective layout	0.42	11.021	0.00	increasing
UI	sub overcrowding	0.39	7.255	0.00	increasing
UI	subjective access	0.34	10.009	0.00	increasing
QOUL	subjective housing	0.45	10.658	0.00	increasing
QOUL	sub overcrowding	-0.21	-5.035	0.00	decreasing
QOUL	subjective layout	-0.08	-1.902	0.05	no correlation
QOUL	subjective access	0.04	1.059	0.29	no correlation
QOUL	subjective land use	0.02	0.508	0.612	no correlation

The strongest correlation is between urban identity and subjective land use. The indicators of subjective land use are satisfaction with health centers (regular use or emergency use), satisfaction with shopping centers in neighborhood and city, satisfaction with educational units, and satisfaction with green space in neighborhood and city and also the availability of health centers, green spaces, educational units, and shopping centers in the neighborhood and city. Afterward, the correlation between urban identity and subjective housing including satisfaction with housing type, satisfaction with the quality of the building, satisfaction with the number of households, satisfaction with the area of the unit, and satisfaction with housing cost is the next strong correlation. Then, QOUL has the third strongest correlation, which is with subjective housing.

Main hypotheses

HI - There is a direct and mutual correlation between Urban Identity and Quality of Urban Life in Andisheh new town

The evaluation of the measures of UI and QOUL through SEM represents the optimum positive correlation between these dimensions. As the value of the path coefficient is 0.87, these dimensions affect each other in Andisheh new town strongly. (see 5.10)

HII - Urban Form affects Urban Identity and Quality of Urban Life in Andisheh new town

Through the analysis of SEM, it is concluded that urban form affects urban identity in Andisheh new town, as well as quality of urban life (see 5.10). The value of the path coefficient among the UF and QOUL is -0.64, which indicates a strong negative correlation. The value of the path coefficient between UF and UI is -1.3, which represents a strong negative correlation (the reason why the absolute value of the path coefficient is more than 1 is a high correlation between variables in this relation).

Table 6.3. The correlation between QOUL, UI, and UF

Table of path coefficient and its significance					
examined correlation		***path coefficient***	***t-value***	***p-value***	***type of correlation***
UF	QOUL	-0.64	-11.500	0.00	decreasing
UF	UI	-1.30	-10.696	0.00	decreasing

The Evaluation of Research Question

1- How urban physical form can be analyzed through its objective features and subjective characteristics of urban identity and quality of urban life? In other words, how urban form, quality of urban life and urban identity can be analyzed through common objective and subjective features? And what are the criteria

and indicators of urban identity and quality of urban life related to urban physical form?

The purpose of this research is to find out the indicators of quality of urban life and urban identity based on the indicators of urban physical form and achieving a more specific and practical definition of urban identity and quality of life conception related to urban form. Therefore, the previous studies and literature, which have been conducted by experts, and researchers about UF, QOUL, and UI are reviewed and the indicators that affect UI, QOUL, and UI are studied in chapter 2, and the subjective and objective indicators for the present research are defined. Through these indicators, the common variables that affect each dimension are selected, so that, the dimensions (UI, QOUL, and UI) can be evaluated with their common indicators. The indicators are classified into five categories, which are population and density, housing, land use, accessibility, and layout. Why five categories? Since the indicators of UF that include objective indicators have been classified into five categories, the defined indicators of QOUL and UI, which are subjective, are also categorized based on these five categories to relate these indicators to urban form (see 2.3.7). Due to the limited access to data of Andisheh new town some of the objective and subjective indicators have been removed from the research. The indicators of the research are explained in chapter 2 (see 2.4) and subjective and objective indicators of these dimensions are illustrated in the conceptual framework (see 2.5). Therefore, urban form is analyzed through the objective features and subjective characteristics of urban form and quality of urban life.

2- Does urban physical form affect urban identity and quality of urban life in Andisheh new town? And what is the relationship between urban identity and quality of urban life?

In this research, not only the effect of UF on UI and QOUL, but also the relationship between UI and QOUL, are evaluated through the structural equation modeling (SEM). To do analysis, the objective and subjective measures of indicators of these dimensions are considered. As explained in 5.10, using SEM, 53 manifest subjective variables from the field survey and 40 manifest objective variables measure 2 latent subjective variables (UI and QOUL) and 1 objective variable (UF). The evaluation of the first and second main hypotheses represents that UF affects QOUL, as well as UI in Andisheh new town. Furthermore, there is an acceptable correlation between UI and QOUL, therefore, there is a relationship between these dimensions (see 5.10).

3- How it is possible to link UI and QOUL with UPF in new towns? And how to evaluate classified subjective and objective measures of UI, QOUL, and UPF using GIS?

As explained in the chapter of research methods (Chapter 4), to establish a link between objective variables of urban physical form and subjective variables of urban identity and quality of urban life, the addresses of respondents are asked through the questionnaires. Therefore, the data collected through the questionnaires, which included subjective indicators mostly, could be connected to the objective indicators and quantitative spatial data based on the location of residents of Andisheh new town. Indeed, the geocoding method base on the addresses through GIS is applied to link the UI, QOUL, and UPF.

Considering the location of each respondent of the questionnaires, there is a point in GIS. The attribute table of each point includes all of the questions of the questionnaires as well as the geodata; therefore, all data is linked through GIS. Furthermore, to evaluate the classified measures of UI, QOUL, and UPF, the structural equation modeling is applied, the data required for this analysis were the attribute table created in GIS.

4- Obtaining practical results from the collected data and creating maps that represent several qualitative criteria in the whole city.

In the 5th chapter (research analysis) of the present research, all the indicators are evaluated based on the classification into five categories and each indicator is analyzed separately. After the evaluation of each indicator, a map, which illustrates the related indicator in Andisheh new town, is presented. Moreover, tables, which are achieved using SPSS, are also provided along with these maps to help to better understanding.

6.2 Conclusion

As the conclusion of the measures of population and density, Andisheh new town with 116062 population in 2017, has been achieved one of the goals of its comprehensive plan. The comparison of the population of Andisheh new town in different years represents that this city attracts people in all of the quarters (phases) even its developing quarter (Phase6). Most of the population of Andisheh new town are young people. A higher percentage of the residents of this city perceive the overcrowding in their neighborhoods low and the whole city neither low nor high; however, they are satisfied with the overcrowding in both scales of neighborhoods and city. Most of the residents of Phase2 perceive the overcrowding in Phase2 high and they are satisfied with it. Although most of the residents of Phase 3, 4, 5, and 6 are satisfied with the overcrowding in their neighborhoods, most of the residents of Phase3 and 4 perceive the overcrowding neither high nor low, and the residents of Phase5 and 6 perceive it low. About how they perceive the overcrowding in Andisheh, most residents of Phase 2 perceive it high and they are satisfied with it, the residents of Phase 3 and 4 and 5 feel it neither high nor low, and Phase 6 low, but most of the residents of Phase 3 are satisfied with it and the residents of the other phases are neither satisfied nor dissatisfied with it. Therefore, it indicates the impact of the perceived overcrowding in the smaller environment (neighborhood) on the perception of the population in the whole city. The analysis shows that density (objective density) affects people's satisfaction with overcrowding (subjective density), as well as perceived overcrowding; considering the data gathered from the residents of Andisheh new town, this issue is perceptible.

To summarize the results of housing types and characteristics, there are various housing types with different characteristics in Andisheh new town. Most of the respondents live in the two-floor houses and the dwelling units with 71-105 m^2 area and most of the residents are satisfied with the type of their housing, as well as the area. The data represents that the buildings in this city are constructed less than 7 years and most of the residents are satisfied with the quality of their housing. Most of the residents are satisfied with the number of households, which is 3-4 in their buildings. They are neither satisfied nor dissatisfied with the price of renting their housing, but most of the residents of Phase 2 and Phase 6 are satisfied with the price of buying their housing. Overall, most of the inhabitants of Andisheh new town are satisfied with their housings. The SEM analysis represents that objective measures of housing affect the subjective measures of housing and how residents of this city are satisfied with their housings directly.

To conclude the measures of land use, four land uses of health centers, shopping centers, educational units, and public green spaces are evaluated in this research. The analyses represent that the spatial distribution of commercial land use is harmonic (random), educational land use is clustered, healthcare land use is random, and green space land use is homogeneous in the whole city. Using SEM analysis, these objective measures of various land uses as well as their proportional amounts per capita are not correlated to people's satisfaction with them.

Most of the residents of Phase 2, 3, and 4 find the possibility to provide their needs from the shopping centers in their neighborhoods as well as Andisheh good. Although most of the residents of Phase 5 and 6 cannot provide their needs from their neighborhoods, they can provide them from the city. Moreover, most of the respondents provide their needs from the shopping centers in Phase 3, and in general, they are satisfied with supplying their needs from the shopping centers in Andisheh new town.

A family member of most of the residents of Andisheh use primary school, and most of the residents of all phases except Phase 2, refer to Phase 3 to use an educational unit. Most of the residents are satisfied with the educational units in this city.

Although, most of the inhabitants of all phases of Andisheh new town use the health center in Phase 3 (Andisheh Clinic) regularly and in emergence, they are dissatisfied with this land use in this new town.

The public green spaces in Phase 3 are used more by the residents of all phases, and in general, most of the residents are satisfied or neither satisfied nor dissatisfied with the public green spaces in the Andisheh new town. Most residents of Phase 2, Phase 4, and Phase 5 are dissatisfied with the public green spaces in their neighborhoods, however, the residents of Phase 3 are satisfied and the residents of Phase 6 are neither satisfied nor dissatisfied with the public green spaces in their neighborhoods.

To summarize the measures of layout, the main structure of Andisheh new town, main access network, the physical divisions including phases, neighborhoods, phase centers, nodes, and symbols, physical setting including structure, facilities, and mixed land use, activities including access and social interaction, and meaning including symbols and signs, values, memory, attraction, and legibility.

Most residents of Andisheh new town in all phases are satisfied with mixed land use. Except for the residents of Phase 6, people are also satisfied with the structure and urban facilities of Andisheh new town. Most of the inhabitants of all phases of this city, except residents of Phase 6 are satisfied with access. The residents of Phase 6 are mostly dissatisfied with access. Most of the residents of all phases never participate in events in the city nor their neighborhoods. However, they have a relationship with their neighbors, most of them meet and talk to their neighbors once a week.

Most of the respondents stated that there are many symbols and signs, through them, they can address themselves in the city. The higher percentage of residents who have selected many symbols are the residents of Phase 3. The inhabitants of Phase 6 mentioned there are few symbols in Andisheh. Most of the respondents feel somewhat special features to be prideful of them, and know a few memorable places as well as attractive places in this city. Most of the inhabitants admitted that it is easy to find the route in Andisheh, which shows the legibility. The analysis through Space Syntax represents that there are not only high legible routes in the city but also many illegible paths. The SEM analysis indicates the direct correlation between meaning and activities in Andisheh new town.

Accessibility to land uses in Andisheh new town is analyzed through the values of Space Syntax analysis including connectivity, integration (HH), and mean depth, as well as the questions of questionnaires. The analyses represent that residents use the routes with a high amount of integration value, and the most used streets are the main streets of Andisheh new town. To analyze the access to shopping centers, educational units, health centers, and green spaces, the values of connectivity, integration, and mean depth of the roads surrounded each land use are calculated. The most connected and integrated shopping centers, educational units, health centers, and green spaces are stated in the previous chapter. Most of the residents are satisfied with the access to shopping centers, as well as the centers to provide their daily needs, health centers, and public green spaces. However, most of them are not satisfied nor dissatisfied with the access to educational units. The SEM analysis represents that there is not any significant correlation between objective access and subjective access, but there is an acceptable negative correlation between the mean depth of each land use and satisfaction with access to it.

This research has also reached this conclusion that most of the residents of Andisheh new town, except the residents of Phase 6, are satisfied with living in Andisheh new town. Most of the inhabitants (52.0%) are also satisfied or very satisfied to be recognized as a citizen of this new town. Most of the residents of Andisheh (57.4%) like this city. However, most of the residents stated that they like Andisheh, but if they would find a better situation, they would leave this city. These questions were specifically asked in the questionnaire to explain the urban identity and sense of belonging to the new city. Although the residents of this city have a sense of identity in this city, they do not feel a strong sense of belonging.

Finally, through the SEM analyses, it is concluded that objective measures of access, density, housing, and land use are correlated (except objective access and objective density). Furthermore, the subjective measures of access, overcrowding, and layout are also correlated directly and they are correlated with QOUL and UI (except subjective land use/ access/layout and QOUL). As the final conclusion, it is noticeable to mention that the quality of urban life and urban identity in Andisheh are strongly and directly related to each other, while the urban form of this city is indirectly correlated with them.

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Complete questionnaire (2017)

This questionnaire is prepared for an academic research in order to investigate the relationship between urban identity, quality of urban life, and urban physical form in Andisheh new town.

The type of questionnaire: combined questionnaire (open- ended and close- ended questionnaire)
Participants: residents of Andisheh new town

Age	□less than 16 years	□17-25 years	□26-40 years	□41-64 years	□more than 65 years
Gender	□female	□male			
Carrier			Education		

1	Where do you live in Andisheh new town? Your address:	Quarter (phase): Neighborhood: Street :
2	How many years have you lived in Andisheh new town?	□less than 5 years □6 to 10 years □11 to 15 years □16 to 20 years □more than 21 years
3	Type of your housing:	□ detached – terraced house (1-floor) □ detached – terraced house (2-floor) □ three-/ four-floor apartment □ five-/ six-floor apartment □ seven-/ eight-floor apartment
4	Number of floors of the building you live in	□ 1-2 floors □ 3-4 floors □ 5-6 floors □ 7-8 floors □ 9 floors or more
5	Type of the building you live in	□ residential building □ residential- commercial building □ residential- official building □ residential- educational building □ mixed land use building
6	The age of your building you live in	□less than 7 years

		□8 to 14 years □15 to 21 years □21 to 28 years □more than 29 years
7	The number of households live in your building	□1 or 2 □3 or 4 □5 or 6 □7 or 8 □9 or more
8	The number of your family live in dwelling unit (household size)	□1 or 2 □3 □4 □5 □6 or more
9	The area of your dwelling units	□less than $35m^2$ □36 to $70m^2$ □71 to $105m^2$ □106 to $140m^2$ □more than $141m^2$
10	The price of buying your dwelling unit (per m^2)	□ <375 € □ 376-500€ □ 501-625€ □ 626-750€ □ >751 €
11	The price of renting your dwelling unit (per m^2)	□ <75 € □ 76-125€ □ 126-175€ □ 176-225€ □ >226 €
12	How often do you do you visit your neighbors? (relation between your neighbors and you)	□ every day □ once a week

		□ once a month □ once a year □ never
13	How often do you participate in an event in your neighborhood?	□ every day □ once a week □ once a month □ once a year □ never
14	How often do you participate in an event in Andisheh new town?	□ every day □ once a week □ once a month □ once a year □ never
15	How do you perceived density in your neighborhood?	□ very high □ high □ neither high nor low □ low □very low
16	How do you perceived density in Andisheh new town?	□ very high □ high □ neither high nor low □ low □very low
17	Which street do you use more?	Name of street
18	What is the most important characteristic of the street you use more?	
19	How easy can you access a clinic or hospital in Andisheh?	□ very easy □ easy □ neither easy nor difficult □ difficult □ very difficult

20	In which quarter (phase) are the health centers that you refer regularly, located? Name: Address:	□ Phase2 □Phase3 □Phase4 □Phase5 □none of them (out of Andisheh)
21	In which quarter (phase) are the health centers that you refer emergency, located? Name: Address:	□ Phase2 □Phase3 □Phase4 □Phase5 □none of them (out of Andisheh)
22	To access the healthcare services, which streets do you use more? What is the most important characteristic of these street?	Name of street: Characteristic:
23	How easy can you access a green space or park in Andisheh?	□ very easy □ easy □ neither easy nor difficult □ difficult □ very difficult
24	In which quarter (phase) are the green spaces or parks that you refer, located? Name: Address:	□ Phase2 □Phase3 □Phase4 □Phase5 □none of them (out of Andisheh)
25	To access green space and park, which streets do you use more? What is the most important characteristic of these street?	Name of street: Characteristic:
26	How easy can you access a clinic or hospital in Andisheh?	□ very easy □ easy □ neither easy nor difficult □ difficult

		□ very difficult
27	Which type of educational units in Andisheh new town does your family use?	□ Kindergarten □Primary school □ High school □ University □ none
28	In which quarter (phase) are the educational units used by your family located Name: Address:	□ Phase2 □Phase3 □Phase4 □Phase5 □none of them (out of Andisheh)
30	To access educational centers, which streets do you use more? What is the most important characteristic of these street?	Name of street: Characteristic:
31	How possible it is for you to provide your daily needs from your neighborhood?	□ very good □ good □ average □ bad □ very bad
32	How possible it is for you to provide your daily needs from Andisheh new town?	□ very good □ good □ average □ bad □ very bad
33	Where do you refer more to prepare your daily needs? Name: Address:	□ Phase2 □Phase3 □Phase4 □Phase5 □none of them (out of Andisheh)
34	To access shopping center, which streets do you use more?	Name of street:

	What is the most important characteristic of these street?	Characteristic:
35	To access to daily needs such as bakery, which streets do you use more? What is the most important characteristic of these street?	Name of street: Characteristic:
36	How possible is it to find the route in Andisheh new town? (legibility)	□ very easy □ easy □ neither easy nor difficult □ difficult □ very difficult
37	Is there any specific building/ buildings for addressing or finding the route?	□ so many □ many □ somewhat □ few □ not at all
38	Is there any characteristic in Andisheh new town that you are interested in and be proud of it? If yes, what is that characteristic	□ so many □ many □ somewhat □ few □ not at all
39	Are there any memorable places in Andisheh new town, that you feel great by passing through it? If yes, what is that characteristic	□ so many □ many □ somewhat □ few □ not at all
40	Is there any attractive place in Andisheh new town? If yes, where and why?	□ so many □ many □ somewhat □ few □ not at all

41	How satisfied are you with the structure of Andisheh new town?	□ very satisfied □ satisfied □ somewhat □ dissatisfied □ very dissatisfied
42	Would you like others to know you as a resident of Andisheh new town? Why?	□ very much □ much □ rather □ a little □ not at all
43	What was your most motivation to move to Andisheh new town?	□To find a job □To buy a house □Less cost of living □More quietness and calmness □other reasons
44	Would you like to stay and live in Andisheh new town?	□ very much □ much □ rather □ a little □ not at all
45	Which sentence presents your feeling?	□I like Andisheh new town and will stay here forever. □ I like Andisheh new town, but if I would find a better opportunity, I would leave. □ I do not have any feeling about Andisheh. □ I do not like Andisheh, but I have a good situation here. □I do not like Andisheh and will leave this city as soon as possible.
46	Do you like Andisheh new town?	□ very strong □ much □ rather

		◻ a little ◻ not at all

Please answer following question, considering 1= very satisfied, 2= satisfied, 3=neither satisfied nor dissatisfied, 4= dissatisfied and 5= very dissatisfied		1	2	3	4	5
47	How satisfied are you with living in Andisheh new town?					
48	How satisfied are you to be known as a citizen of Andisheh new town?					
49	How satisfied are you with your housing?					
50	How satisfied are you with the price of the dwelling unit (if you have bought)?					
51	How satisfied are you with the cost of renting your dwelling unit (if it is rented)?					
52	How satisfied are you with the area of your dwelling unit?					
Please answer following question, considering 1= very satisfied, 2= satisfied, 3=neither satisfied nor dissatisfied, 4= dissatisfied and 5= very dissatisfied		1	2	3	4	5
53	How satisfied are you with the type of your housing?					
54	How satisfied are you with the quality of the building you live in?					
55	How satisfied are you with the number of households in the building you live?					
56	How satisfied are you with the relationship with your neighbors?					
57	How satisfied are you with the relationship between your neighbors and yourself?					
58	How satisfied are you with personal relationships with other residents of Andisheh new town?					
59	How satisfied are you with your participation in various events in your neighborhood?					
60	How satisfied are you with your participation in various events in Andisheh new town?					
61	How satisfied are you with the overcrowding of your neighborhood?					
62	How satisfied are you with the overcrowding of Andisheh new town?					
63	How satisfied are you with the providing various needs from Andisheh new town (mixed land use)?					
64	How satisfied are you with the providing your needs in Andisheh new town?					
65	How satisfied are you with the shopping centers and CBD of Andisheh new town?					
66	How satisfied are you with the access to centers providing daily needs?					
67	How satisfied are you with the access to shopping centers of Andisheh new town?					

68	How satisfied are you with the quality of educational center (if there is a student un the family)					
69	How satisfied are you with the educational center in Andisheh new town?					
70	How satisfied are you with the access to public green spaces and parks?					
71	How satisfied are you with the number of green spaces and parks in your neighborhood?					
72	How satisfied are you with the number of green spaces and parks in Andisheh new town?					
73	How satisfied are you with the access to educational centers?					
74	How satisfied are you with the quality of healthcare center that you refer regularly?					
75	How satisfied are you with the quality of healthcare center that you refer emergency?					
76	How satisfied are you with the access to health centers in Andisheh new town?					
77	How satisfied are you with the quality of the street you live?					
78	How satisfied are you with the access to various places/ spaces in Andisheh?					
79	How satisfied are you with the urban facilities					
80	How satisfied are you with the urban access					
	If you have any idea, opinion, and suggestion about the issues above in Andisheh new town you can write here:					

Thanks for your participation

Mahsa Derakhshan
Mahsa.derakhshan@tu-dortmund.de

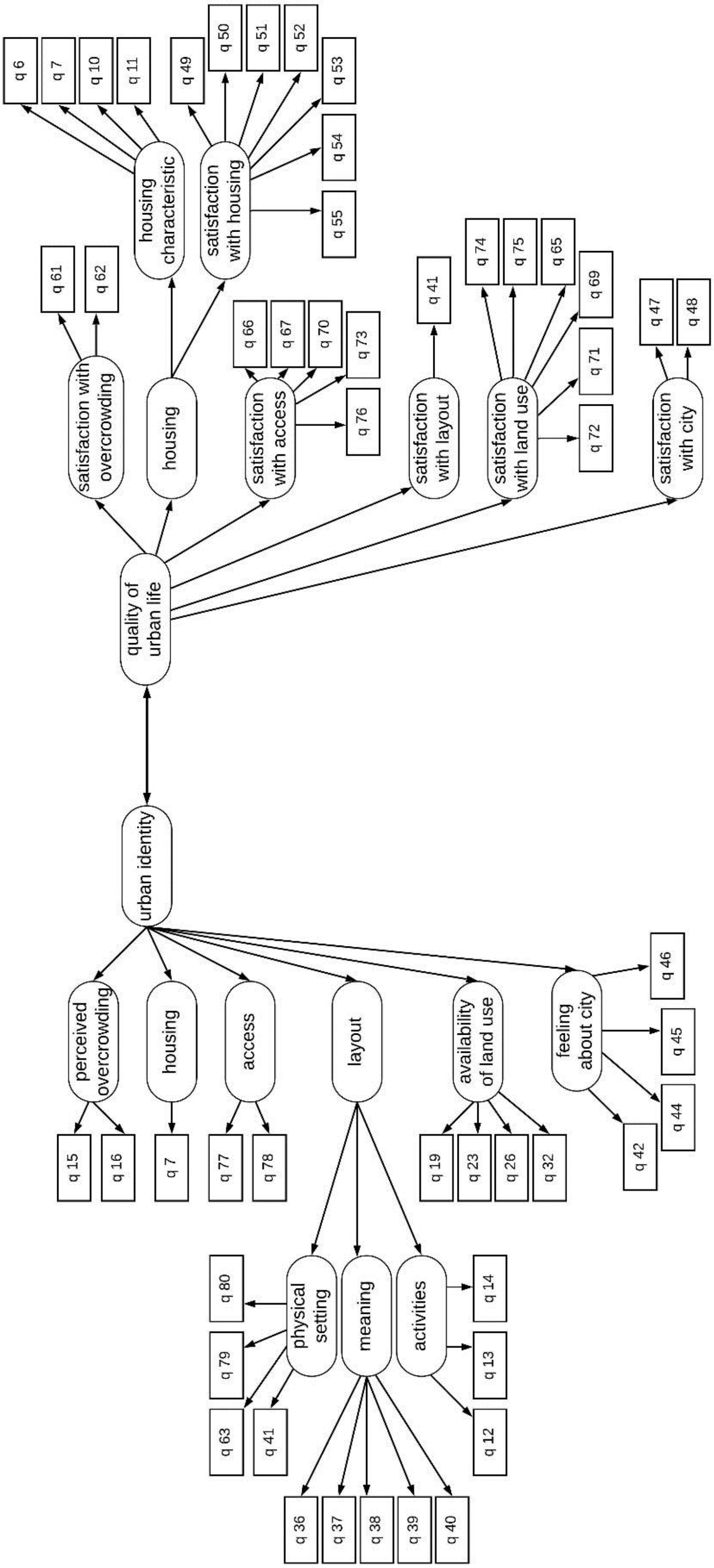

Figure I. The manifest objective and subjective variables used to measure QOUL, UI, and UF in the model of HI

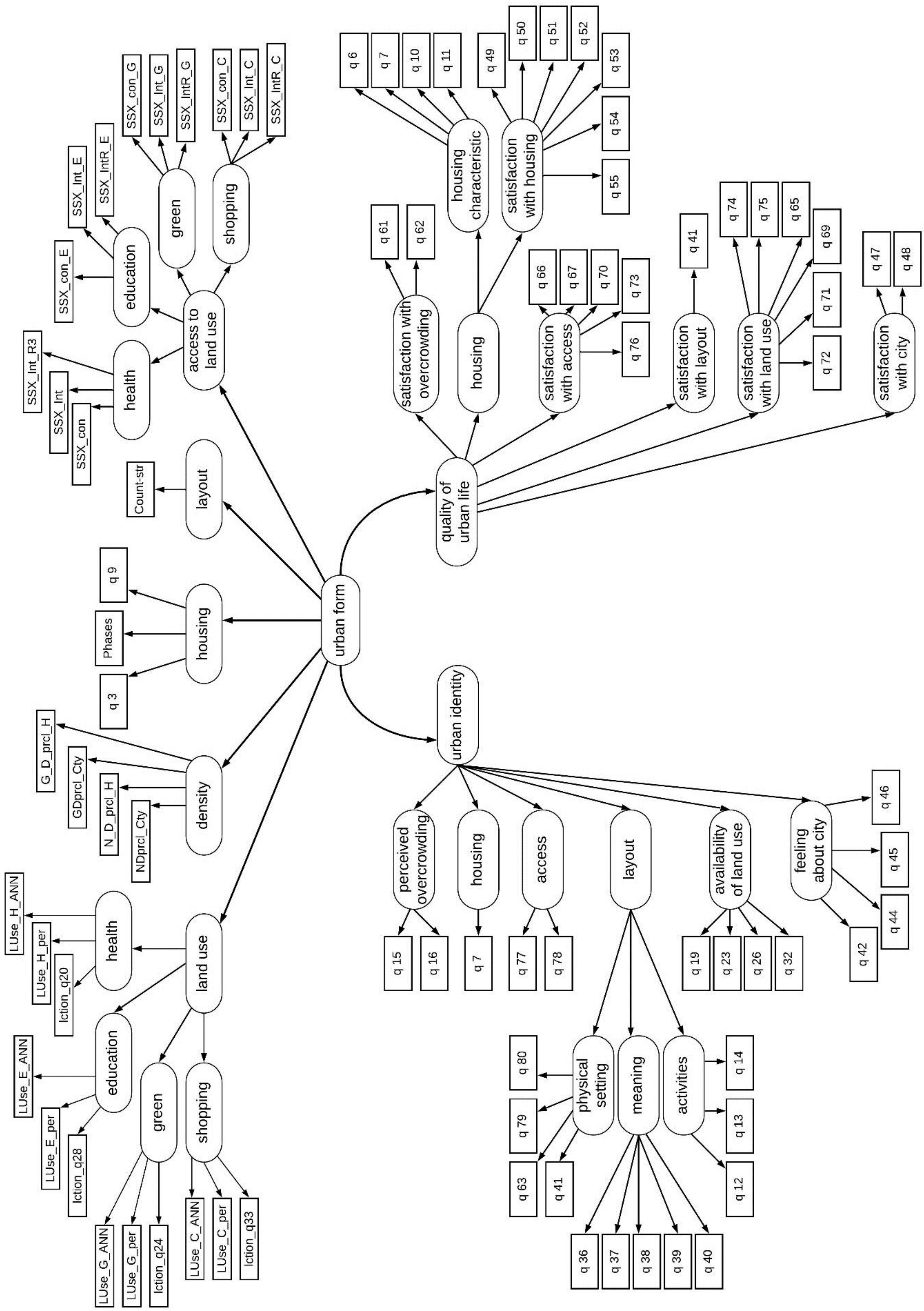

Figure II. The manifest objective and subjective variables used to measure QOUL, UI, and UF in the model of HII

Table A. The rotated component matrix of factor loading on extracted factors of urban form

indicators			***Component***				
Name of indicators		*Name of indicators in column of SPSS*	*1*	*2*	*3*	*4*	*5*
Location of health centers		*lction_q20*	*0.991*				
Location of public green space		*lction_q24*	*0.952*				
Location of educational units		*lction_q28*	*0.972*				
Location of shopping centers		*lction_q33*	*0.990*				
LUSE	*Land use*		*0.976*				
	Proportional amount of health center	*LUse_H_p*					
	Distribution pattern of health centers	*LUse_H_ANN*					
	Proportional amount of shopping cen	*LUse_C_per*					
	Distribution pattern of shopping cente	*LUse_C_ANN*					
	Proportional amount of educational u	*LUse_E_per*					
	Distribution pattern of educational uni	*LUse_E_ANN*					
	Proportional amount of green space	*LUse_G_p*					
	Distribution pattern of green space	*LUse_G_ANN*					
SSX	*Accessibility*					*0.968*	
	Connectivity of health centers	*SSX_con*					
	Integration (HH)of health centers	*SSX_Int*					
	Integration (HH) R3 of health centers	*SSX_Int_R3*					
	Connectivity of shopping centers	*SSX_Con_C*					
	Integration (HH) of shopping centers	*SSX_Int_C*					
	Integration (HH) R3 of shopping cent	*SSX_IntR_C*					
	Connectivity of educational unit	*SSX_Con_E*					
	Integration (HH) of educational unit	*SSX_Int_E*					
	Integration (HH) R3 educational unit	*SSX_IntR_E*					
	Connectivity of green space	*SSX_Con_G*					
	Integration (HH) of green space	*SSX_Int_G*					
	Integration (HH) R3 of green space	*SSX_IntR_G*					
	Mean depth of health centers	*SSX_MDepth*					
	Mean depth R3 of health centers	*SSX_MDep_R*					
	Mean depth of shopping centers	*SSX_MDpt_C*					
	Mean depth R3 of shopping centers	*SSX_MDpR_C*					
	Mean depth of educational unit	*SSX_MDpt_E*					
	Mean depth R3 of educational unit	*SSX_MDpR_E*					
	Mean depth of green space	*SSX_MDpt_G*					
	Mean depth R3 of green space	*SSX_MDpR_G*					
Phase		*count_str*					*0.919*
Gross density (neighborhood)		*G_D_prcl_H*			*0.951*		
Net residential density (neighborhood)		*N_D_prcl_H*			*0.957*		
Area of dwelling unit		*q9*		*0.939*			
Housing type		*q3*		*0.946*			

location	*Phases*		*0.937*			

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Table B. The regression weights of factors of urban form

			path coefficient	***t***	***P***
F1	←	*F3*	*0.05*	*.958*	*.338*
F2	←	*F3*	*-0.59*	*-3.306*	***
F4	←	*F3*	*-0.04*	*-.658*	*.511*
lction_q20	←	*F1*	*1.00*	*82.004*	***
lction_q24	←	*F1*	*0.93*	*51.026*	***
lction_q28	←	*F1*	*0.97*	*77.687*	***
lction_q33	←	*F1*	*1.00*	*26.647*	***
LUSE	←	*F1*	*0.98*	*87.999*	***
G_D_prcl_H	←	*F2*	*0.96*	*71.105*	***
N_D_prcl_H	←	*F2*	*0.92*	*21.128*	***
layout (count_str)	←	*F3*	*0.93*	*29.801*	***
Access (SSX)	←	*F3*	*0.24*	*2.858*	*.004*
q3	←	*F4*	*0.92*	*30.112*	***
q9	←	*F4*	*0.90*	*29.007*	***
location (Phases)	←	*F4*	*0.90*	*29.044*	***

F1= land use , F2= objective density, F3= urban form, F4= housing

Table C. The rotated component matrix of factor loading on extracted factors of quality of urban life

indicators				***Component***					
Name of indicators		*Name of indicators in column of SPSS*		*1*	*2*	*3*	*4*	*5*	*6*
Satisfaction with living in Andisheh		q47							*0.472*
Satisfaction to be a resident		q48							*0.487*
Land use	*Satisfaction with shopping centers*	q64						*0.370*	
	Satisfaction with shopping centers	q65						*0.379*	
	Satisfaction with educational units	q69						*0.617*	
	Satisfaction with health centers (regular / emergence)	sathea	*q74*					*0.385*	
			q75					*0.388*	
	Satisfaction with green space (neighborhood / city)	satgree	*q71*					*0.621*	
			q72					*0.656*	
housing	*Age of building*	housing1	*q6*						
	Number of households		*q7*		*0.691*				
	Housing cost (to buy)		*q10*		*0.604*				
	Housing cost (to rent)		*q11*		*0.801*				
	Overall satisfaction with housing		*q49*		*0.730*				
	Satisfaction with housing cost (to buy)	satisfaction	*q50*		*0.623*				
	Satisfaction with housing cost (to rent)		*q51*		*0.535*				
	Satisfaction with area of dwelling unit		*q52*		*0.768*				
	Satisfaction with housing type		*q53*		*0.664*				
	Satisfaction with quality of building		*q54*		*0.539*				
	Satisfaction with number of households		*q55*		*0.666*				
Satisfaction with overcrowding (neighborhood)		q61		*0.540*					
Satisfaction with overcrowding (city)		q62		*0.559*					
Satisfaction with access to shopping centers in neighborhood		q66				*0.674*			
Satisfaction with access to shopping centers in city		q67				*0.664*			
Satisfaction with access to public green space		q70				*0.687*			
Satisfaction with access to educational units		q73				*0.620*			
Satisfaction with access to health centers		q76				*0.656*			
Satisfaction with structure		q41					*0.437*		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Table D. The rotated component matrix of factor loading on extracted factors of land use (quality of urban life)

Rotated Component Matrix

	Component			
	1	2	3	4
q74	.924			
q75	.918			
q65				.970
q69			.971	
q71		.907		
q72		.891		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Table E. The rotated component matrix of factor loading on extracted factors of housing (quality of urban life)

Rotated Component Matrix

	Component	
	1	2
q6	.923	
q7	.862	
q10	.603	
q11	.546	
q49	.849	
q50		.548
q51		.432
q52		.745
q53		.593
q54		.776
q55		.685

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Table F. The regression weights of factors of quality of urban life

			Path coefficient	t	P
F1	←	F6	0.11	1.658	.097
F2	←	F6	0.14	1.671	0.76
F3	←	F6	0.73	3.180	.001
F4	←	F6	0.21	1.89	0.09
F5	←	F6	0.34	2.602	.009
q48	←	F1	1.05	10.674	***
q47	←	F1	0.53	1.098	.272
satisfaction health	←	F2	0.84	12.104	***
q65	←	F2	0.78	18.684	***
q69	←	F2	0.64	14.236	***
satisfaction green	←	F2	0.95	23.367	***
q66	←	F3	0.88	18.422	***
q67	←	F3	1.00	36.075	***
q70	←	F3	0.84	23.993	***
q73	←	F3	0.88	26.511	***
q76	←	F3	0.86	25.208	***
characteristics	←	F4	0.95	30.210	***
satisfaction	←	F4	0.89	16.769	***
q61	←	F5	0.64	9.172	***
q62	←	F5	0.71	3.438	***
q41	←	F6	0.53	3.535	***

F1= satisfaction with city, F2= land use, F3= accessibility*, F4= housing*, F5= satisfaction with overcrowding, F6= quality of urban life

Table G. The regression weights of factors of land use (quality of urban life)

			path coefficient	t	P
F1	←	F3	0.64	12.718	***
F2	←	F3	0.75	2.369	.018
q74	←	F1	0.85	14.102	***
q75	←	F1	0.91	11.753	***
q71	←	F2	0.79	10.804	***
q72	←	F2	0.88	9.867	***
q65	←	F3	0.18	2.509	.012
q69	←	F3	0.17	2.354	.019

F1= satisfaction with health center, F2= satisfaction with green spaces, F3= land use

Table H. The regression weights of factors of housing characteristic (housing/ quality of urban life)

			path coefficient	t	P
q6	←	F1	0.99	18.006	***
q7	←	F1	0.87	30.547	***
q10	←	F1	0.39	8.508	***
q11	←	F1	0.32	6.849	***
q49	←	F1	0.83	14.650	***

F1= housing characteristic

Table I. The regression weights of factors of housing satisfaction (housing/ quality of urban life)

			path coefficient	t	P
q50	←	F2	0.41	6.079	***
q51	←	F2	0.30	4.812	***
q52	←	F2	0.68	7.956	***
q53	←	F2	0.48	8.117	***
q54	←	F2	0.75	8.148	***
q55	←	F2	0.58	7.430	***

F2= housing satisfaction

Table J. The rotated component matrix of factor loading on extracted factors of urban identity

indicators				**Component**					
Name of indicators			Name of indicators in column of SPSS	1	2	3	4	5	6
To be a citizen of Andisheh			*q42*	*.763*					
To stay and live in Andisheh			*q44*	*.841*					
Feeling about Andisheh			*q45*	*.773*					
Like Andisheh			*q46*	*.810*					
Availability of health centers			*q19*			*.690*			
Availability of shopping centers			*q23*			*.648*			
Availability of educational units			*q26*			*.707*			
Availability of public green space			*q32*			*.649*			
layout	*Physical setting*	*Satisfaction with structure*	*q41*		*.846*				
		Satisfaction with mixed land use	*q63*						
		Satisfaction with urban facilities	*q79*						
		Satisfaction with access	*q80*						
		Legibility	*q36*		*.935*				
		Symbols and signs	*q37*						

	Meaning	*Value*	*q38*						
		Memory	*q39*						
		Attraction	*q40*						
	activities	*Relationship with neighbors*	*q12*						
		Participation in events in neighborhood	*q13*		*.952*				
		Participation in events in city	*q14*						
Satisfaction with quality of paths			*q77*				*.930*		
Satisfaction with access			*q78*				*.933*		
Perceived overcrowding (neighborhood)			*q15*					*.664*	*-.499*
Perceived overcrowding (city)			*q16*					*.836*	
Number of households			*q7*						*.920*

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Table K. The rotated component matrix of factor loading on extracted factors of layout (urban identity)

Indicators			**Component**		
Name of indicators		Name of indicators in column of SPSS	1	2	3
Physical setting	*Satisfaction with structure*	*q41*		*.913*	
	Satisfaction with mixed land use	*q63*		*.351*	
	Satisfaction with urban facilities	*q79*		*.746*	
	Satisfaction with access	*q80*		*.938*	
Meaning	*Legibility*	*q36*	*.899*		
	Symbols and signs	*q37*	*.368*		
	Value	*q38*	*.588*		
	Memory	*q39*	*.781*		
	Attraction	*q40*	*.933*		
Activities	*Relationship with neighbors*	*q12*			*.401*
	Participation in events in neighborhood	*q13*			*.908*
	Participation in events in city	*q14*			*.892*

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Table L. The regression weights of factors of urban identity

			path coefficient	t	P
F1	←	F6	1.31	24.701	***
F2	←	F6	0.33	.868	.386
F3	←	F6	0.12	.825	.409
F4	←	F6	-0.02	-.314	.753
F5	←	F6	-0.09	-.794	.427
q7	←	F6	0.03	.550	.582
q42	←	F1	0.64	11.151	***
q44	←	F1	0.78	12.155	***
q45	←	F1	0.72	11.516	***
q46	←	F1	0.80	12.261	***
q19	←	F2	0.54	8.414	***
q23	←	F2	0.53	6.530	***
q26	←	F2	0.54	6.602	***
q32	←	F2	0.55	6.646	***
physical	←	F3	0.71	7.132	***
meaning	←	F3	0.92	18.612	***
activities	←	F3	0.99	18.677	***
q77	←	F4	0.88	14.127	***
q78	←	F4	0.84	.459	.646
q15	←	F5	1.01	19.188	***
q16	←	F5	0.94	6.351	***

F1= feeling about city, F2= availability of land use, F3= layout, F4=accessibility, F5=perceived overcrowding, F6= urban identity

Table M. The regression weights of factors of layout (urban identity)

		path coefficient	t	P
F1	← F4	0.21	-2.089	.037
F2	← F4	0.19	2.434	***
F3	← F4	0.21	0.610	.542
q41	← F1	0.88	6.184	0.15
q63	← F1	0.21	4.438	***
q79	← F1	0.67	5.130	***
q80	← F1	1.01	27.636	***
q36	← F2	0.93	5.247	.010
q37	← F2	0.22	2.342	.019
q38	← F2	0.40	2.530	.011
q39	← F2	0.64	2.582	.010
q40	← F2	0.99	2.582	.010
q12	← F3	0.22	5.056	***
q13	← F3	0.80	3.904	***
q14	← F3	0.91	3.257	.001

F1= physical setting, F2= meaning, F3= activities, F4= layout

EIDESSTATTLICHE VERSICHERUNG

Hiermit versichere ich an Eides statt, dass ich die vorliegende Dissertationsschrift zum Thema

“Investigating the relationship between:

Urban Identity, Quality of Urban Life, and Urban Physical Form in Iranian new towns

Case study: Andisheh new town”

selbstständig verfasst und keine anderen als die angegebenen Quellen benutzt habe. Alle Stellen, die wörtlich oder sinngemäß aus Quellen entnommen wurden, habe ich als solche gekennzeichnet.

Des Weiteren erkläre ich an Eides statt, dass diese Arbeit weder in gleicher noch in ähnlicher Fassung einer akademischen Prüfung vorgelegt wurde.

Dortmund, 20.09.2020 MAHSA DERAKHSHAN