

ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE
ENGINEERING AND TECHNOLOGY

**“FLEXIBILITY” AND “ADAPTABILITY”
IN RESIDENTIAL HOUSING PROJECTS:
CASE OF TABRIZ, IRAN**

M.Sc. THESIS

Torkan BORNA

Department of Architecture

Architectural Design Programme

JANUARY 2013

ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE
ENGINEERING AND TECHNOLOGY

**“FLEXIBILITY” AND “ADAPTABILITY”
IN RESIDENTIAL HOUSING PROJECTS:
CASE OF TABRIZ, IRAN**

M.Sc. THESIS

**Torkan BORNA
(502091112)**

Department Of Architecture

Architectural Design Programme

Thesis Advisor: Prof. Dr. Yurdanur DULGEROGLU YUKSEL

JANUARY 2013

İSTANBUL TEKNİK ÜNİVERSİTESİ ★ FEN BİLİMLERİ ENSTİTÜSÜ

**KONUT PROJELERİNDE, “ESNEKLİK” VE “ADAPTASYON”:
TEBRİZ, İRAN ORNEĞİ**

YÜKSEK LİSANS TEZİ

**Torkan BORNA
(502091112)**

Mimarlık Anabilim Dalı

Mimari Tasarım Programı

Tez Danışmanı: Prof. Dr. Yurdanur DULGEROĞLU YUKSEL

OCAK 2013

Torkan-BORNA, a **M.Sc.** student of ITU **Graduate School of Architectural Design** student ID 502091112, successfully defended the **thesis** entitled “**FLEXIBILITY**” AND “**ADAPTABILITY**” IN RESIDENTIAL HOUSING PROJECTS: CASE OF TABRIZ-IRAN” which she prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

Thesis Advisor : **Prof. Dr. Yurdanur D.YUKSEL**

İstanbul Technical University

Jury Members : **Prof. Dr. Orhan HACIHASANOGLU**

İstanbul Technical University

Y. Doç. Dr. Hülya ARI

İstanbul Technical University

Date of Submission : 17 December 2012

Date of Defense : 22 January 2013

To mylife companion, Ali

FOREWORD

First , I would like to send my appreciation to assistance provided to me by my thesis supervisor Prof. Dr. Yurdanur Dulgeroglu Yuksel and Prof. Dr. Marchello Balbo who didn't deprived me of his great advices and epxriences even from long-distances. Thank you dear proffesor, for your patience, great supports and continuous help with the whole process.

I would also like to express my appreciation to the academic staff of Tabriz University, Department of Geography and Urban Planning, especially to Dr. Pour Mohammadi for his great advices and for providing me the possibility of accessing to great resources and for providing me with the materials of the case studies belonging to housing projects in Tabriz.

I am grateful to my family; to parent and to my brothers dear Behnam and Shahram who have supported me endlessly and encouraged me to be the person I have always wanted to be.

I would like to especially thank to my fother in low, Hossein Seifloo, for his endless supports through my studies.

Finally, I would like to express my gratitude to my love Ali Seifloo for his endless supports in my studies and for his continues patience throughout this study and in all aspects of my life.

December 2012

Torkan BORNA
(Master of Architecture)

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	xv
LIST OF FIGURES	xvii
SUMMARY	xix
ÖZET	xxi
1. INTRODUCTION	1
1.1 Purpose of Thesis.....	2
1.2 Methodology.....	3
1.3 Outlines	4
2. AN OVERVIEW OF THE TERMINOLOGY AND THE CONCEPTUAL FRAME WORK.....	7
2.1 Variability of Housing Need	7
2.1.1 Age difference in a family	8
2.1.2 Family size	8
2.1.3 Gender distribution of the children in a family	8
2.1.4 Age differences in children in a family.....	9
2.1.5 Family type.....	9
2.1.6 Home-based jobs	10
2.2 Flexibility, Adaptability and the Level of Satisfaction	13
2.2.1 Spatial flexibility as a factor of user satisfaction for quality housing	19
2.2.2 Definition of flexibility and some literature reviews.....	20
2.3 Some Factors In Determining The Degree of "Housing Flexibility"	25
2.3.1 Initial flexibility	26
2.3.2 The structural system	27
2.3.3 The position of service space	28
2.3.4 The architectural layout of the residential blocks.....	28
2.3.5 Furnishing for flexible use	28
2.3.6 Changing the use of a building completely	30
2.4 "Soft" And "Hard" Analogy.....	30
2.5 Samples Some Projects Which Address Flexibility	31
2.6 Conclusion.....	37
3. CASE STUDY OF TABRIZ.....	39
3.1 Natural Features of Tabriz.....	39
3.1.1 Location of Tabriz	40
3.1.2 Large fault of Tabriz	41
3.1.3 Economical and social characteristics.....	42
3.1.4 Population.....	42
3.1.5 Migration.....	43
3.2 Urban Density Developments In Tabriz	44
4. HOUSING SITUATION IN TABRIZ	47
4.1 Housing Policies In Iran.....	47

4.1.1 The first construction program (1989-1993).....	47
4.1.2 The second construction program (1995-1999)	47
4.1.3 The third construction program (2000-2004).....	48
4.2 General Housing Policies In Tabriz.....	49
4.2.1 Policy of urban land preparation	49
4.2.2 Apartment building policy	50
4.2.3 Housing assessment in regard to the master plan of Tabriz.....	53
4.2.4 Population density in Tabriz	53
4.2.5 Housing density in Tabriz	54
4.3 Evaluation of Zone 2 of Tabriz as The Study Area.....	55
4.3.1 Evaluation of zone 1 and 2 in the eastern part of Tabriz as the study area.....	55
4.3.2 General information about the residential complexes in region 2.....	56
5. SELECTED HOUSING PROJECTS IN TABRIZ AND THEIR ANALYSIS	
FROM THE PERSPECTIVE OF "FLEXIBILITY"	59
5.1 Determination of The Residential Complexes as The Case Studies	59
5.2 Farhangshahr Project (فرهنگشهر)	61
5.2.1 General Information about the Case Study	61
5.2.2 Evaluation of the flexibility according to the architectural factor.....	63
5.2.1 Extracted data.....	67
5.2.2 Evaluating the issue of flexibility and adaptability according to the collected data.....	70
There are only two plan types; those with two bedrooms and others which have three-bedrooms. The structure of the building is prefabricated system and the inhabitants, in the interviews, mentioned that their house is resistant against earthquake, so this fact makes them feel more secure. This project includes 35 four-story blocks. These blocks are surrounded by a not well-designed landscape but it seems to meet the inhabitant needs for a green area. There is a small park in the central part of the project which is the only place where they can enjoy during their spare time with their friends.....	70
5.3 Aseman-e Tabriz (آسمان‌تبریز)	71
5.3.1 General information about the case study.....	71
5.3.2 Evaluation of the flexibility according to the architectural factor.....	73
5.3.3 Extracted data.....	75
5.3.4 Evaluating the Issues of Flexibility and Adaptability According to the Collected Data.....	78
5.4 Sahand Project (مجتمع‌سهند)	79
5.4.1 General information about the case study.....	79
5.4.2 Evaluation of the flexibility according to the architectural factor.....	81
5.4.3 Extracted Data	83
5.4.4 Evaluating the issues of flexibility and adaptability according to the collected data.....	86
6. EVALUATION AND CONCLUSION	87
REFERENCES.....	91
CURRICULUM VITAE	95

ABBREVIATIONS

UN-Habitat :The United Nations Human Settlements

LIST OF TABLES

	<u>Page</u>
Table 2.1 : Various definations of the terms “Flexibility”, “Adaptability” and “Satisfaction”	16
Table 3.1 : Population change, urban congestion and made levels in Tabriz Over the years 1996-2001, Rasool Gorbani, professor assistant Department of Geography, University of Tabriz	43
Table3.2: Factors of increasing the share of total population in Tabriz	45
Table4.1: Housing project sampels constructed in Tabriz in different years	52
Table4.2: Residential complex list located in region 2-Tabriz	57
Table 5.1 : Evaluation of the architectural changes in the Farhangshahr Project	65
Table 5.2 : Evaluation of the architectural changes in the Aseman Project	74
Table 5.3 : Evaluation of the architectural changes in the Sahand Project	82

LIST OF FIGURES

	<u>Page</u>
Figure 2.1` : Example of an adaptable house before changes and after Drawing by Design Able Environments Inc	11
Figure 2.2` : Seven stages of family cycle and required plan types.....	13
Figure 2.3` : Example of an adaptable house before changes and after.....	17
Figure 2.4 : Kleinwohnung, project (1931) by Carl Fieger	27
Figure 2.5 : Rooms as Furniture	29
Figure 2.6 : Sliding/Moving/Folding walls	29
Figure 2.7 : Variability of unit types, The Weissenhofsiedlung housing project by Mies van der Rohe, the permanent and infill components, Jeremy Till and Tatjana Schneider Flexible housing: the means to the end, 2005...	32
Figure 2.8 : The Weissenhofsiedlung housing project by Mies van der Rohe, the permanent and infill components, Jeremy Till and Tatjana Schneider Flexible housing: the means to the end, 2005	33
Figure 2.9 : The Weissenhofsiedlung housing project by Mies Van Der Rohe, the permanent and infill components, Jeremy Till and Tatjana Schneider Flexible housing: the means to the end, 2005	33
Figure 2.10 : Montereau, Les Frères Arsène-Henry, plan sample, France.....	35
Figure 2.11 : Kallebäck experimental housing (1960) by Erik Friberger: exterior view.....	36
Figure 2.12 : Kallebäck experimental housing (1960) by Erik Friberger	34
Figure 3.1 : Location of Tabriz in Iran	40
Figure 3.2 : Regional plan of Tabriz, 2012.....	41
Figure 3.3 : Population growth rates in different areas of the city of Tabriz in the years 1996-2001	54
Figure 4.1 : Population denisty of Tabriz	55
Figure 4.2 : Housing density in Tabriz.....	53
Figure 4.3 : Urban location of the study area	56
Figure 5.1 : Architectural and Regional Evaluation on the Three Case Studies	60
Figure 5.2 : Evaluating “flexibility” in the view of Architecture and families’ opinion	61
Figure 5.3 : Site Plan of Farhangshahr Housing Project	62
Figure 5.4 : Farhangshahr Complex, Children’s Playground	62
Figure 5.5 : Farhangshahr Complex, a Sample Block.....	63
Figure 5.6 : Some diffrent types of Intersecting walls	63
Figure 5.7 : Main plan types, Farhangshahr Project	65
Figure 5.8 : Parent’s age, Farhangshahr Project	67
Figure 5.9 : Number of family members, Farhangshahr Project	68
Figure 5.10 : Number of children , Farhangshahr Project.....	68
Figure 5.11 : Made/not made changes, Farhangshahr Project.....	68
Figure 5.12 : Owner-Tenent situation, Farhangshahr Project	68
Figure 5.13 : Gender distribution in a family, Farhangshahr Project	69

Figure 5.14 : Occupation, Farhangshahr Project	69
Figure 5.15 : The Level of satisfaction, Farhangshahr project	69
Figure 5.16 : Site Plan, Aseman Housing Project.....	72
Figure 5.17 : Aseman Housing Project	72
Figure 5.18 :Aseman Housing Project	72
Figure 5.19 : Main plan types, Aseman Project.....	73
Figure 5.20 : Number of family member, Aseman Project	76
Figure 5.21 : Lived years, Aseman Project	76
Figure 5.22 : Parent’s age, Aseman Project	76
Figure 5.23 : Number of children in a family, Aseman Project	77
Figure 5.24 : The level of satisfaction, Aseman Project	77
Figure 5.25 : Gender of children in a family, Aseman Project.....	77
Figure 5.26 : Owner-tenent Situation, Aseman Project	78
Figure 5.27 : Occupation, Aseman Project.....	78
Figure 5.28 :Site plan of Sahand Housing Project.....	80
Figure 5.29 : Sahand Housing project.....	80
Figure 5.30 : Sahand Housing project.....	80
Figure 5.31 :Main plan types, Sahand Project.....	81
Figure 5.32 : Number of family members, Sahand Project	83
Figure 5.33 :Lived years in the same flat, Sahand Project	83
Figure 5.34 :Parent’s age, Sahand Project.....	84
Figure 5.35 :Made/not made changes, Sahand Project	84
Figure 5.36 : Level of satisfaction, Sahand Project	84
Figure 5.37 :Gender distribution of the children in a family, Sahand Project.....	85
Figure 5.38 :Owner-Tenant, Sahand Project	85
Figure 5.39 : Occupation, Sahand Project	85
Figure 5.40 :Evaluation of the extracted data from the interviews.....	86
Figure 6.1 :Evaluation of Satisfaction, flexibility and adaptability	86

“FLEXIBILITY” AND “ADAPTABILITY” IN RESIDENTIAL HOUSING PROJECTS: CASE OF TABRIZ, IRAN

SUMMARY

Housing issue is so sensitive, subject to the whole range of cyclic, non-cyclic and trend changes, and if it is not able to respond these changes, it becomes at best unsatisfactory, at worst obsolescent. Dwelling is inevitably dynamic, although it is too often framed intellectually and physically as the fixity. The vast majority of housing, in the developing countries is being built in inflexibility with its obsolescence.

Traditional families with large number of people living in one unit, single-person families, couples with no children are some types of those who need houses and are in the low or medium class of the society. Deficiency in housing quantity has brought the solution of standardization and has made families with variable needs live in the same housing units with the same spatial conditions.

Flexibility issue has been brought to discredit the preponderance of public buildings in 1960s by John Turner and John Habraken. In 1960s, Flexibility became a widespread design key title in response to new demands placed on buildings, particularly in housing.

This issue becomes bolder in the countries which had recently been under the effect of urbanization, and their mega cities have experienced the rapid growth of population as a consequence of the housing deficiency, recently.

The rapid growth of the quick construction of housing has been considered as the solution for the deficiency of accommodation in Tabriz. However, the question is “Are they flexible enough for their adapted residence in order to keep them satisfied with their living place?”

Population growth and Housing demand have persuaded the priority for quantity not for quality and not for preparing suitable houses which meet family's need that appear according to their gradual changes through the time. Adaptability and Housing Flexibility which are the most vital issues for providing family's satisfaction have always been kept behind in planning, design and construction process of housing system. Thus, the evaluation of housing and planning system, in regard to their inhabitants opinion, who are the major characters in this research, it may be possible to analyze the issue of housing flexibility in some housing projects in one of the biggest cities of Iran, Tabriz, in order to present a resource for further studies.

KONUT PROJELERİNDE, “ESNEKLİK” VE “ADAPTASYON”: TEBRİZ - İRAN ORNEĞİ

ÖZET

Bir ihtiyaç ve insan hakkı olan konut, kentleşmenin de temel unsurlarından biridir. Kentleşme sanayi ve modernleşme süreçlerinin sonucu mekansal ve toplumsal yaşamdaki dönüşümü ifade eder. Endüstri devrimi sonrası kırsal alanlardan kentlere yapılan göç ile sanayi kentleri oldukça hızlı büyümüştür. Gelişme sürecinde olan Tebriz ise büyümeye halen devam etmektedir. Hızlı nüfus artışı ve göç ile ortaya çıkan büyüme, kontrol edilemez bir hal almaktadır. Konutta sayısal eksikliği, standardizasyonu çözüm olarak getirmiştir. Bu durum ise, ailelerin değişken ihtiyaçlarına karşın onları aynı mekansal koşullar ve aynı konutlarda yaşamaya mahkum etmiştir.

Hızlı konut inşaatları, Tebriz'de konut eksikliği için çözüm olarak kabul edilmiştir. Ancak, soru budur: “yaşam yeri aileleri memnun etmek için ve rahat bir yaşam sürdürme bilmeleri için, yeterince esnek midir?” Esneklik kavramı değişik yönlerde büyüme ve gelişme olarak tanımlanabilir. Adaptasyon ise değişik koşullara uyum sağlamak olarak tanımlanabilir. Norberg-Schulz esnekliği iki anlamda kullanmaktadır. Birincisi, elemanlar ilavesi veya çıkarılması yolu ile ve bütünlüğü kaybetmeden binanın büyümesi veya küçülmesidir. İkincisi ise elemanların ve ilişkilerin değiştirilebilmesidir. Buna hareketli bölmeler (sürme duvarlar, katlanan duvarlar, perde ve storlar) ile mekan bölümlerinin veya mekan elemanlarının çevreleme biçimlerinin değiştirilebilir olması örnek gösterilebilir.

Tebriz’de, bir büyük şehir örneği olarak, nüfus artışı ve artan konut talebi sebebiyle, önceliklik her zaman niteliğe değil niceliğe verilmiştir, ve zaman içinde, ailelerin kademeli değişikliklerini göz önünde bulundurmayarak yeterince esnek konut yapılmamıştır. Dolayısıyla, ailelerin memnuniyetini sağlamak için en önemli konulardan Adaptasyon ve Konut Esneklik her zaman planlamalarda, tasarımda ve inşaat süreçlerinde geri planda kalmıştır.

Bu çalışmada, konut ve planlama sistemi değerlendirmek istenmiş; bu amaçla da örnek çalışmaların en önemli özellikleri, konut kullanıcılarının fikir ve durumlarına göre, ve ileri çalışmalar için bir kaynak sunmak amacıyla İran’ın megakentlerinden, Tebriz’in konut projelerinde konut esneklik sorununun analizi yapılmıştır.

1. INTRODUCTION

Due to a steady rise in construction costs and growing housing demand, changes which are rapidly taking place in family size and composition and change in expectations of comfort. People, in any social and economic conditions, always have problems with their houses, which do not meet their family's gradual structural changes.

Throughout time, the standardization system has become one of the best ways of responding to housing deficiency. However, it becomes more evident that standardization and rate of development are like a barrier that restricts the variety and other issues that are in relation with the settlers' satisfaction and real needs. The flexibility issue and new empirical evidences have been brought up by John Turner and John Habra Ken to discredit the preponderance of public buildings in the 1960s. In the 1960s, flexibility became a widespread design key title in response to new demands placed on buildings, particularly in housing.

Rapid changes, which were occurring in family size, composition, and structure and changes in expectations of comfort and efficiency began to acknowledge the flexibility issue in these years. The urgency of flexible houses for all of the families—especially for low-income families—is an inevitable fact. Although there have been so many efforts, critical notes and much research done in this regard, the need for flexible housing is still something inevitable, and the need still stands at the same critical point in housing production.

The concept of flexibility is an important concern in the design of housing. Flexibility refers to the idea of accommodating change over time. Thus, flexible housing corresponds to “housing that can adapt to the changing needs of users” (Till & Schneider, 2005). The adaptability and the variability of housing needs are the other concepts related to flexibility.

Comparative results of General Population and Housing Census in 2002 and the years before demonstrate the constant improvement of housing production in the city of Tabriz. As in the past three decades, the rate of housing units to the number

of households has increased. The scarcity of housing units in the past has always kept the issue of housing quality behind, and the authorities remain oblivious to the quality of residential units, which are based on the various needs of each family. In the subject of housing, flexibility, adaptability, and user satisfaction are the most vital and basic issues that matter more than ever today.

This thesis undertakes the evaluation of spatial flexibility level in multiple residential buildings of Tabriz, Iran. The presented arguments and reviewed projects which are implemented through the time in different regions of Tabriz and the findings which are provided directly through inhabitants of the projects will allow us to infer some conclusions of a definition of flexibility.

1.1 Purpose of Thesis

The urbanization progress has made cities more crowded and resulted in insufficient quantity and quality for people. The biggest problem for the governments in most countries, especially in developing ones, has always been the issue of providing quantitatively enough space with the most important needs for the residents. Nevertheless, giving attention to the facts of residential satisfaction, adaptability, and spatial adequacy has always hidden so many other facts and needs behind.

Undoubtedly, large organizations have to provide adequate houses which will operate economically. Because of this reason, they must standardize the procedures and products. Therefore, as the organization and central management get larger, the priority and the aim of the production of houses changes from the most important issues—flexibility, sustainability and adaptability—to resolving the basic demands of the settlements. Because of this fact, mismatches occur between people's housing priorities and the housing they get.

Housing problems in Iran can be easily measured with the rise of prices of housing unit and rents. Tabriz, like other large cities, has recently been under the effect of urbanization and population growth. The number of families in the society have risen recently, as a result, the rise of housing demand have become one of the major problems in this city. High concentration of population, land price inflation, and an increase in rent prices all have made it difficult for authorities to supply sufficient housing units for the inhabitants. Rapid changes, which were occurring in family size, composition, and structure, have been met with the construction of multi-story

buildings and residential complexes in Tabriz. Giving attention to the housing shortage for the required classes has always had particular importance for the government and for authorities. Due to this fact, the matters of flexibility and adaptability, which are the most basic factors of providing satisfaction for the residents, have always been behind the scenes. In this study, the purpose is to evaluate effective factors in the level of changes that may be made on a living space. For this reason, the issues of flexibility and adaptability will be reviewed by focusing on architectural aspects according to the architectural plans of the selected cases and also by studying the inhabitants' opinions about their living place through direct interviews and observations. Therefore, among the existing projects, three sample projects will be selected and analyzed as study cases.

1.2 Methodology

This study will utilize qualitative data collection tools and is rooted in a qualitative epistemological position which recognizes the importance of the flexibility and adaptability issue in providing families' satisfaction.

Data collection will consist of surveys, observations, and interviews with the inhabitants of case studies which will be selected for a comprehensive research.

In this study, by introducing the issue of flexibility and supporting it with some literatures, the main topic will be presented.

There are four main sources used for constructing the framework of the thesis: the works of Tatjana Schneider and Jeremy Till on flexibility: their book titled *Flexible Housing* (2007) and an article titled "Flexible Housing: The Means to the End" (2005b) and "Flexible Housing: Opportunities and Limits" (2005a).

Nabeel Hamdi's own ideas about flexibility: his book titled *Housing without Houses*, which is a complete compartment of John Turner and John Habraken's ideas about the issues of flexibility and adaptability.

Moreover, the issue of variability of housing needs, which is one of the most important items of the need for a flexible and adaptable house, will be discussed. The architectural characteristics of a flexible house will also be defined by presenting some sample designs and plans done by different architects from different countries.

The location of Tabriz and its natural characteristics will be introduced. Some political factors that had effects on the housing production system in Iran and also in Tabriz, according to their time periods, will be presented.

According to Dr. Pour Mohamadi's (Professor of Geography and Urban Planning in the University of Tabriz) advices, three case studies have been selected by paying attention to their location, design, and planning.

The data was collected by a questionnaire survey selected through a stratified random sampling in Istanbul, Turkey. The locations of the study areas are shown in Fig. 2. A total of 30 cases were examined in their own homes by interviewees. The study began at the end of August 2012 and finished at the beginning of October 2012. This evaluation had two parts. Objective questions about the house and its environment, such as the age of the building, dwelling size, dwelling type, physical condition of the building, average density in the neighborhood, and distance to city center. Socio-demographic questions shown to be relevant in the literature on residents' satisfaction, such as the parent's age, children's gender and age, level of education, occupation, family size, family type, number of children in the family, of the dwellings that were owned. 15-20 questions that were designed to measure the resident's perception of his/her residential environment. The third part of evaluation was sketching the main plans, sometimes according to the subject's descriptions, or according to the unit-plans received from the Office of Architecture: the house, and also sketching present situation of the house after possible changes.

As a final step, the data analysis will be done in two aspects: the architectural evaluation of the selected case studies in terms of flexibility and the analysis of the data obtained by the interviews done with the inhabitants of the selected case studies.

1.3 Outlines

This dissertation is organized into five chapters. Chapter 1 is devoted to the introduction, purpose of study and methodology. Chapter 2 presents an overview of the terminology and the conceptual framework that is going through the issue of variability of housing needs, and it will continue with some related concepts: housing flexibility and level of satisfaction. Some factors in determining the degree

of housing flexibility will be presented, and some literature reviews will be included. In this chapter, the related issue will be supported by diagrams and tables, and some examples of flexible houses will be presented in order to determine how flexibility has been proposed in some projects around the world for obtaining the residents' satisfaction. In chapter 3, the focus will be on introducing the urbanization issue of Tabriz City, which can be considered as one of the important reasons of population growth in Tabriz. Housing deficiency, which has emerged because of the day-to-day population growth, will be discussed.

Chapter 4 is dedicated to introduce Tabriz and classifying Tabriz regions, In this chapter city of Tabriz and it's regions will be introduced and the housing policies, which are executed through the time in these places in order to meet people's housing needs.

In chapter 5, the selected housing projects in Tabriz will be analyzed from the perspective of flexibility, and an evaluation will be done based on to the residents' direct responses to the interviews and based on the architectural analyses of the layouts of the selected flats.

2. AN OVERVIEW OF THE TERMINOLOGY AND THE CONCEPTUAL FRAME WORK

2.1 Variability of Housing Need

Residential satisfaction on space is the function of five groups of variables. For sure, the number of these variables is wider but the mentioned factors are more effective on which are directly related to family needs, and requirements. As a result, they relate to their satisfaction from their living environment. These are user characteristics, physical attributes of a space, and beliefs and perception of the user about the experienced space. The level of residential satisfaction gradually may decrease by the time with the changing spatial needs of occupants. Users can gain to satisfaction by changing the physical characteristics of their environments to create more adaptable and flexible spaces.

Size of the family, cultural ethics and the gradual changes that appear in the structure of the family size and the changes that happen in their point of view and requirements, all are effective issues that make them for asking changes in their life. Cultural heterogeneity as an effective issue increases the need for a variable approach to housing provision. A unified, mass-produced, housing- a building-policy, however, blocks this demand. The standard developer house, in its basic layout, a remnant from the late nineteenth century, seems to be at odds with an increasingly itinerant as well as multi-and cross-cultural society. As early as 1961, the seminal Parker Morris report, produced for the UK Government, argued that with the greatly increased rate of social and economic change, the adaptable house was becoming a national necessity... as it would allow much easier and perhaps more satisfactory adaptation to the changing general needs (Parker Morris Report,1961). These factors are effective in changing the demands, which bring the need for spatial flexibility:

- Age difference between children
- Family size

- Gender distribution of children
- Parents age
- Family type

2.1.1 Age difference in a family

This factor is variable and is changeable due to parents' age. Children's age affect the spatial arrangements and structure of the house. It is one of the factors that define how big or how small should a house be. It also defines the number of bedrooms and other parts of the interior plan.

The system of the outdoor spaces of houses can be varying due to the age of children. Generally, if the parents' age would be considered between 30 or below 20, it could be concluded that normally the age of the children will be below 10 in a normal situation.

2.1.2 Family size

Family size is also an important fact in determining the size of the house and the size of the rooms and also the shape of a house. The gender distribution in a family is also the effective fact that will be important in changing the shape of the plan for the residences. It is obvious that families needs, size and requirements will change through the time. Each family also needs changes which make them satisfied and meet their current time. This fact makes the need for a flexible housing bolder and makes architects and related organizations and authorities pay attention to the importance of housing issue once more.

The number of people who live in a house is the most important factor that defines the inside area size, the number of bedrooms and also other parts of the interior. Family size can be varying through the time. A family with no children needs type of a house which answers to two people requirements. As family gets bigger through the time, children's needs come up and the house would not be sufficient any more for the family. Family type determines family size.

2.1.3 Gender distribution of the children in a family

Girls and boys have different emotions and requirements which differ from each other. These, make children ask for a place that meet their needs and make them

satisfied. For children at early ages, gender difference does not make sense. As they grow up, their requirements add on and they ask for their own territory which only belongs to them. Children really want their own space around after a certain age.

This issue is changeable from one family to another, but there are some specific facts in Psychological Science which define children's needs regarding to their gender.

2.1.4 Age differences in children in a family

When children are under the age of 5, they need their parents' more than any other time. Parents prefer to keep their child with them. As they grow up, their dependency to their parents becomes less and they need to have separate areas in the house which belongs to them.

In families with more than one child, this issue becomes more important. Children with age difference of fewer than 5 years, have common needs which make it easier for them to share their territory with their brother or sister.

In those with high age difference, it is difficult to be in the same situation in the house. The older one has his own requirements, and the younger has different needs. So, age difference is an important variable which can change housing demands.

2.1.5 Family type

There are six family types: individuals, nuclear family without children, contracting family (son / daughter with one of the parents), nuclear family with children, extended family and some other forms like two friends living together.

In the individual type, one person lives on a unit which can be a student or an employed one or maybe someone who has lost his/ her family.

The nuclear family or elementary family is a term used to define a family group consisting of a pair of adults and their children. This is in contrast to a polygamous family, single-parent family, and to the larger extended family. Nuclear families typically center on a married couple, but not always; the nuclear family may have any number of children. In contracting family, there is a husband and a wife living with their children.

In an extended family, parents and their children's families may often live under a single roof. This type of joint families often includes multiple generations in the family. In different cultures, the variance of the term may have different meanings.

Family type is the basic fact that defines kind of house family needs or may need in the future, as their family structure or family requirements change as time pass.

2.1.6 Home-based jobs

Some people have home-based jobs. Nowadays most of the offices ask their employees to work at home. This may affect house system and families' living condition. Families will need some changes to be adapted to this kind of situation.

In a dwelling accommodation, there will be different residences in different family sizes, from almost different social groups, different needs and different ages. In this situation for sure, a mix of units that meets immediate demand might be inappropriate. Standard housing units, which have the same plan type, do not meet families who have completely different life situations.

With a demographic view, it is possible to separate residences that need to live in a dwelling which is designed for low-income families and is special for their family situation and needs. For this reason, it is important to place the families in different groups through the parents and the children ages which is critic to be aware of, because it will be the reason for changing the plan design through their needs.

Two families with the same age or with the same gender distribution may need two different shapes of houses. The other effective issue would be the culture or manner of living in each family, as their customs, their habits and culture may be different even if they are from the same economical class (Figure 2.1).

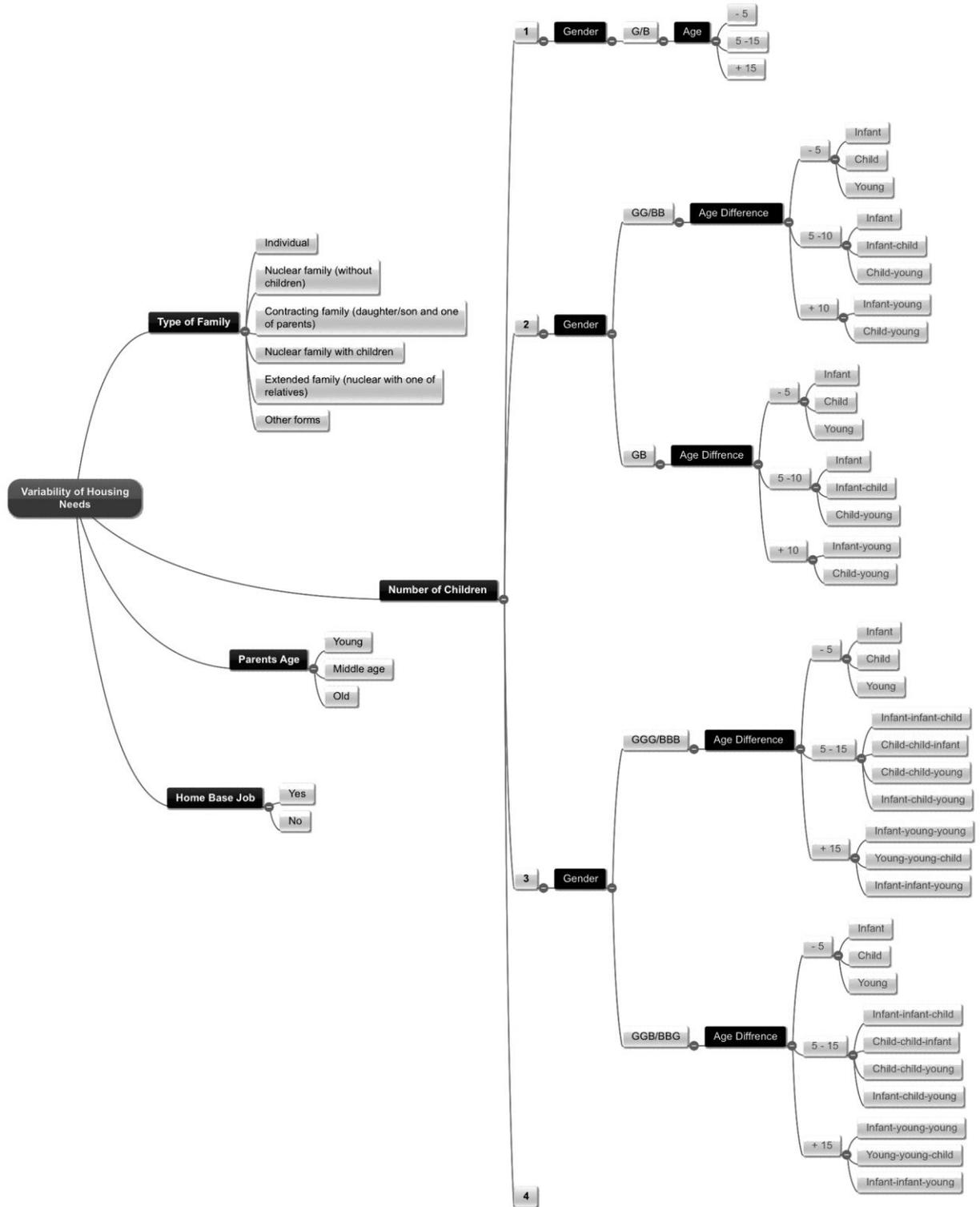


Figure 2.1 : Variability of family types (by the author)

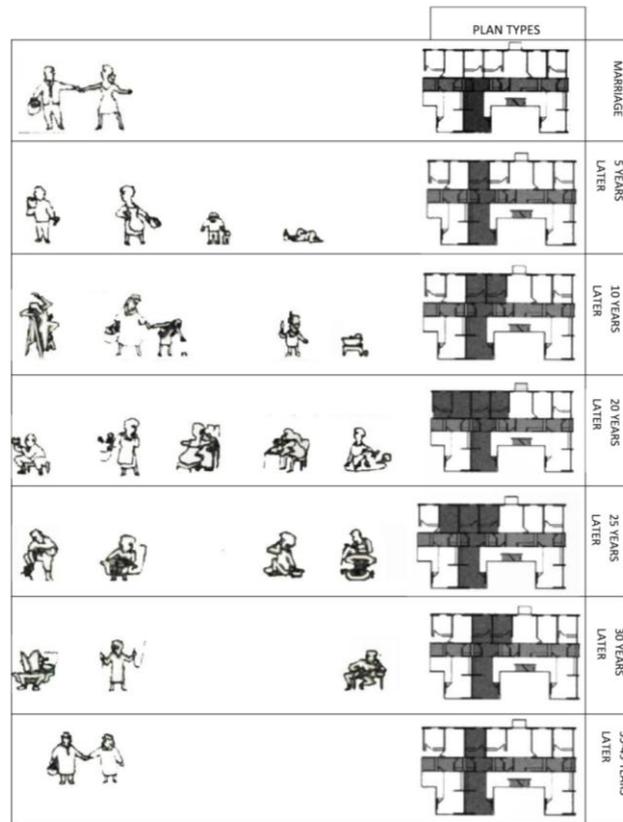


Figure 2.2 : Seven stages of family cycle and required plan types (by the author)

Here is the analysis of the changes that happen in the family structure through the time influencing family members' needs, which normally should be considered in interior as well as exterior parts of their house.

It is obvious that families, who buy a house not so easily, do not want to leave their living place that are used to it. Here is a question,” Are the houses provided by, whether public or private agencies, flexible enough to meet families’ changes needs”?

2.2 Flexibility, Adaptability and the Level of Satisfaction

This chapter aims to clarify the meanings of the terms “flexibility”, “adaptability” and “typological variety”. As both Habraken (2008), and Schneider and Till (2007) mentioned, “flexibility” and “adaptability” are very similar in meaning and often overlap, but the colloquial and the technical meanings can provide a departure point for their clarification and the conceptual framework of the study.

The English colloquial usage of the word “flexibility” is:

1. Able to change to suit new conditions or situations
2. being able to bend easily without breaking.

Opposite: inflexible (Oxford Advanced Learning Dictionary, 2001).

In its ordinary usage, “flexibility” indicates not only a physical change, modification or adaptation, for a variety of purposes or uses, but also freedom, which emerges as one of the key meanings. It also refers to “adaptation”, as well.

Flexibility makes residential spaces adaptation according to the demand of the user with divers’ life style.

Jeremy Till and Tatjana Schneider have categorized flexibility issue in two main parts: "Soft" and "Hard", First, through investigating flexibility at different scales of housing (from the block, through the building and unit, to the individual room), and second by indicating methods by which flexibility has been or may be achieved.

“Soft” refers to tactics, which allow certain indeterminacy, whereas “Hard” refers to elements that more specifically determine the way that the design may be used. Soft schemes generally work in the background, whereas hard schemes both visually and technically, tend to foreground their flexibility. In terms of use it may appear a contradiction that flexibility can be achieved through being either very indeterminate in plan form and/or technology or else very determinate, but historically both approaches have developed in parallel throughout the twentieth century.(Jeremy Till and Tatjana Schneider, 2005)

Adaptation is also an important parameter that is effective in providing people satisfaction, the term “adaptation” is defined as the adaptability for changes and alterations to adapt environment to the changing needs of the occupants in time. The term “flexibility” refers to use of space for various purposes without making physical alterations. The higher level of flexibility in the use of rooms can be achieved in the dwelling types where there exists a potential for adaptation with physical change.

Table 2.1 : Various definitions of the terms “Flexibility”, “Adaptability” and “Satisfaction” (Drawn by the Author of the Thesis)

Authors	Flexibility	Adaptability	Satisfaction
John F. C. Turner 1976	Flexibility gives the chance of managing the relationship of standards, costs, and user demand when making programs.	choices which are imposed to families make it difficult for them to change their positions, they need a place to get use to with their own desire.	The willingness of people to invest their energy and their savings or other material resources depends on the satisfactions they experience or expect as a result.
Schneider and Till 2007	It is the freedom to choose among options that fit individual needs and aspirations.	for making flexible designed projects adaptable for its users increasing the range of initial options to meet future demands would be the best aim.	participation invariably lead to better maintenance easier recovery of costs and greater satisfaction.
N. John Habraken 2008	In the context of housing Flexibility will achieve by changing the physical fabric of building.	In the context of housing Adaptability will achieve through designing rooms or units so that they can be used in a variety of ways	The housing that does not respond to the changes, becomes at best unsatisfactory, at worst obsolescent

In architectural discourse, “flexibility” and “adaptability” are defined in different ways. Some of these definitions are compiled in Table 2.1. In this table, definitions by Schneider and Till (2005a, 2005b, 2007) and N. John Habraken (2008), John F. C. Turner (1976), Nabeel Hamdi (1991) are included.

Flexibility and Adaptability are closely associated. Adaptability refers to situations that allow users to adjust and modify their houses within determined territories according to their wishes. According to Australian standard, which was prepared by committee ME\64, in 1995, the principles of adaptable housing are as follows:

- Adaptable housing is a benchmark or basis to develop the accommodation needs of users of all ages and abilities.
- In an adaptable housing; it should be possible to do minimum changes in minimum cost.
- Suitability for people with any level of ability. The adaptable house must, in its adaptable features, suit any future occupant with any type.



Figure 2.3 : An adaptable house before and after(Design Able Environments Inc).

This two-storey house with a basement features open living spaces on the main floor, as well as a den and a bathroom. Stair access provided to the upper level, which incorporates three bedrooms, and a bathroom.

Residents Profile:

The residents are Mr. and Mrs. Singh and their two teenage sons. The family entertains a lot and frequently has visits from the Singh grandparents. However, later in life, the two sons live in different cities. Mrs. Singh is widowed and is having some difficulty walking — she now uses a walker but may eventually need to use a wheelchair.

Features:

Mrs. Singh occupies the main floor unit. The upper unit rented out to supplement her pension income. The tenants, Mr. and Mrs. Wong, have a baby. Mrs. Wong is a stay-at-home mom and supplements the family income by providing housekeeping and care assistance to Mrs. Singh.

Adaptable house features (Flexible parts) include:

- Level entry at the main entrance;
- A secondary two-bedroom unit on the upper level;
- Secure entrances for both living units;
- An accessible two-bedroom main floor unit, featuring:
 - Accessible floor finishes;
 - Wider hallways;
 - Doors with lever hardware that provide at least 810 mm (32 inch.) of clear space when open;
- A wheelchair-accessible kitchen;
- A wheelchair-accessible bathroom;
- An emergency exit to an exterior area of refuge (e.g. rear patio);
- Lower switches and controls throughout.

2.2.1 Spatial flexibility as a factor of user satisfaction for quality housing

Another emerging problem in housing is the growing demand of residents for better quality housing. While the previous efforts in housing estate have been directed towards meeting the quantitative shortage of dwellings, qualitative aspects of housing have gained importance in recent years. Users are getting more conscious of quality issues in housing environments.

Under these socio-economic circumstances, “adaptability” becomes one of the essential spatial features for residential satisfaction of dwellings of mass(standard)-production types that results in quality factors such as residential satisfaction, adaptability and spatial adequacy. Residential satisfaction and quality of housing are two mutually related concepts in housing evaluation studies.

In some works, satisfaction is referred to as a criterion for evaluating the quality of the residential environment by measuring the effect of perception and assessments of the objective environment upon satisfaction. While some other writers refer to it as a predictor of behavior, Guido Francescato¹ and others conceive satisfaction as a function of different categories of variables: the objective characteristics of the residents, objective characteristics of the housing environments, and the occupants’ perception and beliefs about the aspects of their housing environment which are the physical environment, the housing management, and the other residents. Marans and Sprecklemeyer’s²² model recognizes the physical environment by indicating that objective attributes of the particular environment have an influence upon a person’s satisfaction through the person’s perception and assessments of those environmental attributes. It also states that a person’s behavior is influenced by satisfaction, the perception and assessments of the objective environmental attributes, and the objective attributes of the environment itself.

¹Marans and Sprecklemeyer (Evaluating built environments: A behavioral approach. Ann Arbor: University of Michigan,1981) find that the relationship between neighborhood satisfaction, decisions to move, and quality of life is a sequential process, with neighborhood satisfaction predicting mobility and mobility affecting quality of life.

²Guido Francescato, writer of Residents' Satisfaction in HUD-assisted Housing: Design and Management Factors: Prepared for the Office of Policy Development and Research, U.S. Department of Housing and Urban Development, in 1979.

As Nabeel Hamdi mentions in his book that, *Housing without House*, 1991, change and obsolescence can be answered by flexibility. " Achieving that fit required flexibility in managing the relationship of standards, costs, and user demand when making programs;and for many it meant flexibility in the spatial and physical organization and construction of buildings" (Nabeel Hamdi,1991).

Frank Lloyd Wright in the rest of his thoughts about individualism and industrial production has asserted that mass-produced housing projects should be flexible to enable everyone to put them together in his own way. He mentions that "House" should act as a tree which is growing around a man; its shape depends on individual resources, the needs of his family and his understanding of his own environment.

To sum up, the concept of flexible physical change and adaptation vary according to changing circumstances. Flexibility as an inclusive concept covers the related concepts of adaptability and typological variety and it is achieved by designing the the structural system and the servicing of a residential block in a way to allow change. Kallebäck designed in a way that the building provides opportunities to the users to make physical changes and also adaptations in their houses over time.

2.2.2 Definition of flexibility and some literature reviews

Flexible housing can be defined as housing that can adapt to the changing needs of users. It includes the possibility of choosing different housing layouts prior to occupation as well as the ability to adjust one's housing over time. It also includes the potential to incorporate new technologies over time, to adjust to changing demographics, or even to completely change the use of the building from housing to something else. Flexibility can be consisting of 3 items: Socially, Demographically and Economically.

Socially, it empowers the users to take control of their own dwelling, either by making choices prior to final construction or else over the lifetime of the home. Demographically, it enables housing providers to adjust to new living patterns and configurations of users.

Economically, it avoids obsolescence and costs involved in reconfiguration or refurbishment. Technically, it should allow the incorporation of new technologies

and the upgrading of old ones, in particular servicing. Flexibility gives the chance of making Adaptable changes, and that would be a reason of Satisfaction for users.

In many developing countries housing sector reform is a recurrent issue for domestic policy debate, particularly in the context of rapid urbanization, demographic pressure, slum formation and increasing demand for housing, land and infrastructure. This debate reflects a continued and proven public interest of issues related to the right to adequate housing and growing housing needs in cities. The scale of housing supply is considered fundamental as it impacts on housing prices and overall housing market performance and thus likely to increase choices and broaden affordability. If housing supply is not sufficient, it can act as an alternative to slum formation and as a viable alternative to informal land and housing developments.

However, the debate is not only framed by issues around quantity but also quality. The socio-cultural aspects of housing supply are important insofar that they meet people's needs for not only a roof above their heads but an improved quality of life. In this way, therefore, enabling the housing sector to work will impact directly on urban sustainability and social equity (A Practical Guide for Conducting: Housing Profiles, Supporting evidence-based housing policy and reform, un-habitate, 2010).

Until the 1990s, governments' response to the shelter problem in developing countries was mainly centered on direct provision of (public) housing. These efforts were found to be inefficient in their use of scarce resources, and were found to benefit groups that were better off than the poor for whom the programs were designed. Moreover, shelter provision was inadequate in scale: they were ineffective at meeting the growing housing demands of rapid urbanization in many towns and cities.

This fragmented response was replaced by the "Enabling" approach to housing. Policies, strategies and programs based on the enabling approach have been promoted by the United Nations since 1988 under the framework of the Global Strategy for Shelter to the Year 2000.

It departs from the role of government as shelter provider to that of a facilitator of the actions of all present and potential participants in the shelter production and

improvement process. Governments did this through creating the appropriate legal, institutional and regulatory environment and ensuring the availability of housing finance (A Practical Guide for Conducting: Housing Profiles, Supporting evidence-based housing policy and reform, UN-Habitat, 2010).

In the late 1960s, John Turner changed the way of thoughts about housing. He made all people focus on the housing issue as a verb not as a noun, to value self-help and to see even squatter settlements as a solution and as the best way to solve the problem of housing, not to consider it as a problem that must be solved. As a result, in the early 1970s the World Bank began to fund site-and-service schemes whereby governments helped people to acquire modest homes by building their own (World Bank, 1972, 1973, cited in Harris, 2001).

There were others besides Turner, such as William Mangin (Payne, 1977, Dwyer, 1974, Pugh, 1998, Harris, 2001), Charles Abrams, Aprodicio Laquian, and Charles Stokes (Choguill, 1995, Gilbert, 1992, Potter & Lloyd-Evans, 1998, van der Linden, 1986) who were articulating the importance of people satisfaction which would only be prepared by interrelate them in housing their houses. In their literatures, they have always acknowledged the importance of this issue that; people's demands on housing would not be relevant if the demand for housing were as standardized as the demands for mechanical products (Harris, 2001).

Owner-building itself, however, was not the issue. "The best results are obtained by the users who are in full control of the design, construction, and management of their own homes," (Turner, 1973). By "best results" Turner means the houses that best suit the changing needs and circumstances of their occupants and the occupants who are satisfied by their home which is built directly according to their ideas and needs.

The consultant of Housing and urban development, commented that Turner helped to lay the "conceptual foundation of a new housing strategy" by demonstrating that "people were the best judge of what housing they needed". Turner's ideas were not just in principles but his thoughts and literatures have impact on academic thoughts. Payne agreed, suggesting that Turner had "achieved a revolution of attitudes"

regarding the nationality and value of spontaneous settlements (Geoffrey Payne, 1984).

Turner's thoughts are in the way that people were the best judge of their own needs, and that the settlements they created were likely the best match to their needs. Turner recognizes that values and needs are changeable from one family to the other. Families need authority to be able to organize their life in regard to their needs and income. If housing is treated as a mass-produced consumer product, human use values must be substituted for material values. He believes that it is obvious to think in the way that, these needs are mutable from one family to the other and there should be no restriction to say that families with almost the same funding level have the same living condition. Needs, ideas, ambitions, potentials and the level of standards that a family prefers are the most important facts in the determination of the life level and the place that family lives. But the peak point is to give families the chance to balance their own needs and income and the level of their own life and give them the opportunity to choose what the best is for them. If their needs are limited, No propensity will be left for more effort. So, the construction and maintenance of adequate housing, at prices people and society can afford, depends on the investment of resources which households themselves control. The willingness of people to invest their energy and their savings or other material resources depends on the satisfactions they experience or expect as a result (Turner, 1976).

John turner believes that, the larger the organization and the more centralized management becomes the more frequent and the greater the mismatches are bound to be among peoples' housing priorities and the housing they get. As the mismatches increase, so does the users dissatisfaction. As a result, their investment of local and personal resources decreases and other resources must be found as substitutes.

John Turner has given two examples of two common families in his book (Housing by people), which are experiencing two different living conditions. One is a car painter family who live in a garbage dump in Mexico City - temporarily dependent on rag-picking. Being rent- free and close to work, urban facilities and relatives, minimizing costs by living temporarily in a shack in order to maximize savings had given the chance to the family to maximize their future opportunities and those for betterment. In fact this family has got the chance of experiencing economical and

physical flexibility of their living condition. In the other example that he has mentioned in his book, a semi-employed mason, his unemployed wife, and their student son live in a high standard dwelling which is isolating the family from its sources of livelihood and demanding over half its income for the (subsidized) rent-purchase and utility payments and minimizes opportunities for betterment.

By giving these two examples John Turner wants to point out to this fact that, the problems people actually experience, personally or collectively, are those revealed by these imbalances: poor value for money, financial and social insecurity, isolation and dislocation, and, of course, the physical and economical inflexibility of the living condition that leads them to experience this situation unwillingly .

In his book, *Housing by people*, John Turner by comparing these two case studies, the locally self-governing autonomous system and the centrally administered or heteronomous system, indicates that the bureaucratic heteronomous system produces things of a high standard, at great cost, and of dubious value, while the autonomous system produces things of extremely varied standard, but at low cost, and high use-value and flexibility. He believes that, the residents of housing project have little or no choice; the project is a kind of a ready package which they must take or leave. The shanty-dweller and the owner-builder, on the other hand, have several alternatives to choose their life among, so they are much freer considering the main trade-offs in open housing systems. "Families, who are in the same situation, have the chance to keep their options open and maximize their opportunities to gain future security" (Turner, 1976), So that, they have a flexible opportunity that can change if they wish at any moment, either economically or physically.

John Turner built connections between housing and community development. He presented his ideas in the way that people need enough flexibility to change their own houses and living conditions in the way that they desire or their needs impose them. Their living place should be such flexible that do not come to the idea of leaving there in order to get not for sure a better condition. Family thoughts, needs, preferences, size or living conditions may change through the time. It will naturally affect their living place. They will have to take advantage of the chance of change or transfer their living shelter in the way that fits their desires. Ordinary people do not usually spend their given proportion income on housing, because of the same reason

government officials assume that people do like this, so the forecasts of housing demands always fail.

Because of this miscalculating system, centrally administered housing system confront with some critical problems mostly in developing countries which are facing with the deficiency of housing more than developed ones. Newly on the way of urbanizing countries, it is not usual for a government agency to recover more than half the payments due from renters or buyers of publicly sponsored housing (Turner, 1976).

As a result, if the housing production is more dependent on the centrally administered systems and provided by them, the gap between the potential or needs and the actual production will become bigger and the housing conditions will become worse in for all low-income communities in all developing countries.

As John Turner mentions, centralized decision-making systems, however, are bound to generate standardized products on a large scale. Once governments decide about the problem that residences suffer from and begin to preform it, it will cost so much energy and money to change its direction even if the results and the problems are so obvious, and, the larger the organization, the greater the distance of the managers from the users.

Undoubtedly, large organizations have to provide adequate houses which will operate economically. Because of this reason they must standardize procedures and products. As the organization and centrally management get larger, the priority and the aim of the production of houses change from the most important facts, flexibility, sustainability and adaptability, to resolving the basic demand of the settlements. As a result of the fact, the mismatches bound to be between people's housing priorities and the housing they get.

2.3 Some Factors In Determining The Degree of “Housing Flexibility”

From the perspective of user, there are two issues that should be considered in housing design in order to achieve flexibility: firstly, the capacity of the project to offer a variety of “choices” in housing types prior to occupation, and secondly, its capacity to allow “changes” after occupation. Both of these issues require long term thinking in the design process (Tatjana Schneider, Jeremy Till, 2005).

2.3.1 Initial flexibility

Flexibility can be started from the design stage. In this kind of flexibility, the building offers the possibility of choosing different design layout “prior to occupancy”. In this situation blocks appropriate for diverse users. It provides “the tendency to design buildings that only correspond to a specific type of household at a specific point in time reflects a way of thinking that is predicated on short term economics” (Schneider & Till, 2005)

A: Old lady with a cat

B: Students’ flat

C: Musician

D: Mother/Child flat

E: Family

F: Permanent Flexibility

The second issue in flexible use is stated by Schneider and Till as “the ability to adjust one’s housing over time” including “the potential to incorporate new technologies over time, to adjust to changing demographics, or even to completely change the use of the building from housing to something else”. Permanent components determine whether housing project is flexible or not. It is the possibility of the future changes in needs and demands.

Aging and the number of householders are the most crucial considerations of flexible housing among other variabilities and changes that happen overtime in a family structure. The housing unit should be adoptable and adjustable to fulfill the changing needs of the inhabitants (Galfetti, 2003) Ways to achieve flexibility in housing design is mentioned in the following cases.

2.3.2 The structural system

Structure of a building is one of the permanent parts of the building which is a critical factor in determining whether the architectural layout will be flexible or not. Preconsidering future needs during the process of design makes a unit more adoptable and flexible for its occupants.

There are two structural methods; “base structures” and “polyvalent organizations”. “Base structure” refers to the basic structure system which is based on beams and columns. This kind of structure lets the layout of the unit not fixed and with more vague spaces.

“Polyvalent organization” is based on designing spaces and rooms open and vaguer appropriate for any function (Schneider & Till, Flexible Housing, 2007).

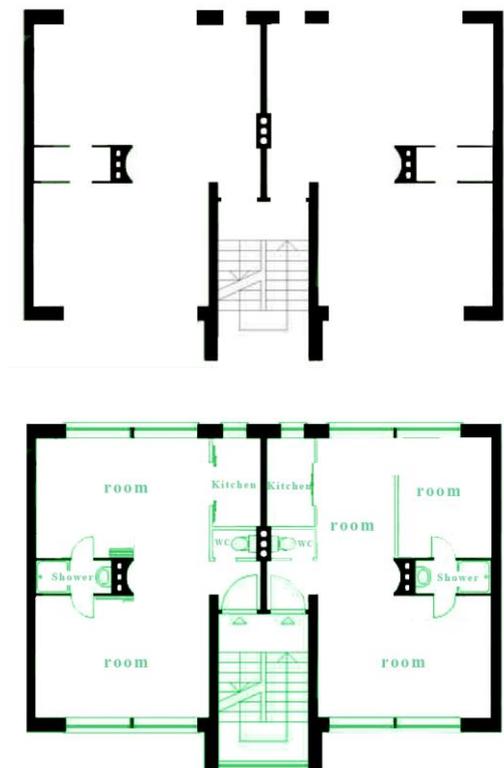


Figure 2.4 : Kleinwohnung, project(Carl Fieger, 1931)

2.3.3 The position of service space

In a flexible house the location of the service spaces is also important in providing more open spaces in the house for the occupants. Service units can be a part of the structural system or they are designed separately. Service spaces consist of access units and wet spaces (kitchen, WC and bathrooms).

The location of the service spaces can make a building capable for a variety of unit types and can give the opportunity of adaptation and adjustment in the future. The most practical place for locating service spaces is a single zone or that the main space can be undisturbed as generic space, “freedom in internal layout” (Rabeneck, Sheppard, & Town, 1974).

2.3.4 The architectural layout of the residential blocks

Architectural layout relates closely to the following factors: “Unit types” and the “Spatial organization”.

In the building scale “unit type” is important and place under the title of architectural design. Preparing different and various types of units for different users is one of the basic issues in creating a flexible unit. As it is mentioned previously, the “Initial flexibility” offers variety of choices to the residents before occupation.

According to “permanent organization” principles, in the post occupancy period, a flexible unit provides opportunity of making changes according to its needs. Architectural layout of the units can include these characteristics:

“The designer intentionally provides spaces for appropriation but does not determine their exact use or configuration” (Schneider & Till, 2007).

The elements used as separators or partitions. The relation between these elements provides different usages and different alternatives in the spatial organization of a housing unit.

2.3.5 Furnishing for flexible use

The use of furniture to separate different functional spaces or the use of folding furniture to allow different configurations for day and night is according to

deficiency land spaces in most of the residential units and the standardization in the construction system. Furnishing plays an important role in occupying less space with more function and providing more functional places for the occupiers.

Furnishing system can be stable and fixed (determined) or moveable or foldable. In the housing projects for low or medium income levels which are minimal dwelling furnishing becomes more important. There are different types of furnishing a housing unit. Furnitures may be foldable, movable, fixed. Indetermined spaces provide extra opportunity for the occupants to use their units as furniture.



Figure 2.5 : Rooms as Furniture

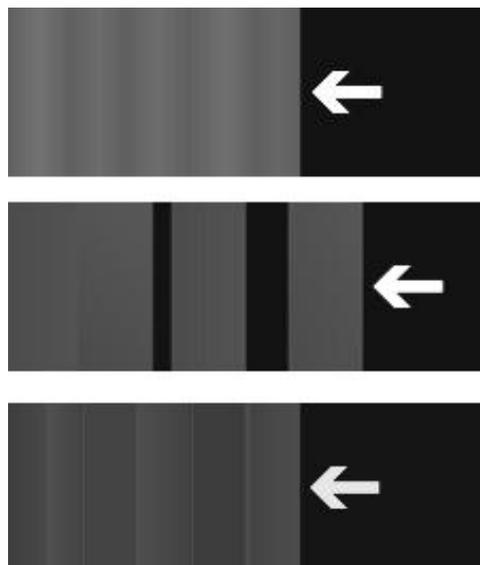


Figure 2.6 : Sliding/Moving/Folding walls

In short, the residential unit should give the opportunity to make physical arrangements and adaptations over time according to the changing needs and wishes

of the users. In order to create housing that provides flexibility in these two stages, the configuration of permanent parts, the structural system and service spaces, play a major role in the design. The degree of flexibility in the main space depends on the configuration of these permanent parts.

2.3.6 Changing the use of a building completely

In this kind of method, it is possible for the habitants or designers to have the chance of changing the usage of a unit. In this kind of flexibility, it is possible to turn the usage from housing one to workplace or other so that there will be no need to move completely from a place to another.

2.4 “Soft” And “Hard” Analogy

Projects can be determined as “Soft” and “Hard” analogy as Schneider and Till introduce and they refer to two different ways of “flexible housing” design. These two analogies are evaluated in the form and use of the project to specify the degree of flexibility.

“Soft” use: “Soft” use, allows users to make changes or adaptations according to their needs and wishes in time. Architects work in the background. “Hard” use: In “Hard” use projects are more architectural based where architects work in the foreground and determine the possible changes or adaptation for users over time (Schneider & Till, 2007).

“Soft” form: “Soft” form is “the stuff that enables flexible housing to unfold in a manner not completely controlled by the foreground of construction techniques” (Till & Schneider, 2005a). Thus, it is a less determinate way of design, whereas flexibility operates in the background. “Hard” form: According to Till and Schneider (2005b), “Hard” form means “those technologies/forms that are developed specifically to achieve flexibility”. The structure of the buildings is intentionally designed for flexibility. It is a determinate way of design and flexibility operates in the foreground in terms of the form of a building. In other words, the construction technique becomes important in determining the housing design.

2.5 Samples Some Projects Which Address Flexibility

Some of the pioneer examples of modernist housing explicitly use the notion of indeterminacy as a response to the housing shortage crisis, reason that a flexible approach could provide for a wider range of occupants.

Wohnzeile, Weissenhofsiedlung

Address: Germany, Stuttgart

Designer: Ludwig Mies van der Rohe

Context: Urban periphery

Designer: Mies van der Rohe

Year: 1927

Number of Storeys: 4-storey

Number of Units: 24

Techniques of Design “Soft”/”Hard”: This project is Flexible in Use and In Construction. Mies Van Der Rohe grants freedom to users by allowing them to fill the main open space with light infill partitions whenever they want. Thus, this project, as a base structure, can be regarded as an example of “soft” form and “soft” use.

Structural system: The initial floor plans are completely open apart from one or two internal structural columns. Combination of open spaces and services arrange around a central core.

Architectural layout

Unit types:

A. The first floor plan is designed for childless couples: one bedroom, a living room, a large kitchen and a bathroom.

B. One of the second floor units is designed as a bachelor apartment with a room for a piano and a small study separated from that room by a moveable partition wall.

C. The next door unit is designed for a family with two children; it is fitted out by the same architects to accommodate two bedrooms (one with a double bed and the other one with two single beds), a small dining / living room and a study.

This project not only addresses initial flexibility by presenting different plan types for different users with variable requests and needs but also is designed by according to the permanent flexibility principles.

Stair case as a structural system, which is bearing walls and the columns and is not moveable or changeable has been located almost at one side of the unit. Bathrooms and kitchens are as service paces, pushed against the party wall and stair enclosure.

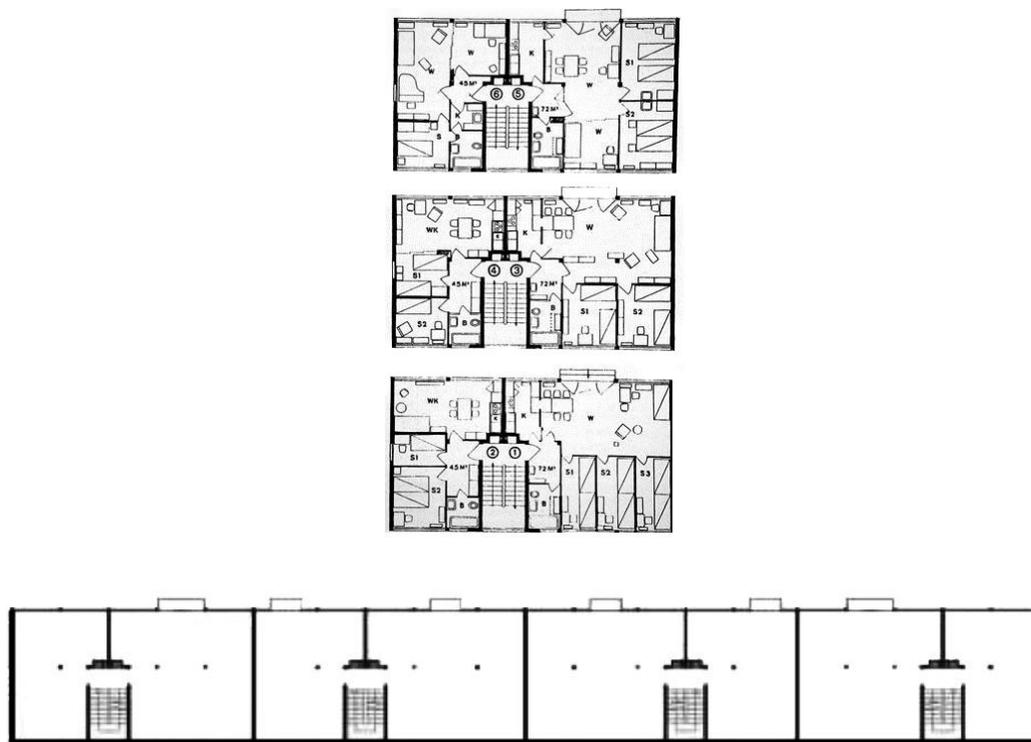


Figure 2.7 : Variability of unit types, (Till and Schneider, 2005).

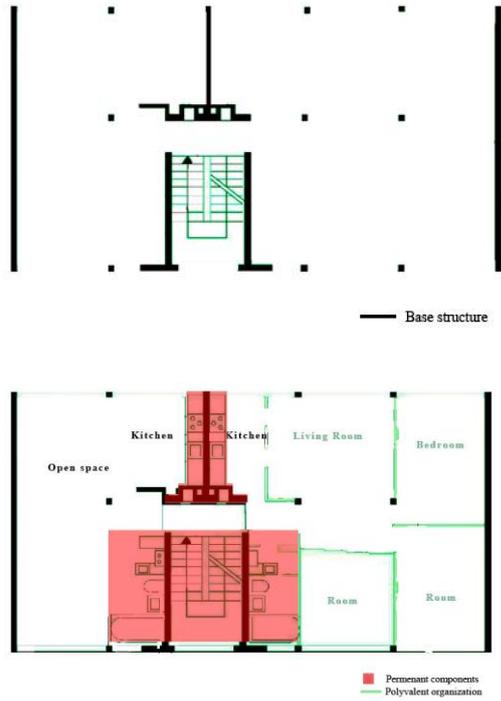


Figure 2.8 : The Weissenhofsiedlung housing project (Till and Schneider, 2005)

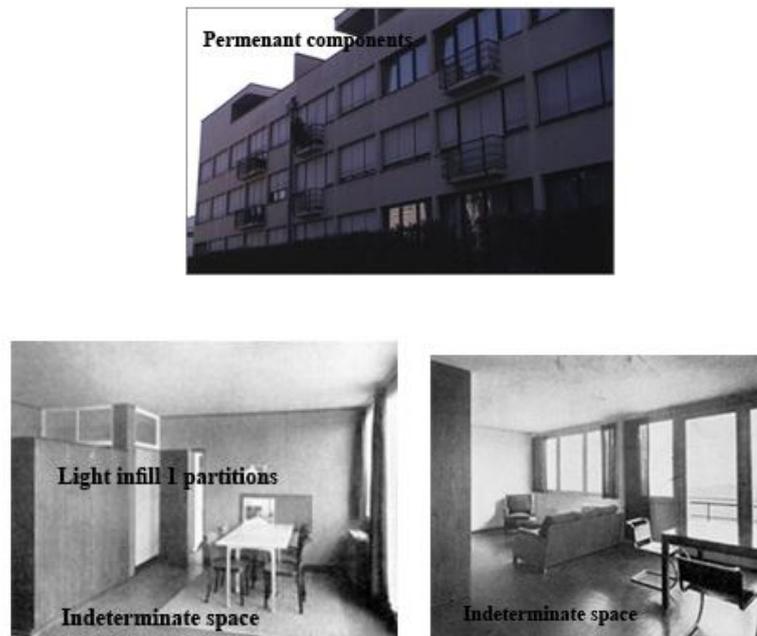


Figure 2.9 : The Weissenhofsiedlung housing project (Till and Schneider, 2005)

Montereau-Surville

Project Information

Address: France

Designer: Les Frères Arsène-Henry

Year: 1971

Number of Storeys: 10-storey

Type of Building: tenement / apart. House [detached]

Number of Units: 37

Techniques of Design “Soft”/”Hard”: The designer of the project by using flexible technology presents an open space, without any predetermined parts. It makes it possible for occupants to choose how their respective space would be subdivided. Therefore, this project is “soft” form and “soft” use.

Structure system: Central service core and Modullar structure allow repetition for providing opportunity of placing service spaces and other optional parts in appropriate place. Each flat is consisting of four units which are grouped around a central core.

Initial flexibility: User participation in the planning process whithing the standard shell.

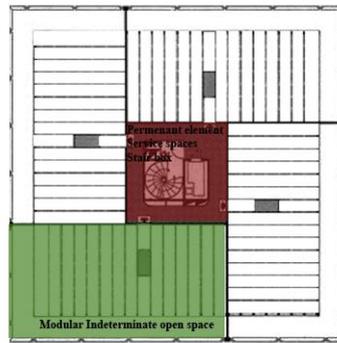


Figure 2.10 : Montereau, Les Frères Arsène-Henry, plan sample, France

Kalleback Experimental Housing (Soft and Hard Flexibility)

Project Information

Address:	Goteborg, Sweden
Designer:	Erik Friberger
Year:	1960
Context:	urban periphery
Number of Storeys:	4-storey
Number of Units:	18

Techniques of Design “Soft”/”Hard”:The form of the project is “hard” because of the specific solutions for construction such as the “demountable partition walls”³, “wall cupboards” and “doors” that are determined by the architect to make the project flexible. It is also designed as a soft flexible project as it provides users the opportunity to extend their units.

Structural system:

Shelving unit provides individual sites for single detached houses. Concrete floor plan plate is designed for each house that provides separate façade floor plan and roof. The front of the ‘shelf’ forms the edge of a balcony for each house.

Architectural layout:

The design of the house is then based around a system of demountable partition walls, wall cupboards and doors, all fixed to the concrete floor plate. Two people are needed for changing parts: one to hold the element, another one to fix it.



Figure 2.11 : Kallebäck experimental housing (Erik Friberger, 1960)

³Infill systems refer to configuration of the detachable units according to users’ needs and wishes.

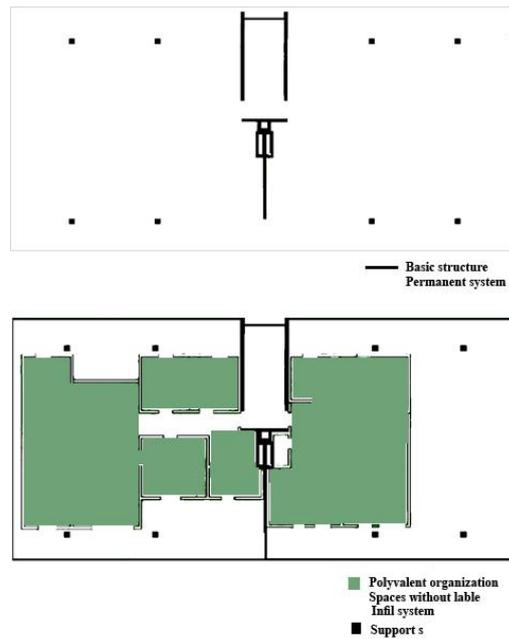


Figure 2.12 : Kallebäck experimental housing (Erik Friberger, 1960)

2.6 Conclusion

In this study, evaluation the projects will be according to different types of flexibility. Questioners which are distributed among the sample projects' habitants will determine whether any type of flexibility have been considered in the housing design or not, and if yes what type it is.

For example if the housing system is “polyvalent organization” ,means the dimension of rooms are appropriate for different functions, and that unit is considered as soft Flexible one, or if the physical fabric is determined by the architects or designers instead of the users, it will be considered as hard type.

3. CASE STUDY OF TABRIZ

3.1 Natural Features of Tabriz

The city is located in a natural basin between two mountain ranges. At the eastern end, the northern highlands with the diversion of about 30 degrees toward the east - west and south elevations get close together in the same direction. Thus, the city from three directions, north, south and east is faced serious restrictions and only from west; there is the possibility of development. Tabriz is constructed on a land that slopes sharply from the north and south and has a gentle slope in the center. Northern highlands that end to the northern limitation of the city in Valiasr, Baghmishe and other northern, end to the steep hills.

The especial condition of southlands in Zafaraniye, Fathabad and the south of Elgoli are similar. In the eastern part of the city in addition to the increase in the level, terrain also increases. As we get close to east, north and south part of the city land slope and consequently the streets steep become less, this decrease is more pronounced in the western part of town (Figure 3.2).

Tabriz weather with cold and long winters and cold winds warrants residences from constructing houses in the negative slopes. Lands in the southern part of Tabriz are generally in this situation. Selecting lands from this part of the city means the acceptance of more shadows on the building and more expenses⁴.

Northern part of the city is restricted by steep levels, domain part of these levels, which are already the basement for location of squatters. This part not only does not have potential for expansion but also some may be destroyed during the renovation of old fabric⁵.

⁴Consulting Engineers of Arse, 1996, p.88

⁵Consulting Engineers of Arklog, 1983, Master plan of Tabriz, Review of contents, p.38

3.1.1 Location of Tabriz

Tabriz (Persian/Azerbaijani: تبریز) is the fifth largest city and one of the historical capitals of Iran and the center of East Azerbaijan Province. Situated at an altitude of 1,350 meters at the junction of the Quru River and Aji River, it was the second largest city in Iran until the late 1960s, one of its former capitals, and residence of the crown prince under the Qajar dynasty. The city is proven extremely influential in the country's recent history. Tabriz is located in a valley to the north of the long ridge of the volcanic cone of Sahand, south of the Eynali Mountain. The valley opens out into a plain that slopes gently down to the northern end of Urmia Lake, 60 km to the west. With cold winters and temperate summers, the city is considered a summer resort.

The estimated population of the city is around 1,400,000 based on results of the Iranian census bureau. Tabriz is the fourth most populous city in Iran after Tehran, Mashhad, and Esfahan, and is a major Iranian heavy industrial and manufacturing center. Some of these industries include automobile, machine tools, oil and petrochemical and cement production.

Tabriz is divided to 9 zones concerning their economic, social, natural, physical, cultural and historical situations. One of these regions because of Council decisions on urban planning and architecture in Iran was omitted (on 17 April 1995) temporarily, this region relates to the urban development plan near Basmenj and Khavaran.

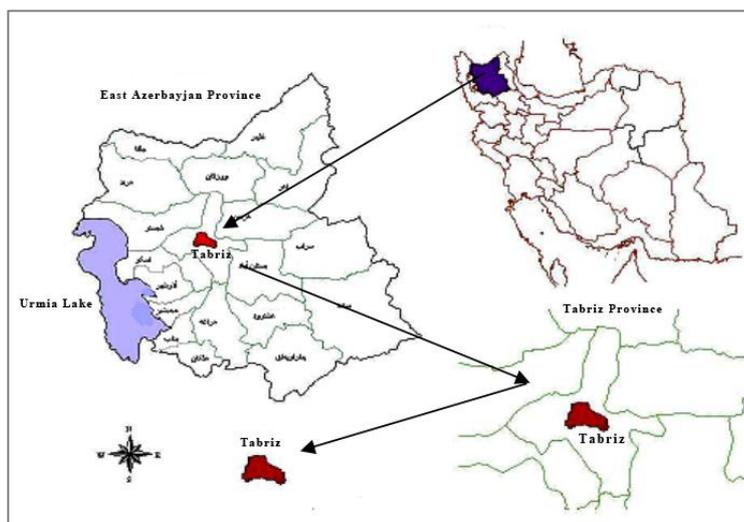


Figure 3.1 : Location of Tabriz in Iran(Tabriz municipality,2012)

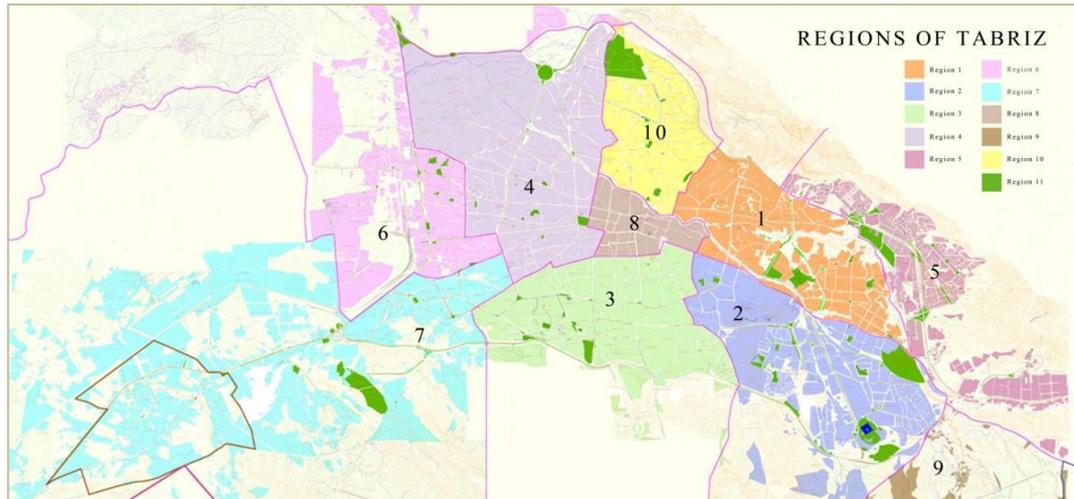


Figure 3.2 : Regional plan of Tabriz (Tabriz municipality,2012)

This city is the combination of various fabrics. These textures are historical, village fabric, nascent traditional context, designed fabric, margins and Mass housing fabric. Most of the mass houses, residential complexes and apartments are located in region 2, housing constructions density, especially apartments, has separated this region from other parts of the city.

3.1.2 Large fault of Tabriz

This fault starts from Misho Mountains, at the western part of Tabriz, passes from Tabriz and extends to Bostnabad and near Miyane cities. This fault plays a critical role at seism tectonic and Regional Seismicity¹. This fault was the cause of strong earthquakes and damages in Tabriz. This fault is recognized as one of the most critical tectonically Phenomena in the region and its vibration is inevitable in the future⁶.

Physical development

Morphological Bottlenecks plain of Tabriz can be divided in to two parts:

a) Elevated areas

- Northern altitudes

⁶ Ruholamini, Mahmood, 1375. Culture of living in apartments, p.654.

The scopes of these mountains cover north-west of Barenj village to Tabriz airport. In addition, it extends to Soofiyan region.

- Southern altitudes

These altitudes cover south and east south margins of the plain. One of the reasons for morph dynamic changes in this part is the effect of seasonal changes (during the wet months of the year). Constituent developers drill this part and in conjunctions, it provides flood flows. This fact proves the fact of instability of these altitudes.

b) Low altitude and flat areas

Western or west northern part of the plain or flat areas scope of this part has so low altitude. Talkherood River causes the increasing of desert like places in this part because of river sediments. This reason prevents residential urban expansion from west part of the Tabriz plain.

3.1.3 Economical and social characteristics

In this study, it is important to analyze age and gender distribution, the combination of the population, migration the annual average population growth in order to evaluate the level of quality and quantity needs for housing. This will also give critical points about how housing units are occupied in different years.

3.1.4 Population

Tabriz has always been the center of industrial development in Iran. This has caused increasing the population rate. According to population and housing census in 2006, total population equals 1.39806 million people.

According to this number, 682, 957 are females and 715, 103 are males. Based on this data, sex ratio is 1.04. The number of ordinary households living in this city is 376, 180 and the ratio of population to the number of families is 3.64.

As can be seen in the following table, the total population and the number of households have increased during the years. The number of households of Tabriz has increased from 77,000 in 1986 to 376,000 in 2006. In order to shed light on the condition of future housing demands it will be helpful to have information about number of households according to the rate of Tabriz population in each year:

Table 3.1 : Population change, urban congestion and made levels in Tabriz Over the years 1996-2001 (Rasool Gorbani, professor assistant Department of Geography, University of Tabriz)

Population density	Increase ratio of Area	Increase ratio of population	Population	Area	Year
189	-	-	403000	2127	1996
186	16.9	18.4	471000	2520	1970
172	46.5	59.4	692000	4019	1978
152	41.5	60.2	979000	6440	1986
136	11.2	23.7	1089000	7965	1991
113	9.36	31.8	1191000	10500	1996
118	12.51	8.1	1340000	11359	2001
189	-	-	403000	2127	1996

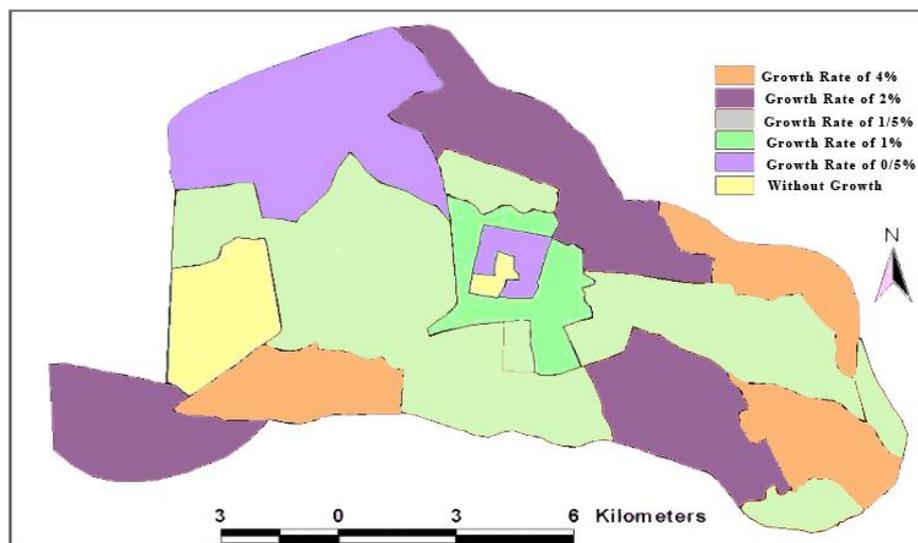


Figure 3.3: Population growth rates , Tabriz 1996-2001(Gorbani)

3.1.5 Migration

Urban population increase because of following reasons:

1. Natural increase
2. Development of marginal areas of the city and merger with nearby villages
3. The effect of population growth, which includes permanent and daily movements

Migrations happen under the effect of various factors. Lewis Everett Lee has classified effective decision reasons for migration into four parts:

1. Factors related to migration
2. Factors related to the destination of migration
3. Individual characteristics of migrators
4. General barriers of migration

Following table shows Factors of increasing the share of total population in Tabriz:

Extracted data demonstrates that the most effective reason of population growth until 1986 was natural growth.

In 1996, the reason of population growth was mostly based on migration.

3.2 Urban Density Developments In Tabriz

Population and area are two main factors, in the context of time and space and the technological level of interaction with communities and urban density. According to the first master plan studies, constructed area in this city in 1966 was 21270000 m² and the population was equivalent to 403000 people.

Thus, urban density in mentioned years was approximately 189000 people per hectare. According to the process of population growth, this is much faster than Physical expansion of the city. According to the decrease of population, density demonstrates that the horizontal expansion of the city is much faster than the population increase. Concerning economic benefits of construction multi-storey buildings, household of Tabriz tend to rebuild their private houses. This is one of the most important factors of vertical expansion of the city.

Table 3.2 : Factors of increasing the share of total population in Tabriz (KhoobAyand, S. Master thesis, 2000)

Increase, Resulting from expansion of Metropolitan area		Increase, Resulting from population growth		Increase, Resulting from natural growth		Collection of population growth	Population	Year
percent	population	percent	population	percent	population			
-	-	-	-	-	-	-	597976	1976
4.1	15000	40	149726	55.9	208780	373506	971482	1986
11.15	25260	57.7	130831	31.07	70378	226469	1197951	1996

4. HOUSING SITUATION IN TABRIZ

4.1 Housing Policies In Iran

Government, private and cooperative sectors, does housing construction in Iran. However, we should find out which one had the most dedication and helpfulness in it the overall housing policy formed in the five-year economic and social development program. It has been designed and run in 5 programs before Islamic Revolution and 4 programs after that. It was designed and executed in five programs prior Islamic Revolution and four programs after the revolution. For instance, during the last term (2005-2009) running final executive program the Ministry of Housing and Urban Development was required to provide the comprehensive plan by the end of the first year of forth term with the consideration of interaction between, Housing sector and National Economy as well as the balance-creating role improving the life and decreasing the imbalances.

4.1.1 The first construction program (1989-1993)

In the first program of economic development of social and cultural rights of Islamic republic of Iran, development and promotion of concrete structures in large and medium size cities and the production of prefabricated housing systems in large cities was placed in the government agenda. In order to improve mass houses production and the use of building materials, especially the petrochemical industries to replace imported materials, government reduced its share of total investment in housing to six percent. In addition, government announced its share on constructing housing for workers and employees and housing in damaged areas. They declared their general tendency in cooperative housing sector.

4.1.2 The second construction program (1995-1999)

In the second program of economic development of social and cultural rights of Islamic republic of Iran, government adopted policies and strategies, including efficient use of land to build housing for low-income applicants, reducing the

average level of residential infrastructure, skills training for new housing constructions and strengthening the bank's financial resources.

In the second program, government reduced its share of total investment in housing to 5 percent again. In this program, the public sector divided its contribution to both direct and indirect intervention in order to affect private sector for running its purposes. Special and clear headings, according to the main slogan, saving, downsizing and mass housing forms the centerpiece of this policy.

4.1.3 The third construction program (2000-2004)

The third construction program refers to the topic of the fact that government supports mass housing production. The first step of this program is minimizing the number of housing units in one complex in mass housing production program.

According to this decision, government sets 7 units in the rural areas and 5 units in small towns in and 92 units in major cities as the minimum number of residential units in a complex.

This fact deliberately extended the range of activities in mass housing. In The Third Development Plan, the government concluded that intensive intervention would cause distortion in the housing market and the wrong signals to the market.

During the Third Plan, the main policies were to supply land for people with market price entering the housing market and the government's entrance to the housing.

Market that increased housing prices and land and moving towards the extreme range was another government policy. Policies in this period, which oversee the distribution of building materials to the government price, were stopped, the policy of assigning land to individual mass builders was taken, and lands were sold in market price. Currently the public sector's measures in housing include the following:

Constructing housing for the charities by Imam Khomeini Relief Committee, providing the financial support for banks in housing construction, offering encouragement for mass housing builders and the government's attempts for providing housing for

Low- income classes with Mehr housing project during which housing is provided for them in the form of 99-year rental duration (The Qualitative and Quantitative Changes of Housing in Iran (1966-2006), Rahimberdi Annamoradnejad and Asghar Zarabi).

4.2 General Housing Policies In Tabriz

These are the most general housing policies adopted with the aim of housing supply for various social groups: policy of urban land preparation, urban land rules, and policy of supportive housing, social housing, mass housing, miniaturization, apartment building and Leased Housing policy.

These policies are mostly adopted for solving housing problems in the cities, especially big cities, which also include Tabriz⁷. In the first six month performance report of Tabriz Housing and Urban Development Organization in 1999 it is announced that Housing and Urban Development Organization and to comply with, Housing and Urban Development Organization of Tabriz in the province has adopted the following policies:

- Not transferring the land to the individuals in the big cities instead of transforming residential units to the applicants.
- The policy of rental housing production with possessions
- Supporting mass housing producers

Hence, housing policies can be grouped into main categories. Explaining these policies more is highly demanded.

4.2.1 Policy of urban land preparation

Land preparation includes profiling and leveling the streets to the substrate surface, inserting surface water disposal channels, separating components, identifying geometric placement of all passageways and parts and etc.

Land preparation for rehabilitation has become common since 1985 and is not a new activity in the urbanization of Iran.

⁷Consulting Engineers of Technic and Art, Master Plan of Zafaraniye, Tabriz.P.1

Stages of urban land preparation

- Positioning
- Design
- Implementation
- Assignment

4.2.2 Apartment building policy

The second type of housing and the most common policy of buildings can be seen in high complexes. In French “apartment” refers to any kind of rehabilitations and houses which are placed in a complex.

In Iran the word “apartment” refers to one multi-storey building. The term “Apartment” does not refer to the collection of houses on top of each other. Apartmental houses can be also built next to each other⁸.

Tabriz has been under the effect of apartment complexes more than other cities and this is because of the limitation in the horizontal expansion of the city. Because of this face, there are various types of apartment complexes in Tabriz which are built with different construction methods, various sites and diversification facilities.

Some of these residential complexes are built for low-income families. The most specific characteristic of these types is building and population density and having insufficient urban and housing services and amenities.

Mentioned apartment units have low level of infrastructure and their residents generally complain of lacking space.

Other apartment complexes relatively, benefit municipal service equipments such as commercial use, green spaces; playing ground, sport and etc. these kinds of gated communities have better quality⁹.

Most of the apartment complexes built in the recent years in Tabriz is those that are constructed by public cooperatives or private companies and factories for

⁸ Ruholamini, Mahmood, 1375. Apartment building and culture of living in apartments.p.654

⁹First reports of Engineer Consultants of Behestatan, p.12

accommodation of their own staff. As already was mentioned, in the recent years apartment construction in Tabriz has been more vogue.

This fact in the big cities that confront with the population growth and urbanization is so inherent and obvious. Besides, this fact is also so common in big cities with physical development constraints. Building apartments in the city of Tabriz has various reasons. One of the other vital reasons is economical issue (as apartment units are cheaper than private housing units).

Following table shows apartmental projects profile. According to this table it can be seen that about 13 apartment projects were constructed within the city of Tabriz from 1996 to 2002.

The whole area of mentioned projects is 456200 square meters. 5416 units have been constructed in these years and the average number of blocks is 35/38. The average number of residential units in each project is about 416 units. The average pure foundation of each unit in the total project is about 69/22 square meters. According to this data the first apartmental project was built in 1994 in Tabriz (Engineer Consultants of Behestatan).

Table 4.1 :Housing project samples constructed in Tabriz in different years and related information (Khoobayand, 2000)

Project performer	Date of contract	Useful area of each unit	Number of housing unit	Number of blocks	Project area	Project location	Project title
Irdak company	1999	71/4	200	17	11181/04	Andishe region	Azerbaijan housing complex
Peyrizan	1997	50	300	19	44354	Andishe region	Peyrizan Paret
Vazan company	1998	50	320	20	24781	Andishe region	Vazan company
Irdak company	1998	71/4	648	57	60000	Andishe region	Irdak company
Peymanir	1998	50	400	32	19700	-	Irdak
Irdak	1995	71/4	480	40	31460	Baghmishe region	Baghmishe (3)
Mahkar company	1994	75	156	13	8674	Zafaraniye lands	Zafaraniye (2)
Shahed	1997	71/4	768	64	47071/65	Baghmishe (3)	Shahriyar (Irdak)
Saman company	1997	75	200	13	10316/23	Eram Town	Saman housing
-	1997	104/4	426	60	11364/8	Baghmishe region	Gaz cooperators
-	-	-	206	18	7309	Zafaraniye region	Zafaraniye (2)
-	-	-	624	50	120000	Laleh Alley	Teraktorsazi
Didas company	1997	74/4	684	57	60000	Andishe region	Andishe region

4.2.3 Housing assessment in regard to the master plan of Tabriz

According to the master plan forecasts, it is shown that Future development will be in marginal areas. City development from the northern part due to restrictions is anticipated for affordable units. Western expansion which is considered as the main direction for expansion, is considered as commercial and industrial development. Eastern part of Tabriz, which is considered desirable in terms of housing facilities, is intended as housing area for high income families.

Southern part of the city is considered as the major part for expansion in the future. Based on master plan recommendations, this part will be the place for the housing development of medium-income level.

Residential use with approximately 46000000 square meters (34/84%) of the city wide area and about 45/54% useful level of the city is allocated to the city's largest urban areas.

4.2.4 Population density in Tabriz

According to the master plan of Tabriz building density and the gross distribution density of population, as we get closer to the center of the city its intensity decreases and as we get far from, its intensity increases.

Population congestion in the commercial centers of the city referrals in order to meet the everyday needs of the citizens, conversely, in neighborhoods and marginalized areas people have the same feeling to the public areas such as streets and their own houses. Tabriz population and housing density can be divided into two main parts: First commercial centers of the city (central and commercial parts and urban downtown cores) and some streets and squares leading to the marginalized communities. It is not unreasonable that streets and alleys used by children, youth and women and the elderly are like the housing units. In these places people spend more time and are satisfied with their living places (Shakooyi, 1393).

4.2.5 Housing density in Tabriz

According to the population growth in Tabriz, each day some parts of unresidential areas turn to residential areas. So the numbers of people have reached from 68/8 to 5/85 per hectare.

Population density in the marginalized areas is much more than predominantly affluent areas. High density and the population growth in these areas originate from social and economic problems and indicate a kind of injustice in access to urban facilities by city residents.

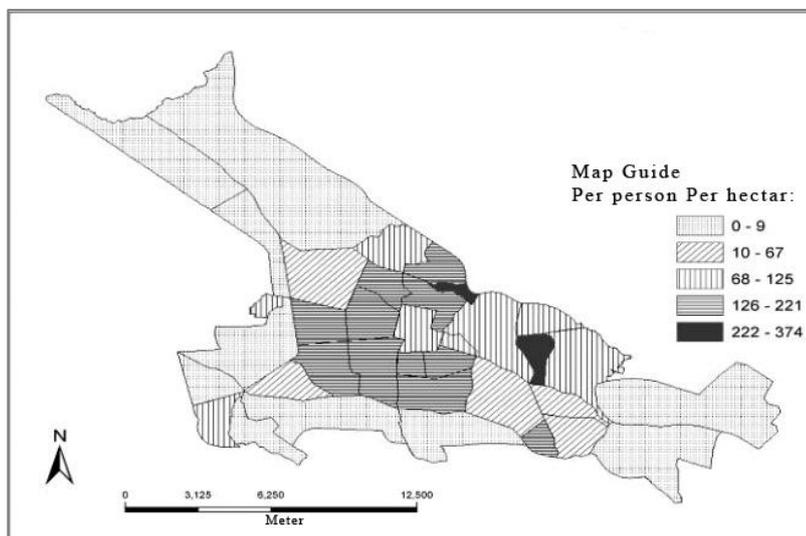


Figure 4.1 : Population density of Tabriz (Department of Geography, Tabriz, 2012)

Accumulation and density of buildings also have two different faces in different sections of Tabriz. Thus, the accumulation of buildings in the central fabric and planned complexes in the surrounding areas of the city is due to the high building density which is not too populated. Yet in marginal areas with low-income level society of Tabriz with the lack of zoning system, and general functions, the high percentage of residential functions and due to the small pieces of separated lands the number of the housing units is so high.

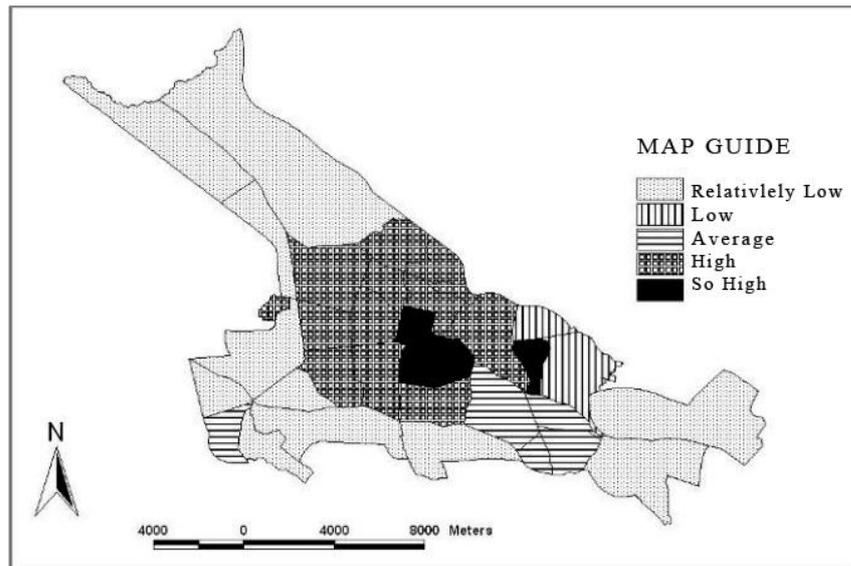


Figure 4.2 : Housing density in Tabriz (Department of Geography,Tabriz, 2012)

Today the main part of constuctions in Tabriz relates to eastern part of the city and somehow southern areas. In recent years constructions in areas such as Valiasr, Roshdiye, Baghmishe and Mirdamad are in the way of residential towers and upturning to high rise buildings (Destruction of low height units).

According to the master plan of Tabriz it is obvious that most of the occupied lands with high density constructions and residential complexes do not fit with the master plan suggestions. Only northern parts(Eram) and south margins(Maralan, Mirdamad and Rajayi Town) have been developed in accordance with ideas and plans of Tabriz Master plan.

4.3 Evaluation of Zone 2 of Tabriz as The Study Area

4.3.1 Evaluation of zone 1 and 2 in the eastern part of Tabriz as the study area

As mentioned before, According to the master plan studies and Economical, Social, Natural, Physical, Cultural, Historical and Skeletal charactristics, Tabriz is devided into 10 regions.

High density of residential buildings specially apartments and residential complexes has separated this region from other parts of the city.

This area in hierarchy of the research has been selected as the sample urban area.

It is worth noting that the results of this research (Evaluation of the level of housing flexibility, adaptability and residents' satisfaction), as it will cover all the information needed for the evaluation of mentioned terminologies, can refer to all of the residential complexes in other regions of the city.

According to the master plan of Tabriz, Tabriz is divided to 33 neighbourhoods. 9 of them are located in region 2 named: Silab, Baghmishe, Saridagh or Bilankooch, Valiasr, Baghshomal, Maralan, Zafaraniye, Elgoli, Parvaz-Ferdos.



Figure 4.3 : Urban location of the study area (Municipality of Tabriz, 2012)

4.3.2 General information about the residential complexes in region 2

Following table shows the list of the residential buildings constructed in region two in Tabriz. It also gives information about the number of floors, inhabitants population, number of blocks, name of the residential complexes and their open addresses, number of housing units and the owners names.

Table 4.2 :Residential complex list located in region 2-Tabriz

Owner's name (manufacturer)	Address	Estimated population (person)	Number of housing units	Number of floors			Number of blocks	Name of the residential complex
				Base- ment	Pilot	Residential		
Basij	Maralan St		420	-	1	4	35	Tajallayi
Housing development	Maralan St	1680	252	1	-	14	3	Dr Beheshti
Motojen company	Zafaraniye	1008	60	1	1	5	6	Sadra
Education Institute	Zafaraniye	240	64	-	-	4		Andishe
-	Zafaraniye	256	90	-	1	5	6	Simine
Housing Investment	Mirdamad	360	216	1	-	4	18	Sahand
Housing Investment	Mirdamad	864	120	1	1	5	12	D Apt
Housing Urban Development	Mirdamad	480	156	1	-	6	13	Mahkar
Second base of hunting	Mirdamad	624	72	-	1	3	12	Pardis
Second base of hunting	Zafaraniye	288	84	-	1	3	14	Kosar
Compressor	Zafaraniye	336	60	-	1	4	5	Vanak
Sepah vooperative	Rajayi shahr	240	106	-	1	5	10	Motahari
Malavi, Irdak and Omid	Elgoli avenu	424	528	-	1	4	66	Fajr
Oil company	Elgoli avenu	2112	756	-	1	3	42	Gods
Housing foundation	Rajayi shahr	3024	168	1	1	11,10	6	Shahid rajayi
Saderat Bank	Elgoli avenu	672	33	-	1	5,6	4	Eskan
Industrial Development	Elgoli avenu	132	294	1	-	3,4,13	17	Madani
Air force organization	Parvaz town	1176	48	1	1	4	6	Golparvaz
Construction development	baharestan,	192	72	-	1	8,10	6	Golestan

Cooperative of education	Elgoli,Shams	288	32	1	1	4	4	Ferdos-Farhangiyan
Sepah Cooperative	Yaghchiyan	128	72	-	1	5	9	Baharestan
-	Yaghchiyan	288	32	-	1	4	4	Golha
Azardasht company	Abresan	128	154	1	-	11,5,4	6	Khazar
Cooperative of Janbazan	Abbasi	616	100	-	-	5	5	Kosar
Azarbayjan housing	Tavanir	400	1256	1	-	4	59	Gol park
Irdak	Valiasr	5024	376	1	-	4	23	Neginpark
Jahad Cooperative	Tavanir	1504	96	-	1	4	12	Negin jahad
Azarbayjan housing	Nezami	384	360	1	-	4	19	Sadigi
Azarbayjan housing	Negin park	1440	40	1	-	4	3	Sadaf
Azarbayjan housing	Shafizade	160	504	1	-	4	29	Shafizade
Foreign company	Valiasr, sadi	2016	190	-	1	4,6,9	5	Irdak
Education	Barenj	760	552	1	-	4	35	Farhangshahr
Estabilishment	Mirdamad	2208	120	1	1	5	12	Maskan bank
SimanSoofiyanCooperative	Rajayishahr	480	45	-	1	5	3	Negin
Literacy Movement	Elgoli Sahand	180	108	-	-	4	9	Kosar

5. SELECTED HOUSING PROJECTS IN TABRIZ AND THEIR ANALYSIS FROM THE PERSPECTIVE OF "FLEXIBILITY"

5.1 Determination of The Residential Complexes as The Case Studies

Based on the extracted data from the municipalities of regions 1 and 2 of Tabriz, about 50 housing projects have been registered in a decade after 1991 (Table 4.2). It is better to mention that, most of the housing projects are located in these regions; other regions mostly include apartments or private old buildings due to the historical urban fabric in the centerl parts of the city. According to the list of the complexes in the Table 4.2, and due to the fact that the localization and qualitative criteria are important facts in categorizing the study samples, three cases were chosen as case studies, which each are located at 3 different neighborhoods in the region 2.

According to the localization and the total area of the municipality, Region 2 can be divided into three districts:

1. North Range, Kooye Valiasr

Considering the location and the residents' desire for living in this neighborhood, this area is one of the best regions of Tabriz. The land and house prices are considerably high in this region.

2. Elgoli

According to the location and the inhabitant desire for living in this neighborhood, this area can be considered as a most-desired neighborhood. The land and house prices are quite high in this region.

3. South and southwest area, including Zafaraniye, Mirdamad, Rajayishahr, and Maralan areas. There are 17 residential complexes in this area in total.

Based on the location and the residents' desire for living in this neighborhood, this area can be considered as a least-desired neighborhood. The land and house prices are not high in this region.

In Iran, land prices are based on the unit price of per square meter, and the unit price of per square meter depends on so many factors, such as the proximity to the transportation system, historical elements of the city, proximity to the land marks, etc.

Due to the fact that the localization and qualitative criteria are important factors in categorizing the study samples, three cases were chosen as case studies:

1. Farhangshahr Residential Complex,

Location: Valiasr

2. Asman-e-Tabriz,

Location: Elgoli district

3. Sahand Complex,

Location: Mirdamad, Rajayishahr

The following figure is a comparison analysis between the selected case studies regarding these factors; Regional value and Architectural value.

Aseman and Farhangshahr Projects are located in affluent neighborhoods. In the Aseman complex, compared by the two other projects, enough attention has been paid to aesthetic, details and landscaping issues.

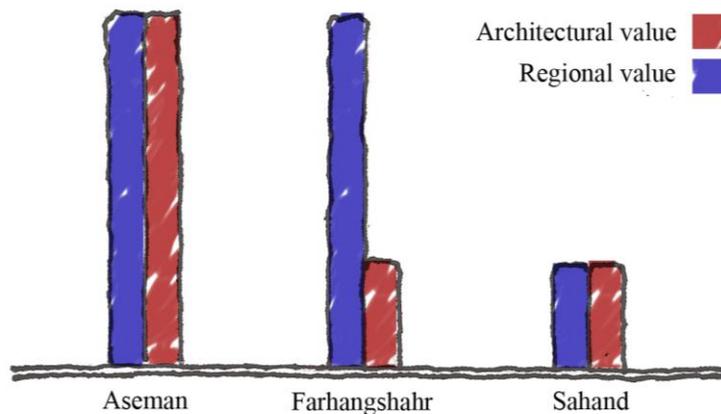


Figure 5.1 : Architectural and regional evaluation of the case studies(by the author)

Selected housing projects will be evaluated based on two aspects:

1. Architectural

By focusing on the flat plans and comparing them according to the theories and factors of Flexibility presented in the second chapter.

2. According to the requirements, opinion, and living conditions of the inhabitants. Data collection system is interview.

The interviews were done by asking open type of questions, and have been asked from randomly 10 families of each project.

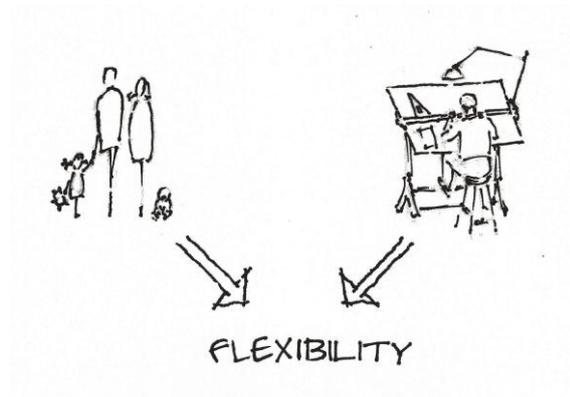


Figure 5.2 : Evaluating “flexibility” from two aspects (by the author).

5.2 Farhangshahr Project (فرهنگ شهر)

5.2.1 General Information about the Case Study

This complex is located in Valiasr, one of the biggest and the most populated areas of Tabriz. This neighborhood is one of the biggest and one of the most crowded areas of Tabriz. Similar to a small town, it consists of boulevards, streets, squares, small bazaars, and many gardens. The residents of its surrounding area are mostly of high and wealthy levels of the society. Turkish and Azerbaijani consulates are located in the northern part of this area.

The units of Farhangshahr complex were sold by the government to the educators in Tabriz, but as of today, most of the residents have sold their units. This complex consists of 35 four-story blocks. Four blocks have one staircase; one block has three staircases; and others have two staircases. In total, this complex consists of 499 units.

General Information about the Project

Project name:	Farhangshahr
For sale since:	1982
Location:	Valiasr Quarter, Tabriz
Project type:	Social Housing Project
Number of housing units:	499
Unit types:	2 Bedrooms/3 Bedrooms

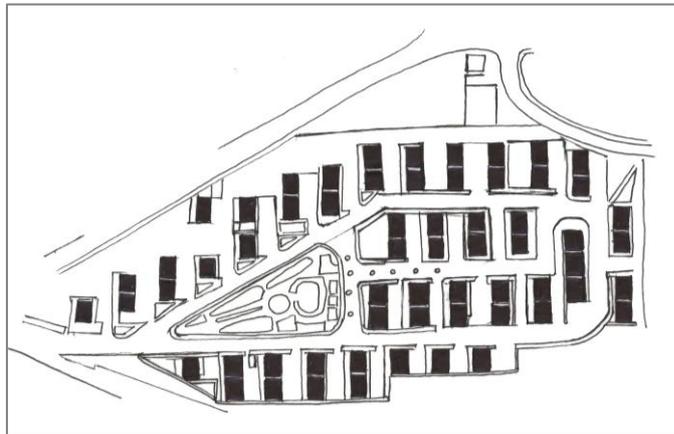


Figure 5.3 : Site plan of Farhangshahr Housing Project(Sketched by the Author)



Figure 5.4 : Farhangshahr Complex, Children's Playground(taken by the author)



Figure 5.5 : Farhangshahr Complex, a Sample Block(taken by the author).

5.2.2 Evaluation of the flexibility according to the architectural factor

According to the observations and the collected data from the visited units, these units are discussed under four themes: structural system, service spaces, architectural layout, and furnishing for flexible use (Figure 5.7).

5.2.2.1 Techniques of design“Soft”/”Hard”:

The construction system which is used in this project is a pre-fabricated system. There is no evidence and no proof of the fact that there was a main and specific concept beyond this idea, but the result has provided housing units with soft use and soft form. No specific elements are used in the structure of the house for making it flexible so that it may be considered as a soft form project. The architect has used a modular system to form the project. No diagonal line is used in the design, and all the walls and even facades of the blocks are straight. In the straight lines/walls, the intersecting walls can move and be placed to every point of the main wall; however, if the walls are designed bent or curved, not more than a wall can be joined to the main one, and that would make problems in the flexibility issue. The shape of the plans is regular quadrilateral, which is the best form that provides maximum opportunity for changing.

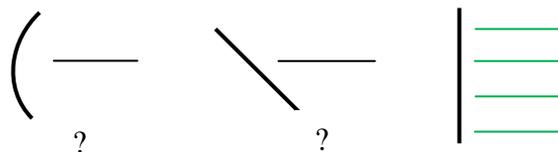


Figure 5.6 : Some different types of intersecting walls (drawn by the author).

5.2.2.2 Architectural layout

As was mentioned in the previous sections, architectural layout relates closely to the unit types and the spatial organization. In the building scale, “unit type” is important and placed under the title of architectural design. Preparing different and various types of units for different users is one of the basic issues in creating a flexible unit.

In these projects, there are two different types of units, and the base unit types were the same in all of the 35 blocks.

Almost 80 percent of the inhabitants of the units with three or two bedrooms have decreased the number of their bedrooms to 2 and 1 respectively, according to their needs and family structure. In the Figure, a comparative analysis is done to show the previous and the present structure of the units.

5.2.2.3 Furnishing for flexible use

In the housing projects with minimal dwelling area, the furnishing system has more critical importance.

In this project, according to the shape of the plans, the maximum possibility of furnishing is provided for the inhabitants. No specific kind of furnishing is required for these units. So, no special concept for furnishing has been considered. The residents have furnished their homes in their own style and without any professional consideration or assistance.

5.2.2.4 Service spaces

The placement of service space in a housing project with limited area is so important. It may provide an opportunity for flexibility or may restrict this chance. In the Farhangshahr Project, the most interesting point which is considered in its design is not only the possibility of relocating spaces but the possibility of displacing the wet spaces. The wet spaces (both kitchen and bathroom) are designed so well in terms of installation that it makes it possible for the inhabitants to relocate these spaces without any problem. The size of the ducts is minimized and is laced in the most appropriate place in the plans, and these factors provide the highest possibility for change.

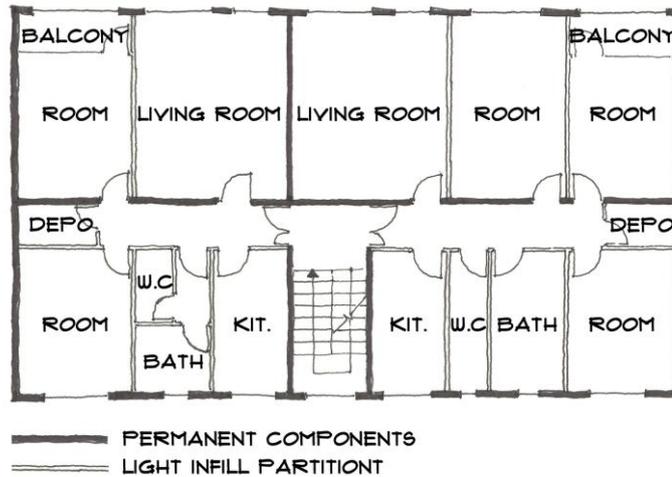
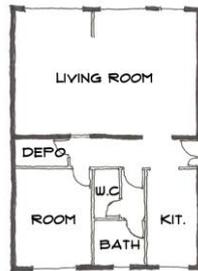


Figure 5.7 : Main plan types, Farhangshahr Project(sketched by the author).

Table 5.1 : Evaluation of the architectural changes in the Farhangshahr Project

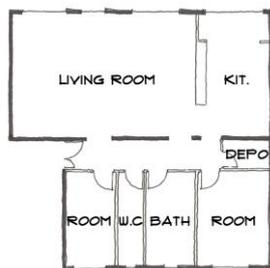
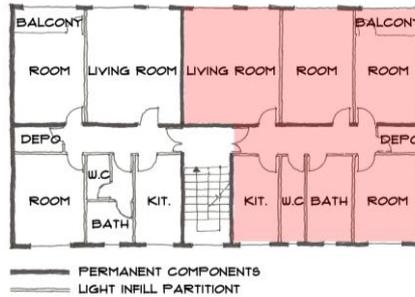
Plan types	
Plans	What kind of Changes have been made?
	<ol style="list-style-type: none"> 1. The storage room has been removed 2. The kitchen's wall and door have been removed
	<ol style="list-style-type: none"> 1. All the doors have been removed 2. The door of the bathroom has been opened to the bedroom. 3. The storag have been removed 4. One of the bedrooms has been omitted and have been mixed with the living room. 5. Th storage room is removed, and an under ground storage has been made.



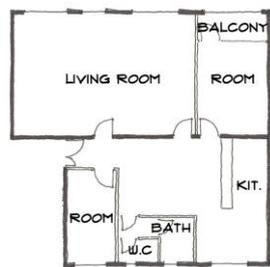
1. One of the bedrooms has been removed and has been mixed with the living room.

Plans

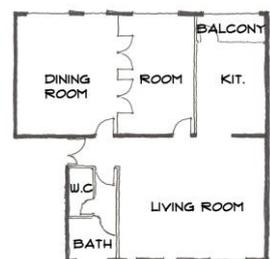
What kind of Changes have been made?



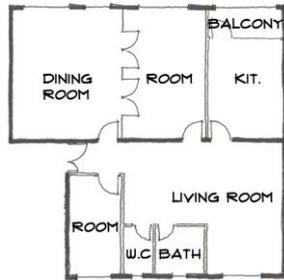
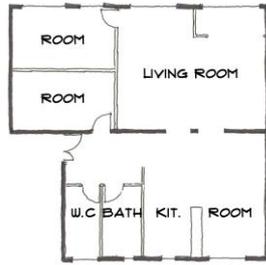
1. The living room and the bedroom are mixed, and the doors are removed.
2. The kitchen's wall and door are removed.



1. The living room and the bedroom are mixed, and the doors have been removed.
2. The storage room is removed
3. The storage room and the bedroom have been mixed, and have been turned into the kitchen, the doors also has been removed.
4. The bathroom has been mixed.



1. The bedroom has been turned into the kitchen
2. The other bedroom has been turned into the bathroom
3. The storage room and the bedroom and the bedroom have been mixed, and have been turned into the living room.
4. The kitchen has been turned into the bathroom.



1. The living room has been divided in to two bedrooms
2. The storage room has been removed
3. The bathroom has been turned into kitchen
4. The kitchen has been turned into a bathroom.
5. The bedroom has been turned into a living room
6. The two bedrooms have been mixed, and have been turned in to the dining room.

1. The kitchen has been turned into the bedroom.
2. The bedroom has been turned into the kitchen
3. The bedroom and the living room have been mixed, and have been dividing with two doors.
4. The storage has been removed and the bedroom has been mixed and has been turned into a living room.

5.2.1 Extracted data

In this project , approximately 5 percent of the housing units have been evaluated, and their inhabitants have been interviewed, having the chance of visiting the interior parts and analyzing the changes that have been or haven't been made along with getting the inhabitants own opinion.

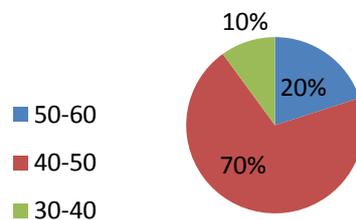


Figure 5.8 : Parent's age, Farhangshahr Project

According to the extracted data from interviews, almost 70 percent of the parents have average age of 40-50. They have bought their houses almost 20-25 years ago and have been lived there since they have been married. They mentioned that their house was the first house that they have bought after their marriages.

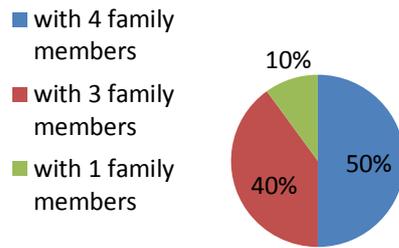


Figure 5.9 : Number of family members, Farhangshahr Project

More than 50 percent of the inhabitants have 4 family members. And about the same percent of them have 2 children. In most of the cases one of the children have been married.

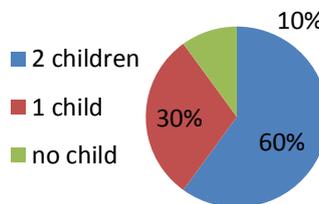


Figure 5.10 : Number of children , Farhangshahr Project

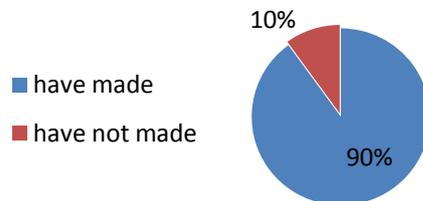


Figure 5.11 : Made/not made changes, Farhangshahr Project

Almost 70 percent of the families have been made changes in the interior parts of their houses according to their requirements and family structure.

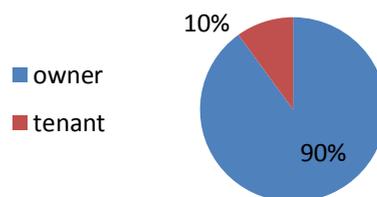


Figure 5.12 : Owner-Tenant situation, Farhangshahr Project

In order to get right datas from the families it was important to make the interviews with the owners.

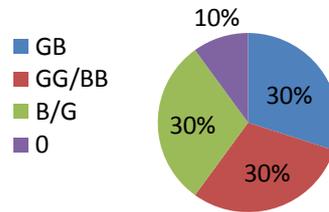


Figure 5.13 : Gender distribution in a family, Farhangshahr Project

Gender of the children is an important factor that determines structure of a family, In this project 30 percent of the families had two girls or two boys, 30 percent of them had a boy and a girl, and again 30 percent of them had a boy or a girl, in 10 percent of the cases families had no children.

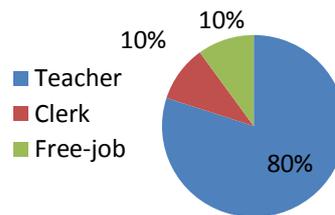


Figure 5.14 : Occupation, Farhangshahr Project

80 percent of the inhabitants are school teachers. This project was constructed in low price and most of the units were sold to the teachers. So, most of the inhabitants are middle-income families.

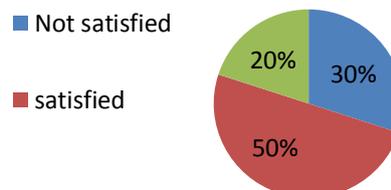


Figure 5.15 : The Level of satisfaction, Farhangshahr project

Almost 50 percent of the interviewed families were satisfied with their living place. They have adapted to their house and neighbours and had the possibility of making some changes in the interior parts of their house, and now they don't have any problem and they don't have any plan of changing their house.

5.2.2 Evaluating the issue of flexibility and adaptability according to the collected data

There are only two plan types; those with two bedrooms and others which have three-bedrooms. The structure of the building is prefabricated system and the inhabitants, in the interviews, mentioned that their house is resistant against earthquake, so this fact makes them feel more secure. This project includes 35 four-story blocks. These blocks are surrounded by a notwell-designed landscape but it seems to meet the inhabitant needs for a green area. There is a small park in the central part of the project which is the only place where they can enjoy during their spare time with their friends.

Most of the inhabitants of the complex are teachers. According to the extracted data almost 90 percent of them are of middle-income families. Although, there are some residents who are newly married and have rented a unit or moved to this complex because of the reasonable cost of rents, about 60 percent of the current inhabitants are living there since 1992. They have bought their units and are considered as the owners.

5.3 Aseman-e Tabriz (آسمان تبریز)

5.3.1 General information about the case study

This is a new complex which is located on Elgoli Boulevard, yet some units are not assigned. This complex is based on an area of 190000 square meters and is composed of 818 twin-story blocks (8th block under construction), and in total, there are 928 units with 2 or 3 bedrooms. The complex is located in an area with a good climatic condition, and the considered facilities are in almost high level. Its residents are of upper society class. Some of the facilities of this complex are as follows: large house units, open area and adequate green area, suitable distance between the blocks, and children's playground.

- Some features of this project:
- Suitable location
- The high price of units
- Architectural and landscape design according to the inhabitant's requirements
- High welfare services
- Top security services
- Quietness

General Information about the Project:

Project Name:	Aseman-e- Tabriz
Start on sale:	1999
Location:	Mirdamad, Tabri
Project type:	Mass housing project
Number of housing units:	928 Units
Unit types:	2 Bedrooms/ 3 Bedrooms
Area of the units:	114-223 square meters

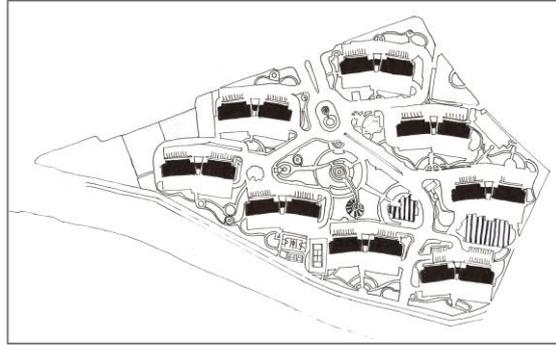


Figure 5.16 : Site Plan,Aseman Housing Project(Sketched by the author).



Figure 5.17 : Aseman Housing Projec(taken by the author).



Figure 5.18 : Aseman Housing Project(taken by the author).

5.3.2 Evaluation of the flexibility according to the architectural factor

According to the observations and the collected data from the visited units, these units are discussed under four themes: 1. Structural system, 2. Service spaces, 3. Architectural layout, and 4. Furnishing for flexible use.

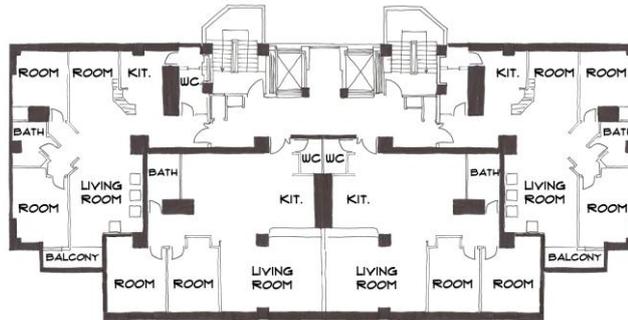


Figure 5.19 : Main plan types, Aseman Project (drawn by the author)

Techniques of Design “Soft”/”Hard”:

In this project, the number of flats is about 15, and the structural system is concrete. For this reason, column dimensions have become 1*1 cm. This dimension increases in the lower flats. The shear walls are not located in a simple way. The existence of numerous and large ducts has caused any changes to be limited.

So, from this data, it is obvious that in this project and the housing units are “hard use” and “hard form”. According to the unit plans, it can be observed that all of the spaces are defined and also the construction system is defined so specifically.

5.3.2.1 Architectural layout

As was mentioned in the previous sections, architectural layout relate closely to the unit types and the spatial organization. In the building scale, unit type is important and is placed under the title of architectural design. Preparing different and various types of units for different users is one of the basic issues in creating a flexible unit. In these projects, there are in total 8 types of units considered. There are 4 types of two-bedroom units and 4 types of three-bedroom units.

There is a fact that is important to be mentioned here; since people in Tabriz have newly become familiar with the culture of living in apartments (the first apartment complex in Tabriz was built in 1994), families are not used to living in multi-story

buildings with lower area. A family, who now live in the biggest unit of the Aseman Complex, has had a two-story private house before with the area of 450 square meters. Therefore, a unit with 3 bedrooms and area of 250 square meters cannot meet their needs. The rooms are defined clearly and there is no chance for changing the usage, but the inhabitants can remove partitions and some walls to mix the spaces. However, the unit size can be considered as another restriction for them.

5.3.2.2 Furnishing for flexible use

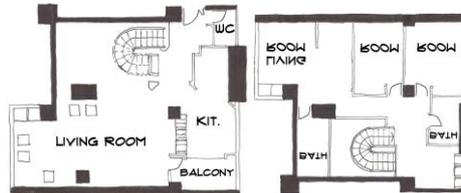
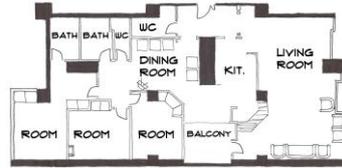
According to the structural system, which was explained at the Architectural layout section, the complexity of the designed plan and the location of the shear walls and large ducts have limited the space, and as a result, this would affect the furnishing system.

5.3.2.3 Service spaces

In this project, the most interesting point which is considered in its design is that because of two different ducts placed separately in the house and due to the sanitation system, there is no possibility of relocating spaces; furthermore, there is no chance of relocating the wet spaces or even replacing wet spaces with each other, which limits the level of flexibility.

Table 5.2 : Evaluation of the Architectural Changes in the Aseman Project

Plan types	
Two-bedrooms	Three-bedrooms



Plan

What kind of Changes have been made?



3. Two adjacent flats have been mixed
 4. In between walls has been removed
-

5.3.3 Extracted data

In this project , approximately 5 percent of the housing units have been evaluated, and their inhabitants have been interviewed by asking open typeof questions, having the chance of visiting the interior parts and analyzing the changes that have been or haven't been made along with getting the inhabitants own opinion.

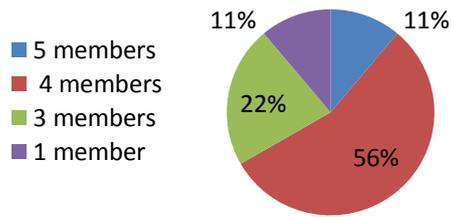


Figure 5.20 : Number of family member, Aseman Project

More than 50 percent of the inhabitants are four family members. Almost one quarter of them are three family members. And others have one or two members.

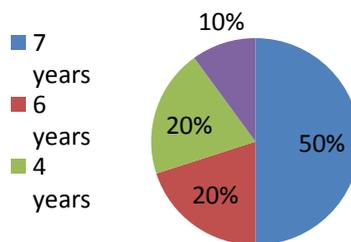


Figure 5.21 : Lived years, Aseman Project

Asemna has been built about 10 years ago. Almost 50 percent of the families live there for about 7 years. Only 10-20 percent of them have moved there about 3 or 4 years ago.

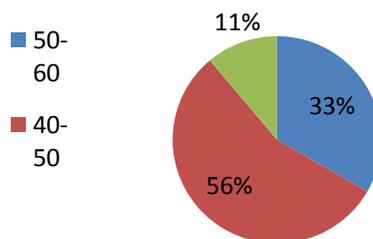


Figure 5.22 : Parent's age, Aseman Project

More than half of the inhabitants have 40-50 years old. based on the fact that more than half of the families have moved there 7 years ago, it becomes more evident that this settlement is not their first living place after their marriage. This fact will be an important fact for the future evaluations.

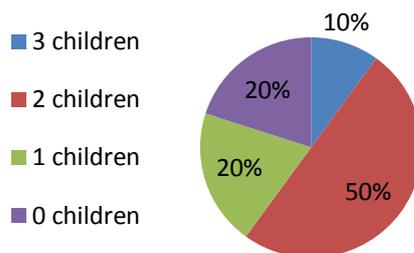


Figure 5.23 : Number of children in a family, Aseman Project

The number of families who have 4 family members includes 50 percent of the whole. Almost one fifth of them have 2 children and 20 percent of them have only one child.

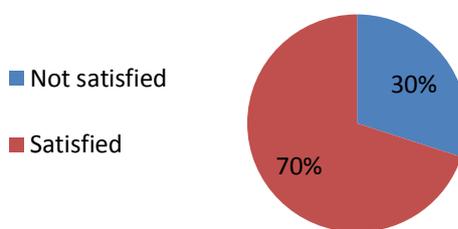


Figure 5.24 : The level of satisfaction, Aseman Project

Top security services, suitable welfare services, landscape, and having quite good social interactions with the neighbours, are the main factors that makes most of the inhabitants satisfied with their living place, despite all other problems with the interior parts which is hard to be adapted.

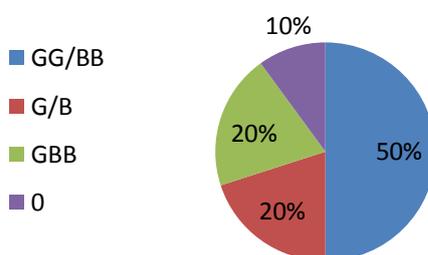


Figure 5.25 : Gender of children in a family, Aseman Project

Larg number of families have two children who have same-sex.

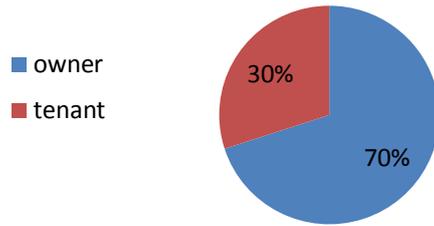


Figure 5.26 : Owner-tenant Situation, Aseman Project

In the interview the attempt was to focus on those families who are the owner of their house not the tenant. In this project almost 70 percent of the inhabitants are the owners of their units.

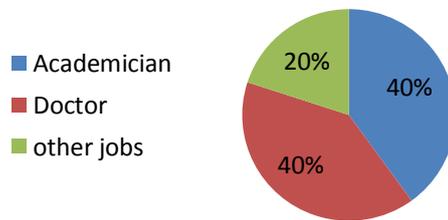


Figure 5.27 : Occupation, Aseman Project

Based on the interviews almost 80 percent of the inhabitants are academician and doctors. According to the income evaluations in Iran, this means that this range are of high income level of the society who have bought a house from this project and have preferred to live in this neighbourhood.

5.3.4 Evaluating the Issues of Flexibility and Adaptability According to the Collected Data

According to the collected data, most of the inhabitants of the project are of cultural elite (university professors) and affluent social class of the society with high incomes.

Among the inhabitants, most of the young couples are tenants, and those in older ages are the owners of the units. One of the major requirements of these families is having a kitchen and living room with the area of more than 100 square meters. Based on the analysis done on the architectural plans of this project, and according to the inhabitants' ideas, the level of flexibility is so limited in design and planning. According to the extracted data, among the inhabitants who are the

owners, only 40 percent of them have made changes, which include, removing infill walls, renewing the color-wall, or bathroom-tiling.

Some of the inhabitants, about 10 percent of them, have bought another unit near their own and have tried to mix them for having a bigger unit. This is an individual fact which has happened only in Aseman housing projects. Although some little changes have been done by the inhabitants due to the limitation of flexibility, almost 70 percent of them are satisfied with their living place.

They believe that although there are some problems in the design of their flat there are some positive factors that are bolder than the negative aspects. These factors are suitable location, the high price of units, considered architectural and landscape design according to the inhabitants' requirements, high welfare services, top security services, quietness of the environment, and the high class neighbors.

5.4 Sahand Project (مجتمع سهند)

5.4.1 General information about the case study

The Sahand Complex is located in Mirdamad, which is a new neighborhood in Tabriz. This neighborhood is located in the southeastern part of the city and is next to Dadgostari, Rajayishahr and Zafaraniye neighborhoods. This complex was built by Iranian Housing Foundation (بنیاد مسکن) and consists of 4 separate complexes named Shanad 1, Shahand 2, Shahand 3 and Zeitoun complexes, which are constructed next to each other. These housing units have been sold to the owners with monthly installments. Each of the complexes is composed of 3-6 blocks, and 4 stories. The number of the units is totally 216.

General Information about the Project

Project Name:	Sahand
Start on sale:	1982
Location:	Mirdamad, Tabriz
Project type:	Social Housing Project by Iranian Housing Foundation
Number of housing units:	216 Units

Unit types: 1 Bedroom/2 Bedrooms

Area of the units: 40-60 square meters

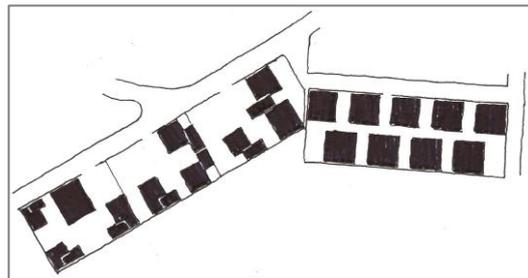


Figure 5.28 : Site Plan,Sahand Housing Project (Sketched by the author).



Figure 5.29 : Sahand Housing Projec (taken by the author).



Figure 5.30 : Sahand Housing project(taken by the author).

5.4.2 Evaluation of the flexibility according to the architectural factor

According to the observations and the collected data from the visited units, these units are discussed under four themes: 1) structural system, 2) service spaces, 3) architectural layout, and 4) furnishing for flexible use (Figure 5.31).

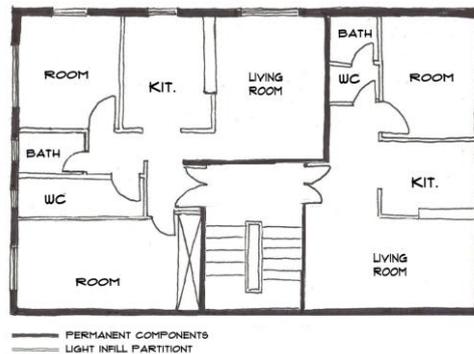


Figure 5.31 : Main plan types, Sahand Project (sketched by the author).

5.4.2.1 Techniques of Design “Soft”/”Hard”

The units are designed in a way that there is level difference between two adjacent units. There are structural elements, between the units, so there is no possibility of combining the units. The units are designed in a hard use system. No specific elements are used in the structure of the house for making it flexible so that it may be considered as a soft form project. Almost all of the internal components are somehow changeable.

5.4.2.2 Architectural layout

As it was mentioned in the previous sections, architectural layout relate closely to the unit types and spatial organization. In the building scale, unit type is important and is placed under the title of architectural design. Preparing different and various types of units for different users is one of the basic issues in creating a flexible unit.

In these projects, there are two different types of units: units with two bedrooms and three bedrooms. Units with two bedrooms have been designed the same and those with three bedrooms have been designed similarly. No specific kind of design is considered for different family types. When families come to buy a unit, they have only two choices: two-bedroom and one-bedroom units. The rooms are defined

clearly and there is no chance for changing the usage, but the inhabitants can remove partitions and some walls to mix the spaces. However, the unit size can be considered as another restriction for them.

5.4.2.3 Furnishing for Flexible Use

In the housing projects for low-income levels which are minimal dwellings, the furnishing system more critical importance.

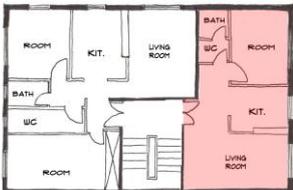
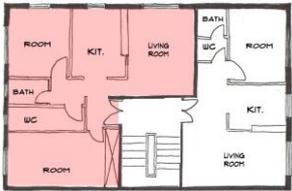
In this project, according to the shape of the plans, the maximum possibility of furnishing is provided for the inhabitants. No specific kind of furnishing is required for these units. So, no special concept for furnishing has been considered. The only difficulty in the furnishing system would be the size of the units.

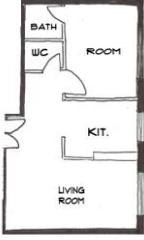
The residents have furnished their homes in their own style and without any professional consideration or assistance.

5.4.2.4 Service spaces

The placement of service space in a housing project with limited area is so important. It may provide opportunity for flexibility or may restrict this chance. In this project, the most interesting point which is considered in its design is that the possibility of not only relocating spaces but also displacing the wet spaces is provided. The wet spaces, both kitchen and bathroom, are located at the center of the house, and are attached to each other, so according to the structure, the places of the wet spaces can be interchangeable, but the wet spaces cannot be relocated to any other parts of the house.

Table 5.3 : Evaluation of the Architectural Changes in the Sahand Project

Plan types	
Two-bedrooms	Three-bedrooms
	

Plan	What kind of Changes have been made?
	<ol style="list-style-type: none"> <li data-bbox="762 338 1267 409">1. The door of the bathroom has been opened to the bedroom

5.4.3 Extracted Data

In this project , approximately 5 percent of the housing units have been evaluated, and their inhabitants have been interviewed, having the chance of visiting the interior parts and analyzing the changes that have been or haven't been made along with getting the inhabitants own opinion.

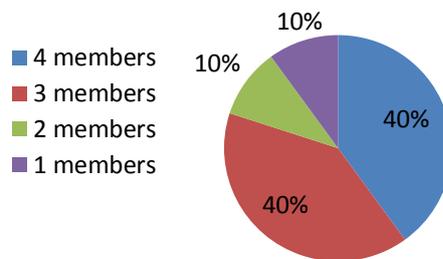


Figure 5.32 : Number of family members, Sahand Project

40 percent of the families have four or three children and othe 20 percent have one or two children.

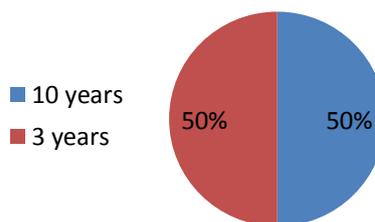


Figure 5.33 : Lived years in the same flat, Sahand Project

Almost half of th inhabitants have bout their houses 10 years ago and have began to live there since 2002, others have moved there since 2009.

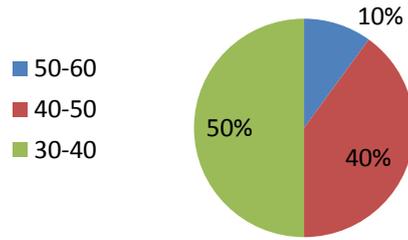


Figure 5.34 : Parent's age, Sahand Project

Most of the inhabitants are young couples who have one child or have married newly. Other major part are those who have moved there ten years ago and now are 40-50 years old.

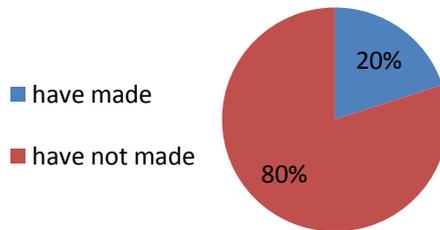


Figure 5.35 : Made/not made changes, Sahand Project

80 percent of the families who are the owner of their units, have not made any changes in the interior parts of their houses and other 20 percent, who have made some changes, have only removed one of the walls or have done changes in tilings or color.

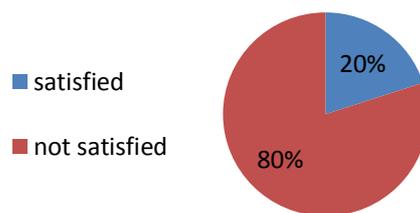


Figure 5.36 : Level of satisfaction, Sahand Project

Base on the extracted data most of the inhabitants are not satisfy with their living place and don't have any decision for a long-term reside.

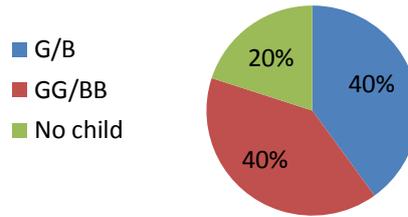


Figure 5.37 : Gender distribution of the children in a family, Sahand Project

40 percent of the families have a girl or a boy. Large number of families have two children who have same-sex.

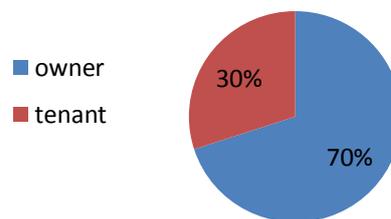


Figure 5.38 : Owner-Tenant, Sahand Project

In the interview the attempt was to focus on those families who are the owner of their house not the tenant. In this project almost 70 percent of the inhabitants are the owners of their units.

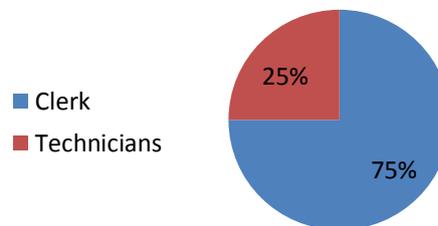


Figure 5.39 : Occupation, Sahand Project

based on the extracted data, more than 70 percent of the families are of low-income level. According to economic evaluation of central bank of Iran, those who work in an government organization and have a normal position, gets about \$ 300 per months.

5.4.4 Evaluating the issues of flexibility and adaptability according to the collected data

The area of the flats varies from 40 to 60 square meters. The Blocks are located away from each other and none of the complexes have adequate facilities such as children's play-ground and green space. There is very limited green space only in the first Sahand which is renamed as Zeytoon Complex. Due to the limited services like security, green space, clean and quiet area, and enough space for parking cars almost 80 percent of the inhabitants are not satisfied with their living place. More than 50 percent of the inhabitants are owner of their unit and still pay their house installments. Their income is low, and their housing falts are too small and are not flexible enough. Moreover, they do not have the chance of making much more changes in their houses. More than 60 percent of them do not have long term plan forreside in the same place. In the following bar, an evaluation of all extracted and obtained data from the interviews with the families of each case study has been done.

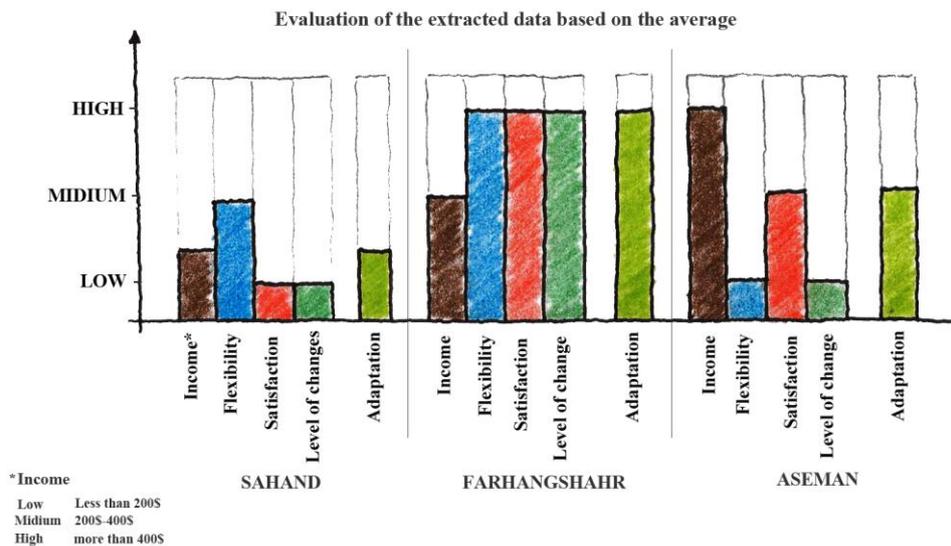


Figure 5.40 : Evaluation of the extracted data from the interviews (by the authore).

6. EVALUATION AND CONCLUSION

According to the evaluations, In the Sahand complex living condition is somehow different for the families. They are living in flats with small area, which have been bought in a low price and with mortgage. Most of the inhabitants are young couples with one child or without any children. Some of them have lost their spouse and have invested their little fund in the best way according to their explanation. This project is not located in a most-preferred neighbourhood and the land price is low. Those who are living there don't have long-term plans for living there and always have had hope of moving to a better place. So, they don't pay any money for making any change in their houses. However, size of the unit is a critical factor in limiting its flexibility for any changes.

Farhangshahr project, was constructed about 20 years ago in Valiasr neighborhood, which was considered as a suburban area in Tabriz. The housing flats were sold to teachers and workers of the Ministry of Education. Over the time Valiasr has become one of the most important places in Tabriz and house prices rose sharply. Teachers, who have bought housing flats are of middle-income level of the society, and with their current income, living in this complex is the best choice for them. There are some important factors that make the inhabitants for long-term reside.

- The location of the complex
- Security and comfort
- Getting used to the surroundings, friends, and neighbors

These are some factors that encourage the families continue their life in the same place without having any plan for changing it. These inhabitants have done as many changes as they could inside their houses to turn it to a desirable place according to their gradual requirements. In Farhangshahr Project, based on the observations, about 80 percent of the inhabitants have made maximum changes in their houses; removing some separating partitions, replacing wet spaces, and changing usage of spaces are some of these changes. As a conclusion, they need maximum flexibility

in their houses to be able to make changes in a way that meet their needs in order to be adapted to their living place and to become satisfied.

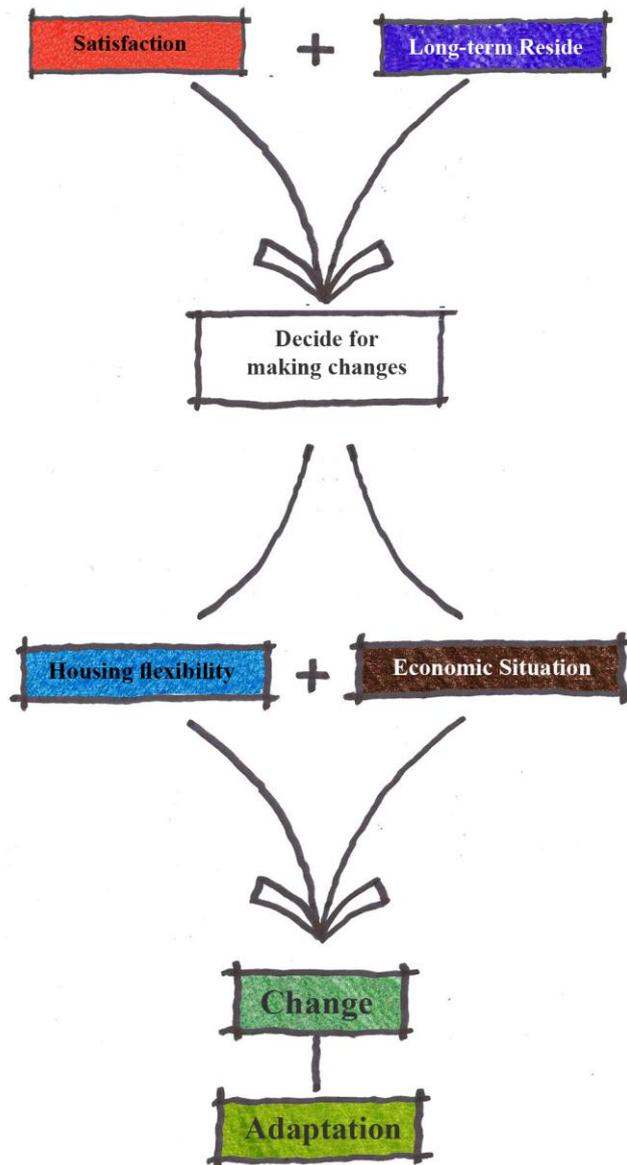


Figure 6.1:Evaluation of Satisfaction, flexibility and adaptability (by the author)

As a result, If the two factors, dissatisfaction and purpose for a long-term residence, come together, the inhabitants would decide to change their environment. But the amount of change is the result of challenges between two factors; Housing Flexibility and Economic Situation of a family. The result of this challenge will lead to the change, and that would bring Satisfaction and, as a result, Adaptability to a family.

In the Farhangshahr sample, almost 80 percent of the inhabitants have long-term plan to reside in their present living place. But, according to some different factors during their life, they have become dissatisfied with their living place and have decided to change their environment. Consequently, according to the possibility for making changes and due to the level of housing flexibility, almost 80 percent of the inhabitants have been done maximum changes in their houses, so more than 50 percent of them are satisfied with their environment and are adapted to it.

In the Sahand sample, almost 20 percent of the inhabitants have long-term plan for reside in their present living place. At the present time almost 80 percent of them are not satisfied with their living place and they do not have any decision for making any changes in the interior design of their flats. Nevertheless, there are some other factors like architectural factor like the limitation of flexibility in this project, and the Economic situation of the inhabitants that are limiting making changes and therefor the level of adaptability.

In the Aseman project, 70 percent of the inhabitants do not have long term reside planning. More than 50 percent of them haven't done any changes in the interior plan of their flats. According to the structural system of the housing units, Flexibility is not considered in this project, so this issue can be consider as another factor for limitation in making any changes. Although some of the inhabitants have done some changes in the interior plans but due to limited flexibility most of the inhabitants have the idea of selling their housing flats and are not satisfied enough with their living place.

This study was the first step for analyzing the concept of Flexibility and conducting some case studies for better understanding this phenomenon. It demonstrates the fact that each family has different requirements, and these needs may change over time within a family. Some of them do not make changes in their housing units due to many factors such as Economic or Financial situation or due to the lack of Flexibility in their architectural planning system of their houses. Those families who have long term plan for reside are those who tend to make maximum changes in their house.

Future research questions:

1. Is housing flexibility a need or privilege for all residential complexes?
2. Which sector of a society need houses with maximum flexibility?
3. In which kind of projects the issue of housing flexibility must be proposed?
4. How can Housing Flexibility become a disadvantage in a project?
5. What effects rate of changes,required in a housing unit?
6. How does the economic situation of a family can affect their level of adaptability to the place they live ?

REFERENCES

- Albostan, D.** (2009). "Flexibility" in multi-residential Housing Projects: Three innovative cases from Turkey, Master thesis, graduate school of Natural and Applied sciences (Master dissertation). Retrieved from <https://etd.lib.metu.edu.tr/upload/12610793/index.pdf>
- Barker, K.** (2004). Review of Housing Supply: Delivering Stability, Securing our Future Housing Needs, London: Her Majesty's Stationery Office, p. 23.
- Carmon, N.** (2001). User-controlled Housing: Desirability and Feasibility, *European Planning Studies*, Vol. 10, no. 3, pp. 286-289.
- Davis, M.** (2006). Planet of Slums, Verso, London, pp. 28 – 32.
- Donald, L & Chatfield, AICP; Melissa J. Shaw, AICP; & Alan D. Warnock, NCARB.** (2000). The Challenges of Affordable Housing, *National building conference*, pp.6-10.
- Esin, N & Özsoy, A.** (1998). Spatial Adaptability and Flexibility as Parameters of User Satisfaction for Quality Housing, *Building and Environment*, (pp.316-31), Elsevier Science, Vol. 33, no. 5.
- Francescato, G., Weidemann, S., Anderson, J.R.** (1989). Evaluating Built Environment from the Users' Point of View: An Attitudinal Model of Resident Satisfaction. In: Preiser, F.E.V. (Ed.), *Building Evaluation*. Plenum, New York, pp. 181-198.
- Golizade, H.** (2002). *Effects of high-rise building on the structure of the physical space case of Valiasr Tabriz* (Master thesis), Department of Geography and Urban Planning, Tabriz University, pp. 108-110.
- Habraken, N. J.** (2008). Design for Flexibility. *Building Research & Information*, 36 (3), 290-296.
- Habraken, J.** (1972). Supports: an alternative to mass housing, London, Architectural Press, p.82.
- Hamdi, N.** (1990). Housing without Houses: participation, flexibility, enablement, New York: Van Nostrand Reinhold, p.45.
- Harris, R.** (1998). The Silence of the Experts: "Aided Self-help Housing", *Elsevier Science Ltd, HABITATINTNL*, Vol. 22, No. 2, pp. 165-189.
- Harris, R.** (2001). A double irony: the originality and influence of John F.C. Turner, School of Geography and Geology, McMaster University, Hamilton, Ont. L8S 4K1, Canada. *Habitat International* 27 (2003), pp. 245–269.
- Hill, J.** (2001). The Use of Architects. *Urban Studies*, pp. 351-365.

- Jahanbin, R.** (2007). *Informal settlement policy and community empowerment strategies - Case of Tabriz* (Master thesis), Department of Geography and Urban Planning, Tabriz University, pp. 78-100.
- Keivani, R & Edmundo, W.** (2001). Modes of housing provision in developing countries, Faculty of Built Environment, South Bank University, pp. 4-6
- Khoobayand, S.** (1999). *Ways to provide housing for low-income urban groups in Iran – Case of Tabriz* (Master thesis), Department of Geography and Urban Planning, Tabriz University, pp. 76-87.
- Lutfi Kellekc, O., & BERK, L.** (2006). Mass Housing: User Satisfaction in Housing and its Environment in Istanbul, Turkey, *European Journal*, Vol. 6, no. 1, pp. 78-81
- Marans, R.W., & Rodgers, W.** (1975). Toward understanding of community satisfaction. In: Rock, V.P. (Ed.), *Metropolitan America in Contemporary Perspective*. Halsted, New York.
- Marans, R.W., Spreckelmeyer, K.F.** (1981). Evaluating Built Environments: A Behavioral Approach. University of Michigan, Institute for Social Research and the Architectural Research Laboratory, *Ann Arbor*.
- Mohamadzade, Y.** (2002). *Assessment considerations in the construction of residential complexes in Tabriz city (Glpark, Shafizadeh, Shahid Rajayi and Kosar complexes)* (Master thesis), Department of Geography and Urban Planning, Tabriz University, pp. 113-128.
- Newman, S.J., Duncan, G.J.** (1979). Residential problems, dissatisfaction and mobility. *J. Am. Planning Assoc.* 45, 154-166.
- Payne, G. (Ed.).** (1984). *Low income housing in the developing world*, New York: Wiley.
- Rabeneck, A., Sheppard, D., & Town, P.** (1974). Housing Flexibility/Adaptability? *Architectural Design*, 44, pp. 76-90.
- Rapoport, A.** (1969). *House form and culture*, University of Wisconsin Milwaukee, published by Prentice-Hall, Inc., Englewood Cliffs, NJ 07632 USA.
- Rent, G.S., Rent, C.S.** (1978). Low income housing: factors related to residential satisfaction. *Environ, Behavior* 10 (4), 459-488.
- Schneider, F.** (2003). The Layout of Apartment/the Floor Plan Idea. In B. Leupen, & J. Leupen, *Dwelling Architecture and Modernity* (pp. 31-37).
- Schneider, T., & Till, J.** (2005a). Flexible Housing: Opportunities and Limits. *Arq.*, 9 (2), 157-166.
- Schneider, T., & Till, J.** (2005b). Flexible Housing: The means to the end. *Arq.*, vol 9. nos ¾, 287-290.
- Schneider, T., & Till, J.** (2007). *Flexible Housing*. Oxford, United Kingdom: Architectural Press.
- Steinfeld, E.** (1980). Designing adaptable housing to meet barrier free goals, *Architectural Record*, 167, no.3, p.57

- Turner, F.C, J.** (1976). *Housing by People Towards autonomy in building environments*, New York, pp.73-83.
- Turner, John F. C. and R. Fichter.** (1972). *Freedom to Build: Dweller Control of the Housing Process*. New York: The Macmillan Company.
- Tiirkoglu, H.D.** (1997). Residents' satisfaction of housing environments: the case of Istanbul, Turkey. *Landscape and Urban Planning*, Vol 39, pp.55-67
- Yockey, K.** (n.d.). Space norms and Housing satisfaction of Low-income families, department of family environment, Iowa state university, *Housing educators Journal*.
- Url-1** <<http://www.tabriz.ir>>, date retrieved 30.10.2012.
- Url-2** <<http://www.amar.org.ir/>>, date retrieved 05.11.2012.
- Url-3** <<http://www.bonyadmaskan.ir>>, date retrieved 05.11.2012.
- Url-4** <<http://www.habraken.com/>>, date retrieved 10.09.2012.
- Url-5** <http://www.jeremytill.net/Articles_files/flexible_arq_2.pdf>, date retrieved 12.09.2011
- Altas, N. E. & Özsoy, A.** (1998). Spatial adaptability and flexibility as parameters of user satisfaction for quality housing. *Building and Environment*, 33 (5), pp. 315-323. Date retrieved: 13.07.2012, adress: <http://www.andrew.cmu.edu>
- Oxford English Dictionary Online.** (2009). New York, USA. Date retrieved: 05.12.2012, adress: <http://oxforddictionaries.com/>

CURRICULUM VITAE



Name Surname: Torkan Borna

Place and Date of Birth: Oroumیه, 09/20/1986

Address: Istanbul, Turkey

E-Mail: borna@itu.edu.tr

B.Sc.: Faculty of Architecture, Islamic Azad University, Tabriz, Iran

List of Publications and Patents:

Mapping Proximity Goksu Quarter, 4th international OIKODOMOS workshop: Housing and Proximity, Istanbul Technical University, Istanbul, Turkey, 2-6 May, 2011

How does/should Istanbul's urban fabric change? The Case of "Sisli Merkez"; "Planlama Dergisi" (was not defended), Torkan Borna, Istanbul, Turkey, Dec 2010.