Adaptable Housing for Low Income Groups in Northern Cyprus

Maral Saffarian Nour

Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the Degree of

Master of Science
in
Architecture

Eastern Mediterranean University
September 2010
Gazimağusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

Prof. Dr. Elvan Yılmaz
Director (a)

I certify that this thesis satisfies the requirements as a thesis for the degree of Master of Science in Architecture.

Assoc. Prof. Dr. Özgür Dinçyürek
Chair, Department of Architecture

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Architecture.

Asst. Prof. Dr.Nicholas Wilkinson
Supervisor

Examining Committee

1. Assoc. Prof. Dr. Yonca Hürol
2. Asst. Prof. Dr.Nicholas Wilkinson
3. Asst. Prof. Dr. Resmiye Alpar Atun

ABSTRACT

In order to clarify the research questions in respect of this issue of adaptability in residential buildings, the importance and necessity of considering adaptability issues are researched and dealt with in this study. The need for adaptability varies over time due to the differing needs and requirements of the users, thus, in order to classify and explain the main issues in terms of adaptability; only the basic and general principles are explained. The need for adaptability in residential buildings can be classified into three main categories; 1.functional, 2. socio-psychological and 3.economical.

Functional requirements depend on the arrangement of the household, the number of household members. Life style of the household members, the types of activities, the age of the members and their relative activities, the type of equipment used by the household members and the way in which they use that equipment. All of these functional issues and aspects mentioned above involve specific social and psychological requirements that elevate or increase the importance the need for and the importance of developing and implementing the concept of adaptability in housing.

The main objective of the study was to adapt and develop the design criteria for the residential requirements of social housing apartments in Northern Cyprus. Particular emphasis is placed on their use of space for adapting home plans to meet the principle that social housing is primarily available to people on a low income. This research develops, demonstrates and describes several solutions for making the social housing apartments more adaptable in the future by applying the principles of open building.

As a conclusion, the study attempts to highlight the necessity of integrating and implementing the principles of adaptability, and considers how to facilitate motivate and encourage this concept in a discursive way, in respect of opening paths of communication and participation between residents or prospective residents and the relevant authorities. The first step in this process could be, by e.g. ensuring or implementing the effective distribution and sharing of appropriate and relevant information by the housing information services. It is also very important that technical advice is made available to the users of social housing projects.

Consequently, a general change in the design planning and process of social housing in Northern Cyprus is put forward and this rests upon the design and construction of support structures and the participatory role of household members to formulate their own infill plan configurations with the benefit of available technical help and support, which should then be applied.

Keywords: Social housing, Adaptability, Low income group.

ÖZ

Bu çalışmada; araştırma soruları da göz önünde bulundurularak konutlarda uyum, uyumun önemi ve gerekliliği ele alınmıştır. Konutlarda uyum zaman içinde, kullanıcıların değişen ihtiyaç ve gereksinimlerine göre değişir. Bu çalışmada konutlarda uyum açısından ana konuları açıklamak ve sınıflandırmak için sadece temel ve genel ilkeler ele alınmıştır. Buna göre konutlarda uyum üç ana başlıkta toplanabilir.

1- İşlevsel

2- Sosyo-psikolojik

3- Ekonomik

İşlevsel donanım evin düzenlenmesine ve aile üyelerine de bağlıdır. Aile üyelerinin yaşam şartları, yapılan etkinlik türleri, üyelerin yaşları, aile üyeleri tarafından kullanılan donanım türleri ve bunların kullanılış yönleri fonksiyonel donanımın göstergesidir.

Yukarıda belirtilen fonksiyonel donanım konusu, belirli sosyal ve psikolojik gereksinimleri içermekte olup konutta uyum kavramının hayata geçirilmesini ve konutta uyumun gelişmesini ve önemini açıklar.

Bu çalışmanın esas hedefi, Kuzey Kıbrıs'taki apartman tipi konut projelerinde tasarım kriterlerinin gelişmesini sağlamaktır. Apartman tipi sosyal konut projelerindeki plan uyumunda özellikle vurgulanmak istenen sosyal konut projelerinin düşük gelir seviyesinden insanlara uygun olduğudur. Bunun yanında, gelecekte, apartman tipi sosyal konut projelerinde açık bina prensiplerinden yola çıkılarak daha uyumlu planların oluşması için birçok çözüm göstermeyi amaçlar.

Sonuç olarak, bu çalışma konutta uyum ilkelerinin hayata geçirilmesinin gerekliliğine ışık tutar. Bunun yanısıra, konuttaki uyumu konut yaşayanları ve ilgili makamlar arasında iletişime dayalı olarak nasıl yapılacağını, nasıl kolaylaştırılacağını, ve nasıl teşvik edileceğini söylemsel bir biçimde ele alır.

Bu aşamadaki ilk basamak konut bilgi servislerinin etkili dağıtımını ve paylaşımını sağlamak ve uygulamaktır. Ayrıca, buna ek olarak sosyal konut tiplerinde kullanıcılara yapılacak olan teknik danışmanlık çok önemlidir.

Sonuç olarak, Kuzey Kıbrıs'taki sosyal konut tasarım planlamasındaki süreci ortaya koymak ve buna dayalı olarak tasarım ve destek yapılarının inşası, hane halkının katılımcı rolü ile dolgu planı yapılandırılması mevcut destek yararı ile formüle edilir ve daha sonra uygulanılır.

Anahtar Kelimeler: Sosyal konut, Adaptasyon, Düşük gelir grubuna.

To My Family

ACKNOWLEDGMENTS

It is my pleasure to thank those who have helped and guided me through this journey. My thanks go especially to, Assist. Prof. Dr.Nicholas Wilkinson of the Eastern Mediterranean University for the support he given me in a number of ways and for his excellent and much appreciated guidance in respect of collecting information.

I am also grateful to Mrs.Margaret Gordon for her wise suggestions in proof reading my thesis.

I would also like to show my gratitude to my dear friends who helped me in collecting the questionnaires and for their companionship, Especially, Zachi Talha Osmanlı, Oldooz Asadzadeh and Abbas Hedayat for accompanying me on my visits to the social housings in Famagusta, Lefkosha, Kyrenia and Caesar Resort apartments. I also want to thank Ghazlaeh Mokhaberi for her work in translating my text.

In addition, it is my pleasure to thank the kind people of in the social housings in Lefkosha, Famagusta, Kyrenia and Caesar resort that answered the questionnaires comprehensively and allowed me to visit their homes.

Finally, it is an honour for me to thank the architectural department of the Eastern Mediterranean University and all of the instructors who supported me through my education in this university. Especially, Assist. Prof. Dr. Munther Moh`d and Dean of Faculty of Architecture, Prof. Dr. Ibrahim Numan.

At last, my honest thanks to my friend Melek Erçakıca for translation the abstract part to Turkish, and Assoc. Prof. Dr. Netice Yıldız who helped me in correction of Abstract.

I owe my deepest gratitude to my dear family who sacrifice so much and who have supported me throughout these years. I hope sometimes there would be a chance for me to reimburse all these kindness. Therefore, I dedicate this thesis to them as a very small repair to all their efforts.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF DRAWINGS

LIST OF CHARTS

Chapter 1

INTRODUCTION

The world that we live in is constantly changing and it is not as expectant as it was before. Therefore, it is very important that buildings are constructed in such a way that they can be manipulated and altered in order to accommodate any requisite and/ or necessary changes. (Leupen, Heijne, & Zwol, 2005, p. 98)

"Nowadays the buildings are not known as one scheme. The buildings are going to be known as grouping of systems in the early future, these systems have their own specific design procedure, production procedure and lifespan" (Leupen, Heijne, & Zwol, 2005).

"Home is an individualized dwelling, and the means of this subtle personalization seem to be outside our notion of architecture. Dwelling, a house, is the container, the shell for home. The substance of home is secreted, as it were, upon the framework of the dwelling by the dweller" (Pallasmaa, 1994).

To 'dwell' means to live in a structure, and make it your abode whatever form that structure might take. For many people this means a permanent structure, for some it means temporary accommodation, whilst for others it is simply where they live, even if there is little evidence of a building (Oliver, 2003, p. 15).

"The requirements for flexibility stems not just for desire and possibility, but also from economy and necessity" (Kroneburg, 2007).

“An adaptable house is not a separate issue in house design. It is a concept that contributes to a package of principles, which collectively contribute to good design” (Courtesy, 2007).

> Home seems to consist of three types of mental or symbolic element: elements which have their foundation in the deep unconscious bio-cultural level (entry, hearth) elements that are related to the inhabitant's personal life and identity (memorabilia, inherited objects of the household); and social symbols intended to give certain images and messages to outsiders (signs of wealth, education, social identity, etc.) (Pallasmaa, 1994).

1.1 Definition of the problem

Social housing is the name given to public sector council apartments provided by housing associations. Housing is a basic need. Everyone needs a home. Social housing is a public service-provided by the community, usually the local authority-for the use of all.

Technology and architecture always are constantly expanding and transforming very quickly and the changing life and work styles has meant that there has been an increasing demand for very adaptable and/or flexible buildings which have the ability to be modified particularly in respect of their interior and exterior spaces, The modern world employs different techniques to deal with approach the difference between what they need/want/require and what they manage to achieve as a result. It would be to our advantage to more successfully integrate the issue of the adaptation of physical adjustment with organization (Friedman A. , 2002).

Almost all the occupants would almost never be interested in aesthetic values; Houses always play an important part in our lives. Almost always the occupants of a house are not interested in the original appearance of the house in which they now live (Habraken J. N., 1999).

Adaptability helps to extend the usage life of the building because the buildings can be altered to meet the needs of the users. The adaptable buildings must be able to

offer the possibility of fulfilling several functions simultaneously or be able to alter its usage functions quickly and easily, for example, transforming a living space into a working space or into a leisure space. Creating an exciting urban space that has the possibility of being altered in order to create and fulfil other functions and accommodate a variety of people. (Leupen, Heijne, & Zwol, 2005, p. 101)

> Notably, flexible design allows for user choice prior to construction as well as the ability to evolve not only in configuration and appearance, but also in use. Prior to exploring how flexible design is an option that is worth considering for public housing developments, also it is important to outline how flexible design is a valuable tool for the public housing sector in general (Debicka & Friedman, 2009, p. 27).

> The housing problem is one of the most important issues in Northern Cyprus as in all other developing countries. The main factor that has led to the remarkable changes in the socio-demographic characteristics of the country has been the establishment of the universities that have led to remarkable changes. The other factor has been the tendency of middle-income people to live in individual houses of international character, which seem to denote a certain social status (Oktay, 2001, p. 67).

> The last 50 years have seen considerable changes in housing development throughout the industrialized world and the island of Cyprus is no exemption to this. Cyprus presents similar indicators as a result of the process of urbanization with certain differences due to its own indigenous attributes (Alpar Atun & Pulhan, 2009).

The city of Famagusta, in Northern Cyprus, which a city which represents people's culture and this research has mainly focused on the issue of why people demand alterations to be made to their houses and also on some current issues relating to housing design itself. On the other hand this study aims to identify and establish what steps should be taken to create a dwelling with an adaptable design.

In the Turkish Republic of Northern Cyprus, social housing projects have been developed by the Ministry of Housing. Social housing were designed in 1986 and were built in 1989 in three different stages in different cities of Northern Cyprus. This type of housing is built in different sizes of 100Sqm, 85Sqm and 60 Sqm according to the income of the citizens and to provide a choice of payments.

> The experience of Cyprus is respect of the housing issues actually dates back to the pre industrial period. The traditional fabric of the settlements during the Ottomans period (1571-1878), was dependent on a neighborhood network, which was densely defined with the residential units featuring Ottoman and local attributes, in the organic manner (Numan & Pulhan, Transitional Space in the Traditional Settlements of Cyprus, 2005, p. 82).

Different life styles evolved in Cypriot society, probably as a result of the Greek and Turkish Cypriots living more or less separately in segregated villages or in segregated quarters in towns (Alpar Atun & Pulhan, 2009) .

In the social housing developments introduced by TRNC government in 1989, neither the particular or specific needs nor demands of the owners or households and/or the space requirements, nor the cultural issue and factors were considered during the design process. For this reason these social housing units do not meet the needs of the household in a variety of ways including spatial needs and other specific needs and wishes. Therefore, the owners of these houses have been carrying out alterations and making changes to their homes themselves.

> The narrative of housing in Cyprus involves experiences in regards to different socio-political and environmental concerns in different periods of the Island's history. As a condition of the modern lifestyle and living conditions, migration from rural to the urban settlements drastically changed the overall spatial and social developments and the nature of housing by the beginning of the twentieth century (Alpar Atun & Pulhan, 2009).

In this research firstly, according to the findings, the applied changes by the inhabitants to the interior of the apartments is considered. The architectural reasons for applying these changes and the aims behind them are also studied and discussed. The research focuses on the changes in sizes, dimensions and the added and subtracted elements inside the buildings in question. The changes in the total area of the buildings and the additions to the buildings such as terraces for various usages, are also evaluated.

> User flexibility in dwelling units is an architectural design objective, which aims at furnishing dwellers with a number of interior space sub-division

> alternatives. Such options are designed to address the specific dwelling needs of potential dwellers, thus enabling them to continue using these present dwelling units without having to move to new ones when such need arises (Karni, 2008).

The research basically identifies and evaluates the changes which the users have applied to their physical living environment in order to meet their needs and requirements during their life time.

It will also demonstrate that the present study, the results of which, in respect of the current problems in housing design in Northern Cyprus, will be discussed, that they are not adaptable.

The main problem arises in examining the existing low income housing in order to apply the principles of adaptability to it in terms of its possibilities.

In this respect the need for adaptability and why people need adaptability will be explained by demonstrating and discussing the different ways in which a dwelling can be adapted for different users in terms of the residential spaces available and the requirements of the household unit.

> According to Jane Bringolf: Adaptable housing refers to dwelling with design features that are easily adapted at a later date with the changing needs of occupants. A simple example is tiling the kitchen floor before placing cupboards, so that if a cupboard needs to be removed to provide knee-space under a bench later on, the floor remains intact. This means the adaptations require worth at less cost (Bringolf, 2004).

The principle of the modern movement was to improve the dynamic virtues of the home surroundings, either by means of flexible floor plans with a series of rooms flowing into each other that were adaptable for a multiplicity of uses, or with the help of multi-functional interior objects.

However environmental science teaches us that, the capability to move, change and adapt are obviously beneficial to our lives, and this knowledge and answers the causes us to view other cultures that have a different or better relationship with nature than we do, as mostly attractive.

> The concept of adequate housing for all, when considered in connection with sustainable settlement(the two themes for Habitat II),requires us to think beyond a definition of social housing developments that provide only a maximum number of housing units to the lowest physical standards (Komut, 1996).

It is as a result of the present studies, whose results are explained and discussed below that a separate pattern of environmental adaptation in relation to the economical limitations of the lifestyle of the residents developed in this study.

Usually, with regard to those people who are interested in the issue of the adaptability of their own dwellings there is a possibility for them to make decisions in respect of this according to their budget and aspirations. This is especially true of new housing which has to be altered according to the customer's requirements. For example, the utilization of the spaces and suitability of the design depends on whether the space is required for residential or business use. Currently, in respect of economical issues and limitations there are some techniques available. Which can prevent or reduce the wasting of time as well as cost with regard the alteration, rearrangement or modification of a space, both issues of which play a significant role in this field, additionally, in respect of this, today's sophisticated and very advanced technology can offer and provide very useful alternative possibilities and option with regard to the issue and process of adaptability.

> The arguments for flexible housing are compelling. Socially, it empowers the user 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 for the incorporation of new technologies and the upgrading of old ones, in particular servicing (Schneider & Till, 2004-6).

1.2 Objectives

The study aims to research and consider the issue or concept of adaptability and change in local authority social housing units by analysing and investigating three

selected case studies in three areas of Northern Cyprus. The places chosen for the case studies are: Famagusta, Nicosia and Iskele.

Using the examples of these three cases studies, the main aim of the research will be realized. According to the aims and objectives, investigative and research methods were applied in order to identify the types of adaptability possible in social housing and the need for this concept to be included in the design plan of such housing and for it to be implemented in the construction thereafter.

"A town is above all movement, movement of forces of matter and society in restless process. If, for example, it were possible today to build a gigantic building which could shelter the entire population, there would be no reason to do so" (Habraken J. N., 1999).

The objectives of this study are threefold:

1- To adapt the design criteria to the residential need of the traditional Turkish Cypriot household, with particular emphasis on their use of spaces for the adaptation of home plans or for the addition of interior elements to their physical or spatial needs.

2- To ensure that the changes and adaptations can respond with ease to the demands of the different functions, patterns of use and specific users requirements within the limitations of their low income.

3- To evaluate 1) the degree to which the current occupants of the sample residents 2) are satisfied with their dwellings or 3) if they want to change them in some way4) what they think about their houses and whether they are able to adapt them to their needs, in terms of the space required, vis a vis the size of their units.

Consequently the definition determines flexible housing as housing that can adapt to the changing needs of users. This definition is deliberately broad. 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 (Schneider & Till, 2004-6).

The whole idea is to allow people to easily change and re-create their personal space at any time, and for a variety of purposes according to their needs (Lun & Man Hon, 1999/2000).

For instance dwelling size, type and combination are changeable by opening or closing doors in unit division walls, also one large apartment can be divided into two or three smaller apartments, also two or three small apartments can be combined together into one large apartment (Ada, 1998/1999, p. 41).

1.3 Limits of study

The limits of the study includes firstly: the cities of Northern Cyprus that Cyprus is the third largest island in the Mediterranean, it is located to the east of the Mediterranean with distance of 70 km to the south of Turkey secondly, 965 km to the East of Greece, 100 km to the West of Syria, and 400 km to the North of Egypt. The island once the country of an independent state, bearing the same name as the island itself is today divided between the Turkish and Greek inhabitants. As a result, Republic of Cyprus populated exclusively by the Greek inhabitants is located to the south of the island, and so is T.R.N.C. (Turkish Republic of Northern Cyprus) occupied mainly by Turkish Cypriot to the north of the island. Secondly, the apartment blocks are categorized as housing type. In this research the focus of the study is not a house, a house has characteristics of extending, expanding and demolishing easily, that's why it is not the focal point of this research; the focus of this thesis is multi story social housing. Cypriot apartments is a household run business that specializes in designing and building individual dwellings, houses,

bungalows, villas, swimming pools in Northern Cyprus and finally people with specific and defined income which in reality we can say the cost of living in Northern Cyprus is low, it is actually the cheapest in the whole Mediterranean region with nearby produced with local products.

There is also the problem surrounded by many low income groups in Northern Cyprus such as retirement, unemployment, disabilities of workers. A large number of households that are working are also receiving low incomes. This study limits its research to the low income group people in Northern Cyprus that are living in social housing apartments.

1.4 Method of study

For the objectives and purposes of the study four types of information were required which are as follows:

1) The information about the demographic characteristics of the current and past residents of the sample residential parts of Northern Cyprus chosen for the study.

2) Quantitive and qualitative information concerning the original architectural characteristic of the samples including the dimensional, structural, constructional and stylistic aspects of the case studies.

3) Quantitive and qualitative information about all types and methods of architectural alterations and adjustments carried out on the sample residence in respect of/in accordance with their incomes and their salary, it refer to the face that the changes were made in accordance with what they could afford.

4) Information on how the subjects felt about living in their home and their adaptability needs, and if the concept of adaptability was possible in their homes and what happen if they change their residence to the one that they wanted.

1.4.1 Selection of sample dwellings and buildings

In the selection of a sample environment for the study some basic criteria were followed. Firstly, the availability and/or accessibility to the material, and proof of information about the structures was required. Secondly, it was necessary that the structures were designed in such a way as to be further adaptable within reason, according to the regional and local so that they formed residential apartments and so, in this way, had a visually compact form. Thirdly, the regularity of people in terms of their cultural background. On the basis of these criteria, the city of Famagusta, whose population is completely Turkish Cypriot, was selected as the sample environment for this study.

1.4.2 Methods of field surveys

For the inspection and recording survey, five types of apartments situated in Northern Cyprus were selected as samples these are based in Famagusta, Nicosia, Iskele and Kyrenia.

There are a couple of reasons for selection of the considered examples. Firstly, the focus of the research is more on apartment social housings rather than the single building houses. Secondly, cost efficient buildings for low-income facilities have been emphasized in the research. As we will see later in the research, these two specifications are seen in all of the selected social housing examples in Famagusta, Nicosia; these examples are apartments buildings and duplexes which have the same architectural plans; but they have various building areas.

Caesar Resort resorts are some apartment buildings which are none governmental buildings and constructed in a private building sector by a company from Israel. There are a couple of reasons for selection of these buildings as a case study in this research; Firstly, these buildings that include four to seven stories are designed and

constructed in a broad site with the same plans and located with harmony to each other. Secondly, the building costs are so efficient and economical for the users; it is around 20,000-25,000 pounds.

These examples were carried out with the permission of the residents, and then the types of architectural adjustment performed by the residents recorded in the form of photograph. Questionnaires on the other hand, were designed to cover information in detail on the subject .They were comprised of ten questions, which were distributed by the researcher visiting each house in the sample area, (the low income groups).The questionnaire was translated in Turkish for the residents since the majority of them were native Turkish speakers. The complete questionnaire is presented in the appendices, with charts, diagrams and the percentages. Appendix "A" indicates the questionnaire taken in English and Appendix "B" shows the same questionnaire in Turkish

Also various forms of data has been employed carry out and effect the study: the literature review is compiled from various important sources such as books, conference proceedings, journals and thesis, in order to formulate the basis of the investigative criteria of the research.

After investigating, analyzing and evaluating the information obtained from related sources and case studies the research is completed with investigation.

1.5 Outline of the study

The thesis consists of seven chapters; the first chapter introduces the problem and sets out the goals and objectives. Furthermore, scope and limitation of the study are being defined within the frame of certain key features, which form the overall structure of the thesis.

The second chapter conveys the explanation and information of the housing and key concepts which are referred to all through the study, for the respect of providing common understanding in the different chapters.

Further on, the third chapter investigates the basic terminology of 'Adaptability' and its criteria, with the classification of open building concept. The fourth chapter deals with adaptable dwellings in social housing in different countries that included three cases in three different regions. The fifth chapter examines three examples of low income social housing in Northern Cyprus and analyzes them according to adaptability criteria. The sixth chapter considers some recommendations on how to make housing more adaptable and the idea that housing information and technical advice should be made available to the users of social housing projects.

The seventh chapter investigates the conclusion of the study.

1.6 Key Concepts

The main key word that are directly related to the study and which is going to be used extensively in this study is: social housing settlement. These are the apartments in Northern Cyprus called apartments type. The main reasons why this type of dwelling was involved the field research of the paper was that most of the households were owners-occupiers and also in the low income group. As a result, the households had and still have the right and possibility to make necessary and/or desired alterations to their homes.

1.7 Message

Statement about adaptability "if" you can make social housing adaptable then the housing will be more sustainable and better use to the occupants and housing authority.

Chapter 2

INTRODUCTION TO SOCIAL HOUSING

In chapter two, a background study of the social housing movement and the housing requirements of residential buildings with some good examples of social housing will be described. Understanding of the basic user requirements is extremely important for satisfactory design of residential space. According to the changing life style and condition, the requirements of any single household may vary considerably.

The primary purpose of this chapter is to track housing development in respect of contemporary architecture, including the concept of the flexible dwellings, types of housing environment, and the concept of open plan design and placing that concept within the context of sustainable development by using the product and process of adaptable design.

As a result this chapter includes an investigation into the requirements and needs of social housing and its residents and the accompanying changes, which are both necessary and desirable to meet the variation of need, this being the primary reason for adaptable housing.

In addition, this chapter looks at Elif C. Bakkaloglu, "A quest on flexibility criteria in the design of residential interior spaces" that was done in January 2006.

2.1 General information

It is difficult to define or think of humanity without a house or a house without humanity (Hamdi, 1999).

> People are undoubtedly finding it more difficult to get on to the property ladder at the moment, and more may be looking to the private rented sector to meet their housing needs. There is a perception that people think of renting as a

> stopgap or a second choice behind homeownership or social housing (Beckett, 2010).

Human needs are centered on the environment and in the community. When these factors are positive in a person's life, they can support he/she in being productive and maintaining his/her life without feeling socially, psychologically and physiologically anxious. In other words conditions which support and meet the basic human needs are necessary for the individual to fulfill (to perform) their functions (activities and obligations) correctly and efficiently.

> Housing is one of the major issues in a country. It is an outcome of the macroeconomic policies. Therefore, housing is affected by the country's economic characteristics, while demonstrating their effects on the society and society's response to them most explicitly, since it serves directly to the household, the smallest unit of society. Therefore, it is one of the basic issues of concern for all nations, especially for the developing ones (Baytin, 2005)
> The concept of housing integrates and demonstrates reflections of the socio-cultural, political, and economical features of a society, since housing structures exhibit those characteristics, which are uniquely related to the particular existing environmental conditions. This implies that each traditional setting in respect of housing in general and mass housing, in particular, possesses its own particular image and identity (Önal Hoskara, Tevfikler Çavusoglu, & Öngul, 2009).

"Housing environments take up the majority of developed land and we spend long periods of our life within them" (Biddulph, 2007, p. 1).

> Each generation, each occupants, changed what he found. That is why in restorations more than one ceiling is found, or why paneling hides earlier, often more beautiful, wall decoration, why conservatories are added, doors blocked up and others formed, balconies removed or added. These alternations were not always done for functional purposes. They were done to keep up with the times or because notions about living changed (Habraken J. N., 1999).

According to Kiray (1)(1982a:386)(1): "apartments are the dwelling of new middle classes, wage workers and civil servants that emerged with the industrial society. The developed parallel to the form and speed of the society to create middle strata" (Wigglesworth, Till, & Schneider(2), 2004-2006(2)).

Social housing is commonly defined from the perception of the housing providers. It is also a term used to explain residential properties made available for people to

rent. Social Housing is owned by working group, Housing societies or registered Social landowners (Von Vegesack & Schwartz-Clauss, 2002).

Social housing is housing that is let at low rents and on a secure basis to people in housing need. It is generally provided by groups and organizations which are nonprofit making, such as housing associations (Allison, 2010).

> The investigation of the ability of a town to cope with time lies in its ability to adapt to change, to assimilate the new, to alter part by part, and yet to maintain its identity, and to ensure this existence and that of its inhabitants without overly serve shocks (Habraken J. N., 1999).

According to Davidoff et. Al. (1) (1995:52): "People define places, places define people. This generalization is crystallized in the relationship between woman and dwelling" (Cook, 1972). (2)

"Human situations are as concerned with environmental changes and activity within the city, as with the precept of situation as an idea generator in creating a truly living city. Cities should generate, reflect and activate life, their structure organized to precipitate life and movement" (Cook, 1972).

In general a housing development modification or fully supported by the government to help out low income households, social housing is an accommodation for renting to the people who want to rent and the people who want be the owner of the houses, but the organization offering social housing is bound by several rules, one of which is that this type of housing should usually have the aim of providing reasonably priced housing. Even though the common purpose of public housing is to provide affordable housing, the details, expressions, definitions of deficiency and other criteria for sharing adaptability apply (Von Vegesack & Schwartz-Clauss, 2002).

> The literature shows that considerations of housing consumption, related to household circumstances, play a dominant role in the decision to rent or to buy a dwelling. Government policy certainly has an influence on the decision of

> households to rent or to buy a dwelling. In the long term government promotion of one particular occupancy sector over a long period may well stimulate household preference for this sector. And by consistently building large parts of new construction in occupancy, opportunities of moving in or into this sector are increased (Dielemana & Everaersb, 1994).

Economically priced housing is used for dwelling units, whose total housing costs are supposed to be “affordable" for people on a low income. Although the term ‘affordable’ is regularly applied to rental housing, which is made especially available to people on a lower income, the concept is also relevant and available to would-be occupants in all income ranges. The research investigates those who have a low income and poor or inadequate housing in respect of considering and evaluating the possibilities for improving or adapting their housing conditions (Von Vegesack & Schwartz-Clauss, 2002).

In third world countries social housing can usually be recognized by the fact that the houses are identical in structure and appearance and are arranged in a row, thus creating neighbourhoods, which are somewhat monotonous, is appearance and effect (Rhyner, 2004).

This study will further analyze the characteristics of a number of apartment blocks, which a have similar design of plan, structure and appearance and which were all constructed in the same area or district. These buildings belong to governmental institutes and their construction is financed from governmental budgets. They have the same design construction and similar facades, although the forms may vary from country to country (Von Vegesack & Schwartz-Clauss, 2002).

This research also examines the concept that social housing which was built by a government agency can also be designed in an adaptable way so that people can integrate modern lifestyles into these dwellings, bearing in mind that the need for

adaptability is influenced by household, economy and participation (Von Vegesack & Schwartz-Clauss, 2002).

Social housing is built to help people from different classes in society with different incomes, and diverse needs in respect of age range and the number of people requiring housing. For instance, a household may prefer a larger dwelling with several bedrooms and access to private open space; a university student may want to share accommodation with other students; a young single professional person may require a smaller apartment, whilst an elderly couple may seek an easy care unit within a retirement village. All of these groups have different types of needs and tastes in respect of the location, size and style of the housing they desire and need, some will prefer to extend the dwelling or alter the interior in some way. (Von Vegesack & Schwartz-Clauss, 2002).

2.2 Housing movement

Up until the present day, adaptable and multi-functional household objects have a long tradition in western culture. They were attributes of environments in the antiquity and medieval periods, predominantly in the nineteenth and twentieth centuries (Von Vegesack & Schwartz-Clauss, 2002).

> Adaptable approaches create 'individual living contexts' which are flexible enough to suit specific and changing needs within the framework of a larger scheme. The new concepts of adaptability must not limited to structural flexibility, but also embrace ideas of polyvalence, versatility of space and spatial indeterminacy at different levels in design. Favoring an open and 4-dimensional transformative space encourages the investigation of an evolving system which can adroitly fulfill ever-changing needs (Chan Shek Lun, 1999/2000, p. 18)

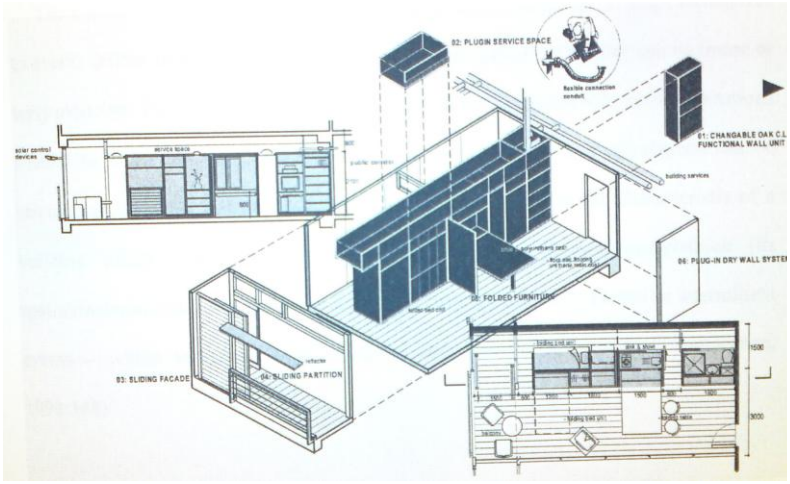


Figure 1: Adaptable housing unit
Source: (Chan Shek Lun, 1999/2000)

> A variety of housing typologies designed in different manners, such as the single storey house, duplex, triplex, or multi-storey - apartment/flat, apartment building/blocks of flats, studio apartments (according to number of floors) or detached / free-standing, link-detached, semi-detached / twin house / twin terraced house/terraced house (UK) / townhouse (US), back-to-back, maisonette (according to the relationship of a residential building to the neighboring ones), can be observed in many cities and countries. The way in which these housing types and their environments are planned and designed, whether it is either in a loose, sprawling manner or in a denser and more compact manner, is a matter of planning decisions. Similarly, land-use policies, which have great impact on the housing environments, are also part of the legal framework. The existence or non-existence of master plans, design guidelines, design control policies, and so forth, either leads to outstanding environmental (physical and social) quality or falls short of excellence (Önal Hoskara, Tevfikler Çavusoglu, & Öngul, 2009).

"A central concern of modern movement was to increase the dynamic qualities of the home environment, whether by means of flexible floor plans with flowing room sequences that were adaptable to a variety of uses, or with the help of multifunctional interior objects" (Von Vegesack & Schwartz-Clauss, 2002).

In ecological science the ability to move, change and adapt is necessary for sustaining life and this ability is also connected to those cultures that have a different relationship with nature. (Von Vegesack & Schwartz-Clauss, 2002).

> Every nomadic life style has its settled moments, just as every settled lifestyle has nomadic aspects and a natural part of living somewhere is arriving and

> staying there, feeling secure and sustained, as a house their furnishings are conversely something to be secured and maintained. Yet in our society the values associated with owner ship, on the other hand, and the freedom of time and space to pursue personal interests, on the other hand, have shifted. In view of this, the most promising possibilities for increasing the flexibility of our dwellings probably lie in the experimental opportunities they offer. The expanding functions of data transmission, variable divisions of interior space and flexible furnishing can all apply a role in this development. And in the flexible dwelling of tomorrow, the folding screen will still be very much at home (Von Vegesack & Schwartz-Clauss, 2002).

2.3 Modern architecture and the flexible dwelling

The automatic temporary habitation (settling) of people responds to some needs and requirements of human beings, such as furnishing and comfort facilities. The optimum design for a house or a building probably is the one, which is the most adaptable to the user's expectations. In other words, the most appropriate design can be created if the space has the capability to be redesigned, used for different purposes or altered by the users (Von Vegesack & Schwartz-Clauss, 2002).

The physical requirements of households can be defined as providing suitable conditions during the activities if households. These are characteristics of the dwelling that are closely related population, nature of activities and equipments as a reason for anthropometrics of household, household population and the equipment elements. (Arcan & Evci, 1999)

> In some cultures the act of place-making is achieved with even more flexible, ephemeral acts than this. The Japanese landscape is filled with instances of place-making without buildings, achieved by the act of binding-encircling trees, rocks, even apparently empty places, with rope, fabric and paper. The aboriginal Australian culture can define a place by walking route recounted in a story, and by association home, is therefore not necessarily achieved by the creation of a permanent building-moveable and temporary artefacts and situations can be equally significant (Von Vegesack & Schwartz-Clauss, 2002).

On the other hand, the demand for adaptability arises from the aspirations, of opportunity and economy. This, requirement or demand is nothing new. Whilst most people buy their homes when they can or when they need it, the purchase is often not

only related to the consideration of present circumstances, but also to future household circumstances etc., and the purchase is often more likely to be considered an investment for creating some capital, which can then provide the opportunity for moving on to better and/or improved accommodation (Von Vegesack & Schwartz-Clauss, 2002).

> Making housing as opposed to a house creates a very different problem for the designer who wishes to provide adaptability for the occupants. The one-off house-whether it is created by a well-known architect that support a set of ideas and criteria in addition to those set by his client, or by an individual, working alone or with professionals to make something very personal is a comparatively small, though high profile, percentage of total housing provision (Von Vegesack & Schwartz-Clauss, 2002).

Experience shows commercial mass house-building companies do not want to endanger their profit margins on designing complex adaptable and flexible dwellings, which would also indisputably create the need for the modernization of their construction and planning processes, which would probably result in them pricing themselves out of business, making their product more expensive than that of their competitors. (Von Vegesack & Schwartz-Clauss, 2002).

A flexible attitude towards dwelling design and the household setting generally is now obligatory for an extensive range of reasons:

"First step housing created by the Common Ground Community in New York City is an innovative project that uses individual's innate sense of home building to provide a pathway" (Von Vegesack & Schwartz-Clauss, 2002).

The responsibility of a modern designer is now apparently to create a permanent basic or foundation setting for the lives of the inhabitants of a house, and one in which they can create, alter or modify as they wish (Von Vegesack & Schwartz-Clauss, 2002).

There are a numbers of requirements for achieving a flexible design in a residential building. Flexibility in design means ensuring that adaptability is included in today's architectural requirements so that the necessary facilities and conditions are provided and/or available for the household members, of which privacy is one of the main priority factors amongst others (Von Vegesack & Schwartz-Clauss, 2002).

“Historically-until perhaps seventy five years ago pattern of residential development, decision-making, construction and control were relatively constant, Now they are rapidly shifting” (Kendall S. , 2000a, p. 4).

In the beginning of the twentieth century Europe was the main scene of a revolution in architecture. The development of architectural language was created by Le Corbusier that is now the international style. For example Une Petite Maison 1923-24 is a good example of the relationship between adaptable elements and housing design. There are some flexible elements in the design of this building for example sliding screen to separate the areas.

On the other hand many flexibly designed houses were constructed in this period such as, e.g. the house in Cap-Martin, France (1926-29) designed by the architect,Eleen Gray and also the van der Leeuw house (Sandler, 2010).

Figure 2: Study model of the Eileen Gray Villa E-1027, Roquebrune Cap Martin
Source: (Gray & Roquebrune, Eileen Gray , 2008)

> Le Corbusier, arguably the greatest architect of the 20th century, was obsessed and haunted by E-1027, the seaside villa Eileen Gray built at Roquebrune Cap Martin in 1929. Over the decades, he sought to possess her "maison en bord de mer" in a multitude of ways. It may have been the last thing he saw before dying of a heart attack while swimming off the rocks beneath E-1027 in 1965. After he died, the footpath serving the area was designated Promenade Le Corbusier. In time, as Gray's reputation faded, some would even credit him with the design of her villa. (Gray & Roquebrune, Eileen Gray , 2008)

Figure 3: South façade and Aerial view of Eileen Gray Villa E-1027, Roquebrune Cap Martin, 1926-29. Photo © Mairie de Roquebrune.
Source: (Gray & Roquebrune, ArchiSeek, 2002)

The architect Gray was the only Irish person who wholly worked on the modern movement and when she- moved to Paris, Gray declared: "This house has been built for a person who likes work, sports and receiving friends." The Eileen Gray Villa E-1027 looks much bigger than it actually is. It has two bedrooms, a maid's room, utility rooms and a large space, which can be partitioned off with the use of screen furniture, and which can serve as a living room, dining area, cloakroom or guest room. The main living area overlooks Monte Carlo harbour and the bedrooms face east. Service spaces are isolated: the kitchen, adjoining an outdoor cooking space, is separate from the rest of the house. Gray felt that each room should remain independent of the others, her argument being that: "everyone, even in a house of restricted dimensions, must be able to remain free and independent. They must have the impression of being alone, and if desired, entirely alone." Each room has a balcony and access to the garden (Gray & Roquebrune, ArchiSeek, 2002).

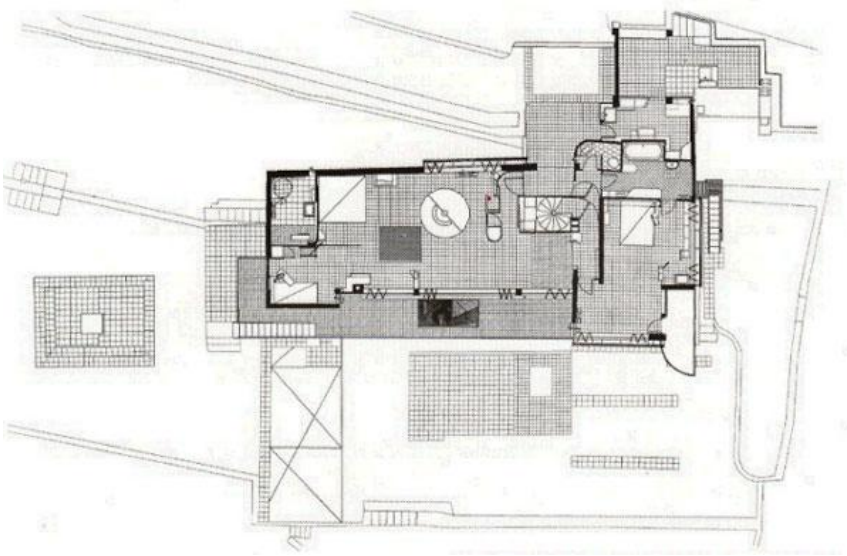


Figure 4: E-1027: Upper ground floor (main level) plan, 1929. Drawing © Renaud Barrès/Mairie de Roquebrune.
Source: (Gray & Roquebrune, ArchiSeek, 2002)

"Van der leeuw", which was designed by Richard and Dion Neutra, and is also known as "Research house", is one of the examples of Modern Architecture

Figure 5: Front view of Van der Leeuw house
Source: (Hikenutty, 2007)

This house is located in Silver Lake in Los Angeles, the house was willed by Dionne Neutra, to the College of Environmental Design, California State Polytechnic University at Pomona. It is a residential building that was built between 1933-1964 (Hikenutty, 2007).

> The first version was designed by Richard Neutra and completed in 1933 as a home for his household. After a fire destroyed all of the main building in 1963, Neutra and his son, architect Dion Neutra, rebuilt the house in a somewhat altered form. The current version of the house continued many basic design elements from the first house, but was larger many of the ideas inherent in the first design were expanded upon (Clayton, 2010).

Possibly one of the most famous examples of flexible housing at this point was Rietveld/Schroeder house in Utrecht. It was designed by the De Stij architect Gerrit Rietveld, in 1927.one of the most mysterious houses is, Maison De Verre deisgned by Pierre Chareau in co-operation with architect Bernard Bijvod.currently,with the modern movement, housing design is almost always Open plan, such as Mies Van Der Rohe's Tugendhat house, which was built in 1929. (Sandler, 2010)

Figure 6: Gerrit Thomas Rietveld house front and side view. Photos by Wilma Kwan 2003
Source: (Glynn, 1998-2010)

This house was designed by Gerrit Thomas Rietveld in 1924 he used predominantly colours such as red, blue, and yellow.

> The house has two levels. The lower floor houses the kitchen/dining/living area, a reading room, a studio space which until 1933 Gerrit Rietveld used as his office, the servant's bedroom, and a storage room. The upper floor was considered as attic space according to the building code regulation. All the sleeping space was located there and the bedrooms only divided by portable partitions. The design concept was used so that the children could have a bigger open space in which to play during the day and then, at night space could be adapted to provide a more private bedroom space (Glynn, 1998-2010).

Figure 7: Gerrit Thomas Rietveld house
Source: (Glynn, 1998-2010)

Mrs. Schroder provided the criteria for the design of the rooms: 1. a bed should be able to fit in the room in at least two different positions. 2. Each room should have direct water supply and drainage. 3. Each room should have a door that gave access to the outside. Gerrit Rietveld was able to meet all the criteria and created a masterpiece by paying a lot of attention to details, including the colour of the wall paint. It might seem like a mural canvas, but each area is painted a certain colour for specific reasons. For example, on the door there is an area painted black because that is the part of the door that is accessed most and, therefore, the most likely to be soiled (Glynn, 1998-2010).

The Maison de Verre house was designed by Bijvoet and Chareau between 1927 and 1932 in Paris.

Figure 8: La Maison de Verre: Pierre Chareau's modernist masterwork (Thames & Hudson)
Source: (Wales & Sanger, 2010)

La Maison de Verre means "house of glass." The Paris residence was designed by Pierre Chareau for Dr. Jean Dalsace. The house, which was built over a period of five years, has a facade of glass blocks. Inside, the house is divided by movable panels and screen doors, allowing light to flood the interior. Piano later used this building as his inspiration for designing the headquarters of Hermès Japan in Tokyo, which opened in 2001 (American Association of Business Publication Editors, 2009) .

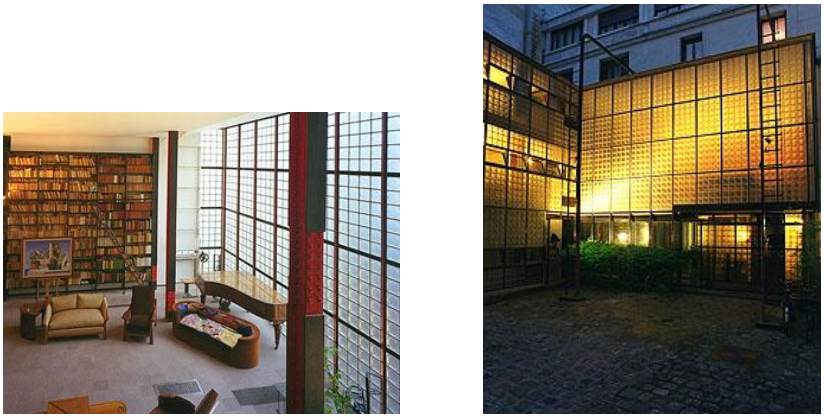


Figure 9: La Maison de Verre: Pierre Chareau's modernist masterwork view of interior and exterior of the house
Source: (Hoyt, 2007)

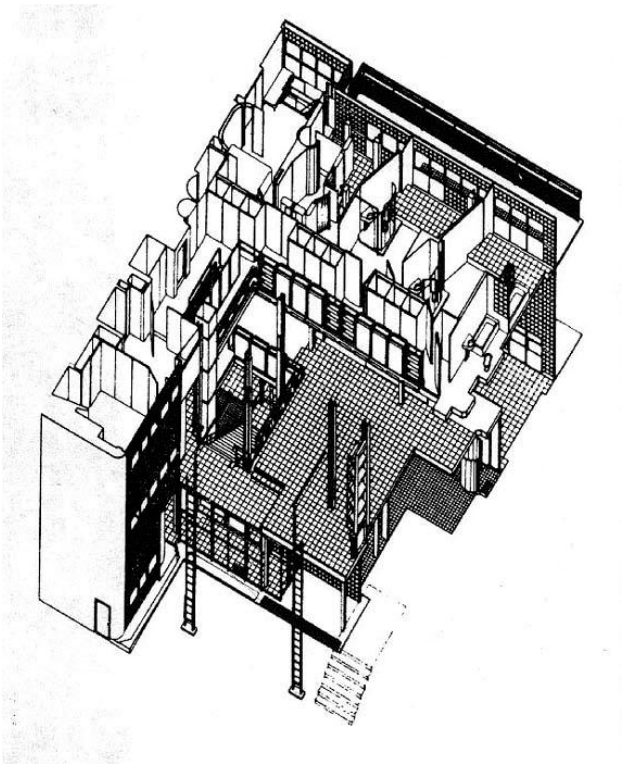


Figure 10: La Maison de Verre: Pierre Chareau's modernist masterwork axonometric plan of the house
Source: (Hoyt, 2007)

The Buckminster Fuller's Dymaxion house by Gropius focuses on the issue of mass production to achieve a high-quality, reasonably prices individual housing environment.

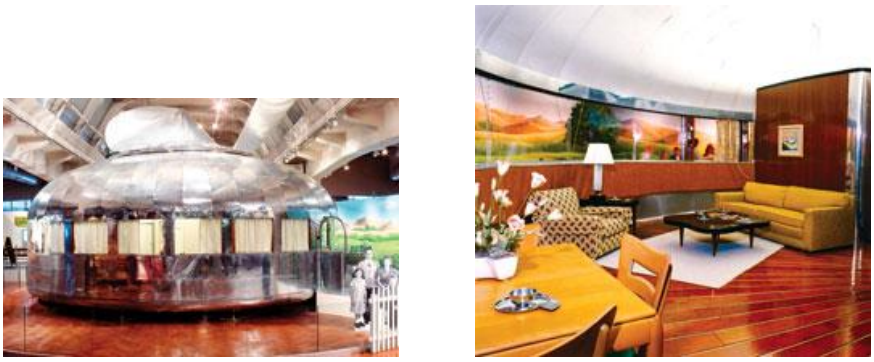


Figure 11: Dymaxion Exterior view and inside of the living room
Source: (Ford, 2010)

The Dymaxion house is made of aluminum. This was the newest of the alloys at the time and was strong and light enough to be easily disassembled and moved. Bucky wanted his houses to be mass-produced, easily shipped, hygienic, and able to stand up to a Kansas tornado. Aluminum provided for all of these criteria and was already used on the aircraft assembly lines, allowing for easy transition after the war from airplane production to Dymaxion House production (Ford, 2010).

One of the larger flexible-use homes now under construction belongs to Universal Studios President Ron Meyer. The 13,000-square-foot Malibu, Calif., mansion has a second level designed as a kind of loft or pavilion, where the dining room, living room and deck can easily be converted into a party area (Sandler, 2010).

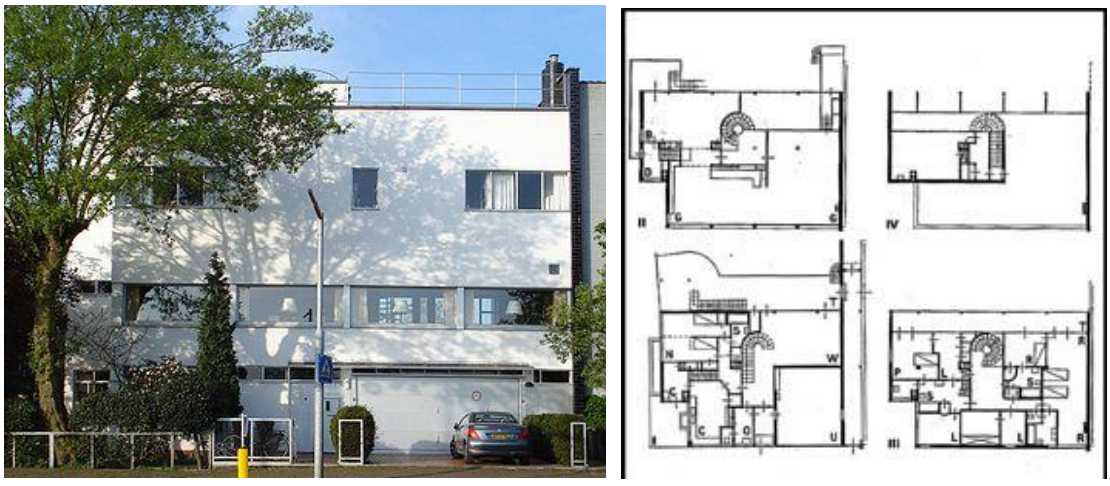


Figure 12: C.H. van der Leeuw House in Rotterdam by Leendert van der Vlugt, 1928-29
Source: (License, 2009)

"The idea of utilizing industrial techniques to make individual houses reminded a particular preoccupation of the post-war years, especially in North America" (Von Vegesack & Schwartz-Clauss, 2002).

"In the traditional process of habitation, each household had of necessarily acted directly to take charge of the act of dwelling" (Kendall S. , 2000a, p. 9).

During the twentieth century the interest in the development the perfect housing design that focused on flexibility and adaptability as a key innovation was growth. However they guess the future of housing design related to social and cultural future aspects, that they called it "homes of the future" (Von Vegesack & Schwartz-Clauss, 2002).

In 1928 the Dymaxion House was publically displayed in order to attract prospective customers to look at the imported French furniture at Marshall Field's Chicago department store. In 1956 Peter Smithson designed a fully equipped house made entirely of plastic. Certainly, however, these experiments in researching the perfect housing design have had an effect on the development of architectural form and the work of subsequent designers, as a result of the issues investigated. In 1960s and 1970s an interesting and innovative group known as the Archigram group was formed by a number of young architects. The main aim of the Archigram's work to communicate ideas rather than was generally the purpose to communicate ideas quite than philosophise.

> Archigram was a group of young architects who, it might be critically surmised, sustained and conceived their projects in an aura of idealism peppered with provocation. Archigram set-out to carve out a space within architectural consciousness that aimed to provoke a new sensibility in what was achievable and indeed desirable for architecture - if only the professions imagination could be stirred (Sadler, 2008).

The idea of the prefabricated house was initially published by Peter Cook in 1964 and recognized in 1972 by Kisho Kurokawa, also in 1968 the concept of a pneumatically designed house was developed,which resembled a suit and which could be inflated as and when required (Von Vegesack & Schwartz-Clauss, 2002).

“In the 1960’s new ideas about adaptable dwellings came up as a reaction to functionalism and mass production” (Moller-Jensen L. , 2008).

“The need for adaptable architecture supports the servant role, as it has done for most of human history” (Von Vegesack & Schwartz-Clauss, 2002).

“It is important to note that industrial capacity for building construction developed somewhat later in Japan than in western countries, For many centuries, indigenous building has been based on timber frame construction within a highly-involved craft tradition” (Kendall S. , 2000a).

2.4 Types of housing environments

There are different types of building to choose from, for example, palaces, castles or everyday houses. Firstly it is important to study the various types of housing. Houses are a vital component in most people’s lives and the house types are, perhaps the most widely shared experience in any given culture (Habraken N. , 1970).

There are a multiplicity of housing types, such as, for example, single, double, triple, duplex, multiplex, detached, semi detached, terraced, low-rise apartments, mid-rise apartments, apartments built over commercial and high-rise buildings. Each of these types of housing has their own properties, which is the main interest and focus of this research. The research does not deal with apartment block higher than seven storeys, and these apartments either belong to the inhabitants or are rented by them. The research deal with types of apartments that typically constructed in a single row and are similar to each other, These types of apartment are called low-rise as well, and have 12 in number and include 40 units in each of them. They consist of four storeys (Design Center, 2005)

> Dynamic dwellings are residential environments of overall stability and relatively long duration, which, through a process of design, implementation and utilization, have the potential capacity to maintain a high degree of congruence between physical setting and human behavior, under changing

> circumstances and patterns of use, through operational options for change, growth and participation, at various stages during the useful life of the dwellings (Karni, 2008, p. 37).

Amos Rapoport argues in his book "House Form and Culture": that the house type cannot be explained by purely functional or technical reasoning. In other words: neither climate, available materials, household structure, nor use, tell us why a particular house type is shaped the way it is (Rapoport, 1969).

"Allowing users to control their living environment is the essence of a theoretical relationship posed by N.J. Habraken. On one side, the space has the physical potential to be controlled" (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004).

A housing development in Wiesbaden in Frankfurt, designed by the architect, Dietz Joppien, and who won a competition for his highly flexible and economical design layout, and efficient use of space, is a good example of the urban development model of flexible layouts for different life styles and the ground floor provides apartments for disabled people. These apartments are designed to provide affordable rental and also owner-occupied dwellings for households (Schittich, 2007, p. 134).

Figure 13 : Variationen of the support and infill plans housing development in Wiesbaden in Frankfurt
Source: (Wolfgang iron, 2010)

"Adjustable dwelling units, capable of adapting o the requirements of the users, rather than rigidly structured floor plans are the basis of the project." (Schittich, 2007)

> This project include six housing blocks with total of 400 dwellings, the three pairs of L-shaped buildings each encompass a semi-public courtyard with a children's play ground. The southern buildings are entered from the courtyards, while the northern buildings are approached from the roadway. Almost identical, the five-storey buildings accommodate 66 dwellings each, which range in size from two to five room layouts. The floor plans are notable for their flexibility. Neutral space, which can be interconnected or divided by ceiling-high sliding walls, allow numerous floor plan alternatives. It is possible for the living spaces to be oriented to the street frontage, the courtyard side, or both, thus providing an open volume from façade to facade. Ceiling-high glazing opens the internal spaces out to the balconies and the outside. All ground floor dwellings and external spaces were planned to be barrier-free and unrestricted (Schittich, 2007).

"Swiss architect Hans Zwimpfer has designed a housing solution that combines the size and flexibility of a freestanding suburban home with the small physical footprint and efficient use of space of an urban apartment building" (Weiner, Gould, Parsia, Fawkes, & Lachut, 2008)

Figure 14 : Views of Tetris style housing that creates flexible living options
Source: (Sejima, 2009)

> The Pile Up design concept is patented in Europe and the United States and helps to solve the problem of suburban sprawl. Pile up housing units are shaped like a capital L rotated 90 degrees, with the short leg vertical. A spacious outdoor area is placed in the two story vertical section of the L shape. Residents can customize the units any way they like, as all interior walls are non load bearing. To keep buildings human scale, Zwimpfer does not allow units to be piled more than 20 high. Four Pile Up projects have been built in Switzerland so far with at least nine more scheduled to be constructed around the world (Weiner, Gould, Parsia, Fawkes, & Lachut, 2008).

2.4.1 Types of housing according to ownership

Housing type according to the ownership can be classified in three types as cooperative housing, government housing and private housing.

A. Cooperative housing: The term cooperative is used to descript e a wide range of institutional arrangement for collective non-profit housing which are also described as collective self-help social housing and housing associations also it can be described as, ways in which individuals come together collectively to improved their housing.

Cooperative housing has provided only a small proportion of the housing required in rapidly growing urban areas in developing countries, in any industrialized countries it provides a great share of housing.

B. Government housing: Government houses are developed by the government of the local authorities for the low income population, because rapid increase in the rent prices direct people to have their own houses. Because of that reason governments try to develop houses for low income population in a long term payment.

C. Private housing: Private houses are constructed by the households according to the needs and pleasure of themselves, in addition to the site selection, design of the house-its form, functions, size-and material selection are done by the owners or by the architects hired by the owners.

2.4.2 Types of housing according to physical layouts

A. Row houses: One of the series of house, often of similar or identical design, situated side by side and joined by common walls. Row houses are houses which are places along pedestrian paths that run at different angles to local roads and parking

lots. Also each house has a short frontage and a long depth. And share the wall along their long side.

Alexander (1977) argues that because of the shared walls, in some cases many of the rooms are poor of light and houses have lack of privacy.

B. Apartments: Apartment houses also may be called apartments blocks or block of flats. Are building containing more than one dwelling unit, most of which are designed for domestic use, but sometimes including shops and other nonresidential x features.

C. Individual houses like villa type: Individual houses are houses which are places on a site individually in a garden. They can be single storey houses or duplex house with two stories where the functions are distributed in two stories. Also triplex and twin houses can be name as individual buildings.

2.5 Role of open building in social housing

Open building is a way of designing and producing the built environment in such a way as to provide freedom of layout, construction and adaptation (Kendall & Dekker, 1997).

"Open building was first introduced in the Netherlands based on the ideas of John Habraken. However, similar concepts can be traced in housing experiments throughout this century related to open building have appeared in many countries in recent decades" (Wilkinson, 2000, p. 36).

Open building has developed in part out of the reinterpretation of the vernacular building tradition. It is manufactured with modernized processes and it approaches for delimiting boundaries of control enlarge traditions that are possibly as old as the built environment itself (Kendall S. , 2000a, p. 27).

Architect Charles Gwathmey wrote: “Open space always gives you more flexibility to move things around” (Sandler, 2010)

> John Habraken is Emeritus Professor at the Massachusetts Institute of Technology, where he served as Chair of the Department of Architecture from 1975-81. He later taught and conducted research there before moving back to the Netherlands. In 1963, he was asked to become the founding director of the SAR (Stichting Architecten Research--Foundation for Architect’s Research) in the Netherlands (see *Housing the Millions*), and served as the first Chairman of the Faculty of Architecture at Eindhoven Technical the Netherlands. His work and the work of the SAR set the stage for what came to be called Open Building. In association with other colleagues around the world and in the Netherlands including Professor Age van Randen, Emeritus Professor at the Delft University of Technology, he has been at the centre of efforts to advance Open Building principles and practices across the world (Beisi, J.; Wong, W., 1998).

Similarly , constructing and enclosing structure against the elements prior to fitting-out the interior, and separating infill from base structure, makes practical sense, particularly in harsh climates. Because most vernacular building types experience a wide range of uses in their life span, builders learned long ago to make the infill level distinct, changeable, less enduring, wherever doing so did not compromise structural performance or the basic social understanding embodied in the building type (Kendall S. , 2000a, p. 27).

In open building, levels with different change are distinguished in the built environment. Users are involved in the decisions at each level collectively or individually (Wilkinson, 2000, p. 34).

The administration policy of social housing have designed and accomplished large urban interventions throughout history including colonial cities, defenses, public utilities, and transportation systems and synchronized much more (Kendall S. , 2000a, p. 29).

In Wiesbaden there is a good example of an urban development model with a flexible layout for different lifestyles with ground floor apartments for disabled

users/residents the architect of this housing complex is Dies Joppien. This housing development is built in blocks that are designed to provide reasonably priced rental and owner-occupied housing for households (Schittich, 2007).

Figure 15 : Views of Housing development in Wiesbaden
Source: (Schittich, 2007)

"The architect of Wiesbaden housing development won the competition with a proposal demonstrating highly flexible, yet economical layouts and an efficient usage of space. Adjustable dwelling units, capable of adapting to the requirements of the users, rather than rigidly structured floor plans are the basis of the project" (Schittich, 2007).

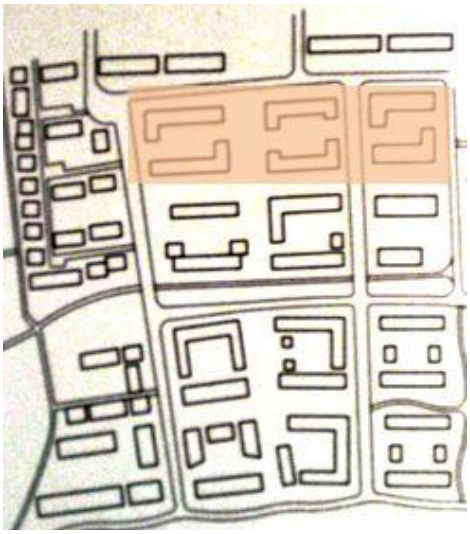


Figure 16 : Site plan of Housing development in Wiesbaden that shows six block of apartments
Source: (Schittich, 2007)

The Wiesbaden housing development is laid out as three pairs of L-shaped apartments, and each block has a semi-public courtyard with a childrens play ground.

The north facing apartments are close to the road and the south facing apartments are entered from the courtyard. The apartments are five storeys height and each storey houses 66 dwellings; the units vary in size from two to five rooms (Schittich, 2007).

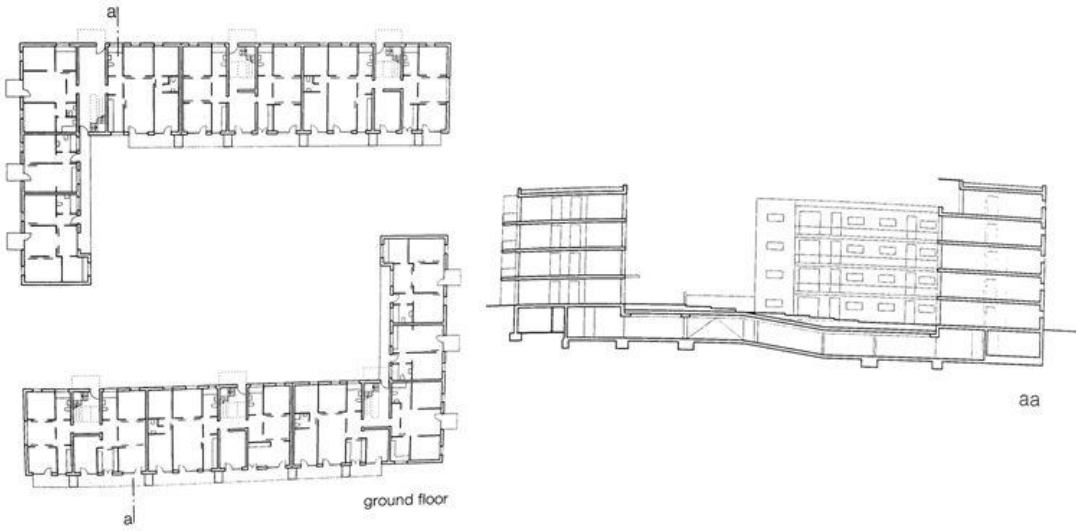


Figure 17 : Ground floor plans of Housing development in Wiesbaden and across section
Source: (Schittich, 2007)

The floor plans of the Wiesbaden housing development offer a variety of adaptations to accommodate the needs of changing generations and changing life styles (Schittich, 2007).

The basic idea of open building based on the ordering and the combining of subsystems so that building efficiency is achieved and so that it is also possible to redesign the subsystem retaining the functions, but without having to redesign or rebuild the whole building (Kendall & Dekker, 1997).

The most important criteria doe open building involves its spatial structure, its support and infill system (Wilkinson, 2000, p. 34).

The characteristic of mass housing was the bringing together of a large number of standardized housing units and then centralizing by placing them under governmental administration and control. The government and institutional systems

of mass housing spread throughout capitalist and socialist societies following the Second World War, the urban housing groups, the basic building blocks of urban fabric, were replaced by coarse-grained, multi-story housing blocks, often containing hundreds of inflexibly consistent of dwellings in residential buildings (Kendall S. , 2000a, p. 29).

2.5.1 Open plan concepts

The response to the various needs of individual users through the phasing of the building design is the central idea in the Open Building concept. Some decisions are postponed until the stage at which future users can be identified and involved in the planning. In order that users have the opportunity to influence the design of their dwelling; the elements should be decided by them and must be inter-changeable (Wilkinson, 2000, p. 35).

On the building level one should make a distinction between , the support and infill level, short and long life cycle, collective and individual decision aspects, supply and demand for the structural design of the building and it's installation (Placeholder1).

2.5.2 Levels

In a housing system based on environmental and decision-making levels the dwelling is not viewed as a product, but as a process, which allows the users to make decisions according to their individual needs while respecting the larger structure of communal services and infrastructure (Habraken N. , 1976).

Three levels in the built environment that we can mention are: urban design, buildings and infill (Habraken N. , 2002).

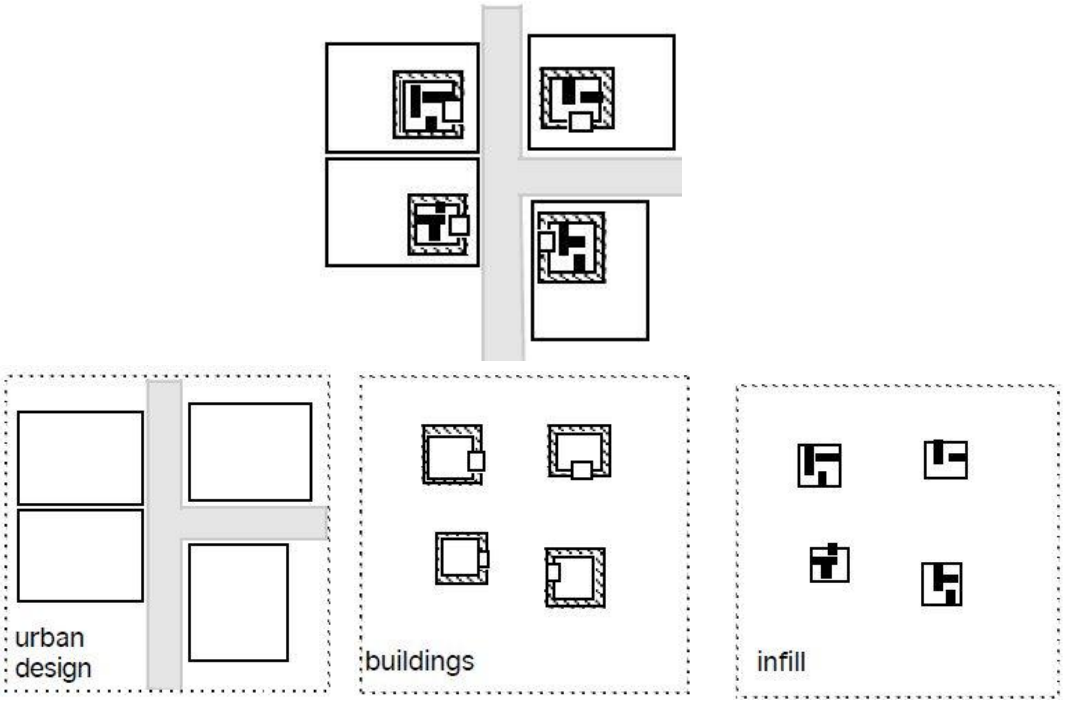


Figure 18 : Configuration of urban design, building and infill system
Source: (Habraken N. , 1976)

Therefore, these structures enable people to have the choice of designing and arranging their dwellings according to their needs wishes and requirements (Habraken N. , 1976).

Habraken concludes by advocating the appropriateness of these 'support structures' as both a means of restoring the natural relationship of user participation in the built environment while fully utilizing the factory produced pre fabrication techniques. Behind this support is John Habraken's realization (Kendall S. , 2000a, p. 31).

"The physical elements that make built environment are always directly associated with the actions of people" (Kendall S. , 2000a, p. 31).

> The building level can be designed to respond to local lifestyles and cultural values. This is what determines the quality of the urban environment. This level can also respond to specific housing types that people prefer. The lower infill level provides the modern amenities that have become international preferences, good bathrooms and kitchens, electricity, telephone and television. Adaptation to a higher standard is possible over time (Habraken N. , 1976).

Using the levels make ecological experts to define the environmental agent in control-who control what as a fundamental principle in designing. Levels classify as physical parts and spaces practically transform in a recurring way. Usually levels describe both as an environmental professions and their field of operation urban planning, architecture, interior design and furnishing (Kendall S. , 2000a, p. 32).

“We can remodel the building and change the distribution of partitioning and equipment without changing the larger building structure or its external shape. But when we begin to change parts of the building and tear down load bearing walls or extend a facade to get more room inside, we expect adjustments in the infill” (Habraken N. , 1976).

Figure 19: Two level organization; building with infill variations
Source: (Habraken N. , 1976)

2.5.2.1 Urban arrangement

Tatjana Schneider and Jeremy Till (2005a) define flexible housing as that which is: “designed for choice at the design stage, both in terms of social use and construction, or designed for change over its life time”.

Once the new development is growth progression of changes in towns and cities begins. This transformation will carry on in the life cycle of each house. These changes can be small, such as changing wall coluors or restoring the windows or building an extra structure in the building. But also there can be large changes such as urban changes for example, the demolishing of some units and the building of a new unit instead, or only changing the infill (Friedman A. , 2002).

“Designing communities for change and adaptability has been proposed, experimented with, and attempted in the past” (Friedman A. , 2002).

On the other hand it includes:

- Arrangement for a change of neighbourhood
- Familiarize and adaptability of existing districts
- Directing small size and scope involvements (Friedman A. , 2002).

2.5.3 Supports

The supports defined as a finished building and ready to be occupied by variable infill. As the size of the houses, offices are not clear from the first step. The supports are stable, shared parts of a building which provide serviced space for residence. The parceling or subdivision of a building will affect on allocations and services will be run to each of these directly from the public space. Supports can be constructed in any stable materials, including any technical systems. In all cases supports provided capacity to satisfy diverse and changing demands throughout their useful life (Kendall S. , 2000a, p. 33).

The fixed part of a building typically includes the foundations, frames and roof of the building, the central system of the services and the common spaces were taking in support level (Wilkinson, 2000, p. 35).

> A clear distinction between support and infill was proposed to offer the users of the housing units the freedom to determine their own floor plan. The support could be built in rigorous repetition as a single project. But on the level of the infill each unit can be different. And the responsibility lies mainly by the user (Habraken N. , 1976).

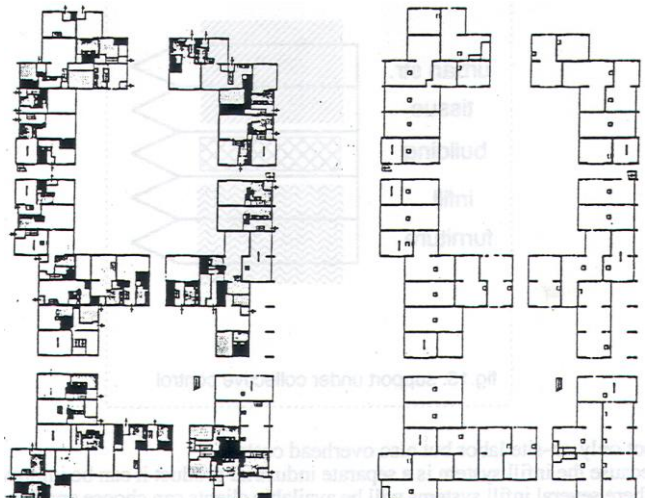


Figure 20 : gives an example of a floor plan of a support project that was built already forty years ago in the Netherlands
Source: (Habraken N. , 1976)

In Figure 20 the houses were designed by architect Frans van der Werf. It is clear to see that all infill plans are different but that the support system is repetitive (Habraken N. , 1976).

The support is not only related to the skeleton of the building. It is not neutral, but is rather enabling the architecture. In addition, a new housing development in which a developer invites a buyer to customize dwelling interiors within certain limits is also a kind of support, as each unit is determined individually and later on sold and again altered to meet the needs of the new residents (Kendall S. , 2000a, p. 34).

> An open spatial structure offers options for regulating the allocation of units and other facilities in the building, as anticipates a variety of different infill to be accommodated in every unit. Access spaces to the apartments are usually fixed as part of support. The elements defining the floor plan and the services inside the units are ideally on the infill level, thus offering a free configuration of the floor plan. Even parts of the facade can be regulated or chosen by the user as part of the infill (Wilkinson, 2000, p. 40).

An open frame system is the pre-requisite for the separation of support and infill in the building. The building services are separated into systems serving the building and these systems serves are individual units. The other individual units are

dependent on the existence of adaptable infill systems for partitions, facades and building services (Wilkinson, 2000, p. 40).

2.5.4 Infill

The most important legend of architecture in the 20th century is the evolution of the infill system. In almost all modern architecture problems occur in the piping, wiring and ducting of the dwellings. In the open plan system these problems are shifted to the lower infill level, with powerful effect. The infill system is independent of whether the apartment is rented or owner occupied- it is under the control of the residents. For example the site-made partition walls are infill elements if the occupants have control over their position, or if they can change it independently of the supports without impacting on any other dwellings. In fact the infill elements are distinguishable by social as well as technical criteria (Kendall S. , 2000a, p. 34).

"Change over time can be related to levels. Change on a lower level is easier and can have a faster frequency than change on a higher level. Clearly defined levels with systems assigned to each, make change over time easier to be organized" (Habraken N. , 1976).

A wide-range of infill systems integrated the partitions, mechanical and electrical installation and equipment, doors, finishes and the other elements that are required to make a completely habitable space within a base building, even though the infill system doesn't need to be industrially produced after the infill is chosen, the parts for each housing design are manufactured, collected or obtained from various companies (Kendall S. , 2000a, p. 36).

"Many new infill systems increasing the adaptability of partitioning are already under development or being tested" (Wilkinson, 2000, p. 41).

2.5.5 Capacity

In the open building system capacity can be applied during the first step of the design.

Capacity study is a complex and demanding practice at the central part of the concept of open building.

Two ideas will be established by capacity:

- The dynamic and open-ended design form
- Built in capacity to have multi scale form and space to accommodate multi functional use over

Designing form is always created by considering the possibilities rather than in terms of a single, inflexible and prearranged function. Three principles that include capacity for designing the ideal supports are:

- Variety and assortment of layouts in each dwelling for a support, possibility of being able to alter the floor area of the building and to be able to change the boundaries of the units, but with the base building or expanding and making the unit bigger.
- Adaptability to different functions for the parts or supports.

> Since adaptability is an essential characteristic of supports, change must be easily effected. Supports must be designed without knowing which particular infill products or system will be employed, just as infill systems must be developed without knowing where they will be installed (Kendall S. , 2000a, p. 39).

However, the form need not be neutral in order to optimize a useful capacity. Totally flexible multi-purpose space devoid of columns, walls, changes in sections or the quality of the light-offers no architectural definition for dwelling (Habraken, N.J., 1976, p. 39).

2.6 Sustainability

The sustainable housing development can be defined as "Housing development that meets the housing need and demands of the present generation without compromising the ability of future generation's to meet their needs and demands". Housing is nonetheless more than meeting accommodation demands; it is simultaneously an important measure of social developments, a key economic concern and cultural elements. Thus, the sustainability of housing development embraces the environmental, social, cultural and economic aspects. (Chiu, 2004)

Nowadays there is an increasing pressure on society to develop and construct sustainable buildings (Geraedts, 2008).

> Sustainable dwellings must be versatile enough to permit a wide range of different uses within the basic structure, they should offer flexibility for individual preferences and ideally they should be able to adapt to the different life phases of its occupants (BMI 1999: 86). Row houses offer to a certain extent the advantage of individual modifications in the usable space (e.g. addition of one storey). The typology allows the concept of so-called core housing in which a parcel is provided with the most important technical utilities and therefore with a minimal standard of amenities. The living space is then partly constructed by the owners in self-initiative, dependent on individual need and financial capabilities (Metzger 2002). (Waibel, Eckert, Bose, & Martin, 2007).

On the other hand, culture, society, and power are also the bases of sustainable development. As Cranz emphasizes (1994), social factors are at the forefront of sustainable development and it is no longer a technocratic specialty. In this context, social equity in the distribution of development benefits and costs is significant in achieving sustainability (Keles, 1999).

> In the context of sustainability, housing seems to act as a container of changing circumstances, where individuals and groups play an important role in the creation of their habitats, and at the same time it provides opportunities for long term flexibility and adaptability. Accordingly, the housing fabric must be capable of sustaining changes and, at the same time, be based on long-range user needs, life cycle and market conditions (Oktay, 2001).

Open building and sustainability more lined to research on developing re-usable components that are considerable. For example one building for long-term capacities that make for change have a workable alternative to investment incentives and valuation based on short-term value extraction from real state (Kendall S. , 2000a, p. 40).

“Sustainability will be a major criterion in judging future buildings, Clearly, flexible buildings and installations that are adaptable to changing conditions respond to this trend” (Anderson, 2010).

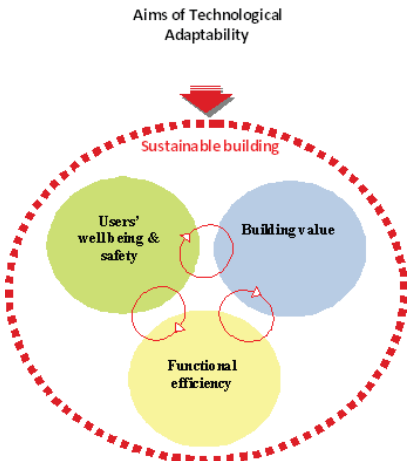


Figure 21: Aims of Technological Adaptability
Source: (Nakib, 2009)

The development of a technical boundary that allows the builder or end user to ‘plug-and-play’ with products that are made by different companies will be an additional alignment. As a result, conservative piecemeal fit-outs in residential or office buildings, while sustaining the base building, must be unused with each following reconfiguration. Such products have little engineered capacity for reuse, and, lacking any alternative, are frequently designed to add to construction waste landfill (Kendall S. , 2000a, p. 40).

2.7 Products and process

“Separation of the lower level systems from the higher level allows for their change without disturbing the higher level. If that condition is fulfilled, adaptation to individual needs on the lower level is easy and efficient” (Habraken N. , 1976).

Changing the system of residential building has resulted in a similar number of technical developments such as:

Multiple networked system dwellings, Homes have been transformed within the space of a century, the networks now penetrate to the dwelling’s core without any exception, and the dwellings need resource supply outlets and interdependent networks system. Lack of waterway and channels for the residential building, the building trunk lines and connectors in the interior spaces threaded such in multi-household housing units (Kendall S. , 2000a).

In some locations where the multi-household housing is near an earthquake line the design of the structure or skeleton is significantly constrained in respect of any attempt to provide reasonably affordable flexible units.

The regular construction of new residential buildings over the last hundred years has brought with it enlargement construction methods.

Open building developments happened in two areas: firstly 'hardware' development and secondly change in the construction process. Clearly the most important arena in the field open building is: supports technology and infill technology and their administration and physical boundary (Kendall S. , 2000a).

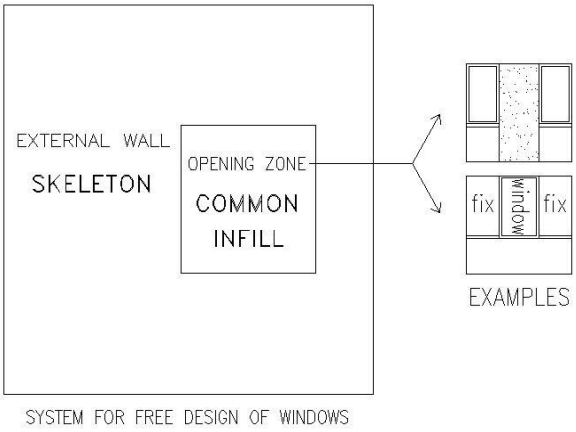


Figure 22: Fixed opening with variable window infill
Source: (By Author, 2010)

In evaluating structural support systems there are, at least six criteria that should always be followed:

1- Safety against disaster

2- Durability

3- Basic performance as living space

4- Capacity for the enlargement of the dwelling space

5- Flexibility for changing dwelling layouts and interior finish

6- Adaptability for elderly occupants (Kendall S. , 2000a, p. 184).

> Effective planning systems may require a proportion of the homes that are to be built to be made affordable. This is important in areas where the costs of homes make it difficult for key worker groups to afford to live, or where, as a result of an influx of new residents, local first time buyers are priced out of the market if they want or need to buy locally. This will clearly have an impact on the value of a scheme: such homes will not maximize the return on that proportion of a site for a developer, while prospective buyers of the market value homes may be unwilling to pay a higher price for their home if the affordable element is not carefully integrated into scheme (Biddulph, 2007).

2.8 Chapter conclusion

"An Adaptable House accommodates lifestyle changes without the need to demolish or substantially modify the existing structure and services" (Palmer & Ward, 2008).

> For thousands of years, built environments of great richness and complexity arose informally and endured. Knowledge about how to make ordinary environment was ubiquitous, innately manifest in the everyday interactions of builders, patrons, and users. The built environment arose from implicit structures based on common understanding (Habraken N. , 2000, p. 4)

The main aim of this chapter is to raise the issue regarding social housing need, for consideration, by pointing out or identifying the varying changes in the basic user requirements of residents. The basic point of this chapter included the psychical and economical needs of households. The authors described the variety of housing typology in different ways.

Before beginning the design of a dwelling also in terms of adaptability, the basic household requirements, both social and physical, must initially be taken into consideration, if lives of residential spaces and/or buildings are to be prolonged extended. The reflection of these needs will be clearly mentioned and exemplified in the following chapters, with the use of the case studies.

Finally the whole chapter mentioned that housing is one of the basic needs for the human being to obtain the need for shelter, to protect the people. From the early periods, apartments are improving according to the requirements, socio, cultural and economic factors, construction and technology.

There is a change in housing within the time according to the need, maintenance statues and ownership. These changes are resulted within extension and modifications at the housing units or in the other words as a general term: transformation.

Chapter 3

WHAT IS ADAPTABILITY?

In this chapter the classification of adaptability and the role of adaptability in open plan buildings will be discussed. The chapter will also discuss the dwelling design in terms of adaptability, the basic household requirements. Both social and physical household requirements cannot be ignored if the life of the residential space is to be extended. The reflection of these needs will be clearly mentioned and exemplified in this chapter.

On the other hand, investigating the reasons for adaptability is the second aim of this chapter. If a dwelling is not able to meet all the physical and psychological needs of its residents, the quality of life is not satisfactory. It is extremely important, therefore, in respect of such a case, to examine and understand the dissatisfaction and/or discomfort, which arise from unmet changing needs in order, are, to design and maintain sustainable environments.

The concept of adaptable housing is combining design and construction stages, the easy application of future changes with minimum expenditure, and meeting the developing changing needs of users. The purpose of adaptable housing is to enable and/or offer households the possibility of continuing to live for long periods, perhaps even for their whole life, in one residence.

The title of the third chapter will clarify the decisions in respect of adaptable design, which will then be clarified in chapter four. Issues of adaptability, such as design, production, usage, functional, structural and cultural adaptability, will be

examined for giving the opportunity of design, according to different needs and wishes of households.

In addition, this chapter looks at Ashraf Abu-Hilal, "Affordable residential open building for low income groups in the West Bank-Palestine" that was done in January 2002.

3.1 Classification

Definition of "flexibility" and "adaptability" in the design of residential buildings might be considered as equal or synonym of each other. However, these two words beside their similarities have some differences as well.

"The term adaptability is used to describe a structure that has the ability to be modified at minimum cost to meet the changing needs of those in the house" (Miller & Hillis, 2010).

The transformation is a kind of extension and modification in dwellings according to the needs and demands of the household. Transformation includes both socio-economic and physical data.

"The transformation has improved the housing by a significant amount so it can be said in general to be filtering up. Transformation appears to be preventing the houses from filtering down" (Tipple, 2000)

The transformation of the use of a building depends on and results from social conditions, architectural styles, climate conditions, building codes and land use rules, investment requirements and other local conditions (Kendall S. , 2000a, p. 32). In this way adaptability is not only a means of modifying the dwelling whilst also using it, it is first and foremost a strategy for meeting and fulfilling individual needs without compromising the rights of succeeding occupants (Wilkinson, 2000, p. 35). Differences exist between the people and the homes in which they decide to live. As

household circles increase in size their traditions, lifestyles, and their use of space change.

"The time factor is a major influence on advances being made in building construction today. Blindly continuing to develop buildings that can satisfy one function only has, in a number of cases, proved to be an untenable strategy" (Friedman A. , 2002).

> An adaptable house can be adapted to suit the changing needs of the people who live there. Housing is adapted to make it accessible for people, whatever their situation. This means that housing is accessible for people as they grow older, and/or if their mobility is impaired in any way. In this sense, adaptable housing can be seen as a pre-cursor to accessible housing. As the Human Rights and Equal Opportunity Commission has stated (Thomson, 2005).

"Adaptable housing refers to housing which while not fully accessible when first constructed is designed to be readily adapted to provide access when and if a resident requires it - for example, when they get older" (Branson, 2010).

> The function of a house doesn't change; we eat, sleep and spend our private lives in them. What does change over time is our lifestyle and needs. Some of us may wish to run a business from home; others, as we grow older, want to look after grandchildren, or may need assistance either from mechanical aids or corers (Miller & Hillis, 2010).

"Flexibility in housing design has social, economic and environmental advantages and yet is currently often ignored" (Till & Schneider, Flexible housing:opportunities and limits, 2005).

> Developments in the building sector show a number of trends all of which point to the growing importance of flexibility in buildings and the installations concerned. Such as:
> •The long life cycle of buildings compared to the short life cycle of its functions
> •The vacancy of buildings because they no longer meet the present requirements. For instance in the Netherlands we have (Placeholder1).
>
> Possible forms of flexibility and their relationship to the construction are:
> 1. Flexibility in latitude: the capacity to make recesses or cuts in a structure;
> 2. Flexibility in subdivision: the capacity to variably organize the interior

3. Flexibility in load: the structure has a greater capacity and the possibility of taking up greater loads locally or across a larger surface area;
4. Flexibility in services: the capacity to modify a building service at a later date;
5. Flexibility in expansion: the capacity to add square meters to the building later, say by adding an extra level or sealing off a void. Generally speaking, the best option is alongside the building, without having to invest in foundations and the like;
6. Flexibility in function: more than one function is possible (Friedman A. , 2002).

Integrating these flexibility aspects at the design stage enable us to eliminate all limitations before construction commences, in order to achieve a flexibility assessment (Friedman A. , 2002).

3.2 Adaptability

Adaptable housing is 'housing for life'. It can accommodate anybody, allowing for diverse needs, lifestyles and age groups now and in the future (Miller J. , 2010).

“When the term adaptability in housing is mentioned, the tendency of both professionals and the public is to associate its application with technical advances” (Friedman A. , 2002).

Tatiana Schneider and Jeremy Till (2005a): define flexible housing as that which is: “designed for choice at the design stage, both in terms of social use and construction, or designed for change over its life time” (Till & Schneider, Flexible Housing, 2007).

Similarity, Jia Beisi (1995): defines the concept of adaptability as follows: “a way to fulfill a large variety of needs and change of needs of housing users (dwellers and owners) within the same building using the potential means which the building techniques and management system offers (Till & Schneider, Flexible Housing, 2007).

Particularly adaptable design permits the user to have an alternative, to construction as well as the ability to develop, not only in configuration and

appearance, but also in use (Till & Schneider, Flexible Housing, 2007). In order to achieve total adaptability in a building one suggestion is that of having a rotating house with openings that adjust towards the sun. A further option or solution is to install moveable interiors partitions that change position with the push of a button (Friedman A. , 2002).

"Adaptable housing is the key to promoting a community-oriented lifestyle in highly dense urban contexts" (Ada, 1998/1999, p. 41).

"Providing occupants with forms and means that facilitate a suitable fit between their spaces needs and the constraints of their homes either before or after occupancy is one interpretation" (Friedman A. , 2002).

"The philosophy behind adaptable housing is to design housing units that facilitate use by a person with a disability or progressive frailty" (Chris, E., 2006).

Achieving appropriate people/spaces fit, the demographic, economic, lifestyle and technological aspects all have an important role to play. Furthermore a mature approach to the issue of adaptable accommodation requires changes in society that have created a need for designers, builders and buyers (Friedman A. , 2002).

"Adaptable, recyclable and sustainable buildings will be major criteria in assessing future buildings" (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004).

As a matter of fact the variation of protections by the occupants fit their needs well, since change has always been a part of human habitation.

> When societies where nomadic, the ability to adapt was relatively easy, since the dwelling carried by the dweller from site to site was light and simple. When more spaces were needed, it was easy to construct another tent or hut, and then take it apart it and move on (Friedman A. , 2002).

"Adaptable housing is a design concept for creating buildings that can fulfill a wide range of living requirements and also accommodate changes" (Wilkinson, 2000).

The coming of the industrial revolution specified a defining moment in many social structures, as well as in habitat. People abandoned their way of life and left the land and their homes that had been part of their household unit's culture. The position of the home as the centre of familial society also came to an end. The concept of mobility in order to obtain better paid work and better housing, also became a reality. (Friedman A. , 2002).

Figure 23: City of Jerusalem
Source: (Ignatieff & L'opposition, 2010)

"Old towns and villages and the homes within them, like the city of Jerusalem, evolved by accretion over centuries" (Friedman A. , 2002).

> The end of the Second World War marked another turning point. Society began to undergo an accelerated pace of change. The introduction of reliable forms of birth control affected the size of households, and the influential power of the media and consumerism affected home life. Some of these changes resulted in demographic transformations, accelerated technological evolution, and new lifestyle tendencies. In the twentieth century, society, it seems, has become accustomed to the fact that constant changes are inevitable. These changes necessitate a new design in which future dwelling needs to be more adaptable to the dynamic nature of societal trends and, as a result, their occupants' lives (Friedman A. , 2002).

As we can see some of the related appearances that have brought about the need for space changes in residential building are mentioned in the following text. (Friedman A. , 2002).

3.3 Transformations

"Buildings have opened up to diverse system during a long-term shift from permanently installed hand-crafted parts to variable or easily changeable industrially-produced parts" (Kendall S. , 2000a, p. 28).

In figure 24 the adaptability values are shown, this figure shows the aspects of flexibility necessary for the transformation of a building according to the changing user requirements, such as the rearrangement of building spaces with infill walls and movable elements (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004).

In fact, the design method of an apartment is based on foundation and column type; this has eased many difficulties of the design. An apartment design can indicate various post and beam techniques. A building has a central core which is considered as a focal point for the building. The design of an apartment, gives us the opportunity of changing the space areas in the building according to the structure. (Freeman, 2010)

In order to highlight the important specifications of adaptability, there are several key words which can be emphasized. These include: Extendable, rearrangeable, movable and disconnectable, as shown in the figure below:

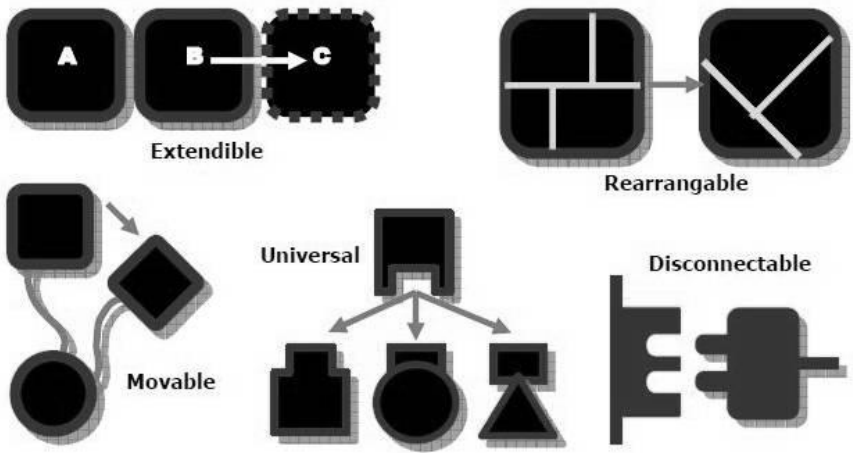


Figure 24: Adaptable buildings ('products') according to the changing client demands
Source: (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004)

A good place to recall changes and their effect on the domestic environment is society itself. The transformation of the traditional household which formally constituted the bulk of North America's home buyers is one of the key factors that drive the need for adaptable housing (Friedman A. , 2002).

Figure 25: Old Oak State-Wulfstan Street
Source: (Betts, 2008–2010)

In the Second World War builders provided for the needs of traditional households, who constituted the majority of home buyers (Friedman A. , 2002).

As a result of the development of new technologies and the availability of a multiplicity of information, the levels of communication and familial contact within the household have reduced. Adaptability, as a way of meeting the increased need for individual space nowadays requires a new model for residential housing settlements (Friedman A. , 2002).

3.3.1 Build for transformation

Traditionalist by nature, builders have given a lot of serious consideration to new techniques or innovations that may be generated in response to modern demographic and economic factors as the main authorities of the design process, these developments and innovative and/or progressive aspects of new technological developments indicate that neighborhood trends will finally lead to considerable

changes in residential design and construction practices in future (Friedman A. , 2002).

3.4 Human life cycle

Adaptable housing emphasizes the opportunity of providing adaptability by using separating elements (Wilkinson, 2000).

As people get older repeatedly providing somewhere to stay by the setting up a range of construction, designing and constructing homes to put up the needs of an elderly population requires the acceptance of a design approach and construction preparations that let inhabitants adapt and fit their home according to their needs. For example the picture below show the adaptability for large-scale changes, or small changes that these changes need related to the requirements of the household (Friedman A. , 2002).

For instance, for a small family, which includes two persons, a 2x2 Sqm bathroom is sufficient, while a bigger bathroom area is needed for a family, which includes five persons. As illustrated in the figure bellow, the bathroom area is quit big and sufficient for the users.

Figure 26 : Adaptability for large-scale changes, or small ones
Source: (Anderson, 2010)

3.4.1 Household size/structure

The ageing change in the household structure will result in changes in apartment. Also as household's increases in size through the addition of children, when the children leave to marry and for their own households, needs and demands for space and other housing goods will hange (Tipple, 2000).

Type of the house hold can be seen at the table below;

Table 1 : Household type

Household type	Type of households and their responsibilities, needs and preferences are important.
Households with children	
Adult households of one and two person without children	
Retired or pensioner households	

Source: (By Author, 2010)

3.4.2 Ability to move between different social levels

Total required space changes according to life-cycle stages.

Adaptability in a unit is usually discussed in three phases; firstly, the issue of adaptability can be considered before households take up residence in a house. There are some principles which can be applied to provide the necessary adaptation possibilities and to ensure that peoples' needs and expectations are met, such as the consultation with and the participation of the future inhabitants of the houses in the application and integration of their wishes and desires to and in the design plan. Secondly, it is very important to enquire about and evaluate the adaptability needs of a household during the time they are moving in: each household has its own needs and specifications, which can be considered in respect of the interior house space, in

order to provide a more comfortable living space for the household. Finaly, the importance of adaptability in the subsequent renovation of the units should be considered; resident households should be able to make frequent changes in such a way that the units can easily and economically be refurbished and revovated at a later date (Friedman & Debicka, 2009).

In order to clarify this matter, some examples are given as follows. Obviously, a household with two young children requires more space than a household with no children. When children leave home for whatever reason, there is more space and some rooms become vacant. On the other hand, during retirement the incomes coming into the house are reduced. Thus, the interior design plan can be organized in such a way that the households can partition the empty spaces and rent them out; this is only feasible if the adaptability issues were considered in the initial design process (Friedman A. , 2002).

To summarize, the identifying factors on the apartment form, the following table done accordingly.

Table 2 : Household type

Identifying factors on apartment form	
Socio-cultural factors	Personal factors
Household size/structure	Education
Economic statues	Life density (The number of individuals, such as inhabitants or housing units, per unit of area)
Position of the household through life cycle	
Life style of the household	

Source: (By Author, 2010)

3.5 Innovative technology

The design and architecture of buildings represent, of course, the technology of the time in which they are built. Constructing and designing buildings that are stable and sustainable whilst, at the same time, have the adaptability to be altered, renovated and upgraded, can extend the useful life of the building (Friedman A. , 2002).

"The building has to adapt continuously its technological systems according to different changing conditions. It is not only a need for modular standards and normalization, like as for the modular systems during the last century, but a new systemic approach of the complexity of building needs, as explained by figure 26" (Nakib, 2009).

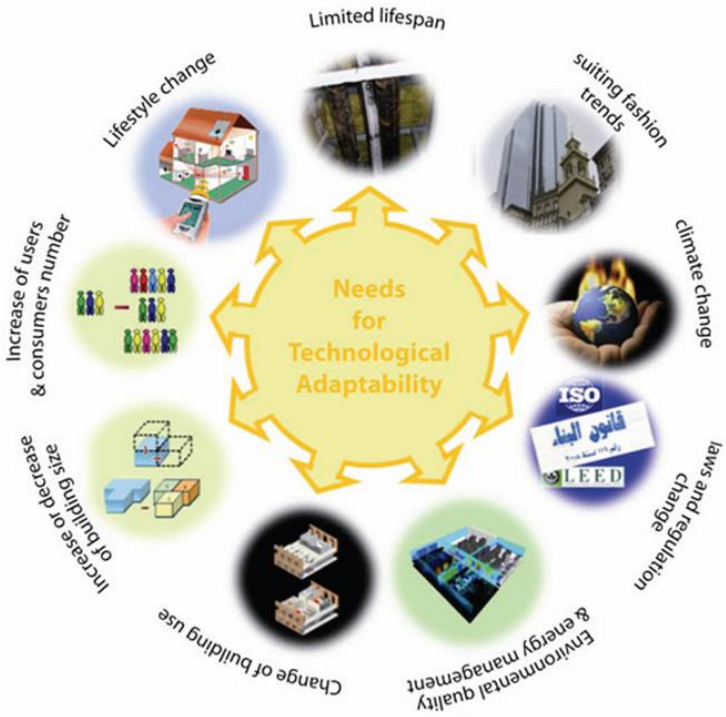


Figure 27 : Needs of Technological Adaptability
Source: (Nakib, 2009)

“Among the factors that play a role here are saving of base materials, minimizing waste production, ease of dismantling and adaptability. Clearly, flexible buildings that are really adaptable to changing conditions respond to this trend” (Placeholder1).

Based on specific principles and methods in programming, design, production planning, construction and facility management, open building provides strategies for consumer oriented and sustainable buildings (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004).

“New technologies were the catalysts for the introduction of new use in homes. With new technologies expected, residents will most likely require constant adaptability of both functions and utilities” (Friedman A. , 2002).

There is good example of new housing development in Switzerland that constructed in 2003, by Theo Hotz AG Architekten and Planer. Eichrain apartments are considered to allow for change with regard to the arrangement of rooms (Städtebau & Stadtrand, 2003, pp. 64-65).

Figure 28 : Top view and front view of Eichrain apartments in Switzerland
Source: (Städtebau & Stadtrand, 2003)

Figure 29 : Views of Eichrain apartments in Glattalstrasse 102-108 / Eichrainstrasse 1-15, 8052 Zürich Seebach
Source: (Städtebau & Stadtrand, 2003)

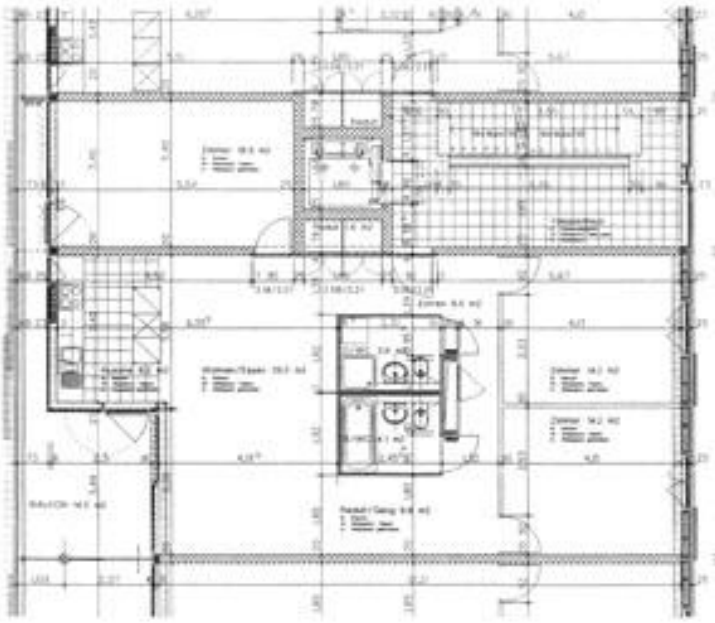


Figure 30 : Plan of Eichrain apartments in Glattalstrasse 102-108 / Eichrainstrasse 1-15, 8052 Zürich Seebach
Source: (Städtebau & Stadtrand, 2003)

Eichrain apartments have five storey and 304 units also Eichrain apartments have another usage such as kindergarten, shops and studios.

In addition, the need for adaptability in residential buildings can be classified into three main categories; 1.functional, 2. socio-psychological and 3.economical. they can be seen as below :

3.6 Functional

3.6.1 Adaptability during construction

Giving consideration to the concept of adaptability during the actual construction of a building enables the designer to create and develop a more flexible design, which may be able to convert the building functions to more efficient outcomes and/or offer alternative functions and outcomes (Friedman A. , 2002).

For example the flexibility of the structure known as 'open end structure' in building construction, means that, the structure has the possibility of being used for another purpose or purposes depending on the needs of the user or users. This might necessitate the need for the exchangeability construction components, which could facilitate the possibility of being able to having various functional changes in the future. In all construction stages or phases the need to change or alter some aspect of the design is normal, in response to the demands or desires of the owner and/or client. Sometimes the builder might change the organization of the sub-functions according to the spatial requirements and the needs and expectations of the client. Also a client might change their minds about a decision previously made regarding a space, when the construction is in the process (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004).

3.6.2 Utilization of the spaces for users

According to Helderman, Mulder & Van Ham (2003), age is a strong indicator of the stages in the life course. The young adult's years are particularly years of change, accompanied by uncertainty and demands for flexibility. Young people are busy shaping their occupational, household and housing careers. Most people are likely, therefore, to make several adjustments and moves before settling down in more permanent accommodation. (Helderman, Mulder, & van Ham, 2003)

"The user flexibility goal is usually related to design constraints such as:

- Familial life-cycle altering needs
- Unknown first residents of the dwelling unit and their specific dwelling needs
- Future change of dwellers" (Karni, 2008).

This new development has resulted in all the preserved housing rows being altered or reorganized in order to create larger and more spacious apartments and it is very interesting that these changes often have been possible without changing the structural system (G.Welling & Leupen, 2008).The need for flexibility might be driven by functional reasons, such as the desire to have the home function in accordance with space needs triggered by change in the household life cycle. Adapting homes can also be the result of moving to an existing dwelling as a resident. The need to modify will result in reshaping a place that was designed and fitted over the years to the needs of another household (Friedman A. , 2002).

3.6.3 Forms of adaptability

In order to achieve a particular goal in respect of the flexibility of the residence, this can be integrated into the design before construction begins. In this way it is possible to create or produce several different types/forms of construction, all of them with their own distinctive characteristics, opportunities, and limitations. The types of adaptability depend on many issues (Kendall & Dekker, 1997).

"Four main areas of intervention have been defined as critical to achieving flexibility in a dwelling such as:

1. Manipulation of volumes
2. Spatial arrangement
3. Growth and division
4. Manipulation of subcomponents" (Friedman A. , 2002).

3.6.4 Manipulation of volumes

This signifies a demonstration of housing adaptability where a number of floors can be merged together to form a larger unit and then divided again whenever it is needed, For example, when a family increase in size the choice of having a larger house is possible. This is a sign of dwelling flexibility (Friedman A. , 2002).

There is good example of manipulation of volumes in Britain, the name of this development is Greenwich Millennium Village (II) by Proctor and Matthews Architects.

"Proctor Matthews' scheme for Greenwich Village consists of 189 private units with 14 live / work units and 47 affordable units, which are accommodated in an eight-storey apartment block and three rows of two- to three-storey houses" (Moen, Evans, Proctor, & Ogorzalek, 2002).

Figure 31 : Front view and interior of Greenwich Millennium Village apartments in Britain

Source: (Moen, Evans, Proctor, & Ogorzalek, 2002)

> The residential units have been designed to be adaptable to changing requirements and needs. Houses are designed to accommodate different lifestyles and users. Possible scenarios developed for an 80 m2 two-storey house include the transformation of a lower ground living room into a fully accessible bedroom or a study room; or, the building-in of a lift into the lower ground living and dining space that can then serve a bedroom on the first floor (Moen, Evans, Proctor, & Ogorzalek, 2002).

Figure 32 : Infill plans of Greenwich Millennium Village apartments in Britain
Source: (Moen, Evans, Proctor, & Ogorzalek, 2002)

"The apartments have a clever plan that allows a variety of layouts. Two central service cores are divided by a small corridor. Around the edge is a sequence of spaces that can be divided up with walls that slide into recesses in the service cores" (Moen, Evans, Proctor, & Ogorzalek, 2002).

> These acoustically isolating walls can both be closed permanently to create a two bedroom apartment, one can be closed to make a one-bed apartment with a study space or they can be either permanently or temporarily pushed back in order to create a more open plan that can be used in a variety of ways. Finally, an extra dividing wall can be installed to create an apartment for three independent users. It is important in this scheme for the sliding walls to be of high quality in order to provide good acoustic separation. It was found that the inherent flexibility of these apartments made them popular with potential purchasers and thus the developer was prepared to fund the marginal extra cost of the sliding walls (Moen, Evans, Proctor, & Ogorzalek, 2002).

3.6.5 Spatial arrangement

In the design stages it is possible to integrate the adaptability of the available spaces, for example one space can perform a double function, such as a kitchen or a guest room and/or a multiple function. Spaces can be designed for disabled or elderly people. The various types of spaces can be made homely and complete with the use of furniture. On the other hand a space can be have an interchangeable use e.g. bedroom become living-room, or vice versa using 'hidden' furniture e.g. a bed in a

cupboard etc., Sometimes bookshelves can be used as a partition between e.g. a living room and dining room, dividing it into two separate spaces (Friedman A. , 2002).

"The dimension of the rooms also offered the possibility of adapting the chosen building model to quite individual needs-mobility and recycling. The building elements could be recycled, and the entire house could be disassembled and moved to another site" (G.Welling & Leupen, 2008).

3.6.6 Growth and division

"Design that considers expansion beyond the dwelling (add-on) or growth into a space within the perimeter of the original volume (add-in) is another form of adaptability" (Friedman A. , 2002).

The opportunity to add new building space or construction and/or the installation of components to the existing in respect of one for this extension ability it is important to ensure that the various levels have a sufficient capacity to be easily adapted and enlarged (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004).

"Multi functionality is the possibility of using building or installation systems for several functions. For example a large unit of an apartment can be divided to two small units or on the small unit extension could be possible" (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004).

"The added space needs to be designed to function along with the existing one. In the event of a division, the new spaces need to be designed to function independently. The designer should pay attention to issues such as natural light and to circulation between the old areas the addition, among other considerations" (Friedman A. , 2002).

There are good examples of the possibility of using building for several functions. For example, The Adaptable House in Britain, which was constructed in 1962, has another usage, which is a garage. The unit size of these apartments are 92 msq in 2 sotrey.

> The Adaptable House, developed by the British Ministry of Housing and Local Government (MHLG) in 1962, emphasises the changeability of the plan as means for providing flexibility. The design for the development of this house was based on findings and recommendations published in the seminal Parker Morris Report in 1961. Parker Morris stressed the importance of a building's adaptability to future needs. Whilst the consideration of the stages in a family's life cycle and their expression in space had already played an important role in the 1930s (i.e. Vroesenlaan by Van den Broek), it became a central focus again in the 1960s and 1970s (Rabeneck, Sheppard, & Town, 1973)

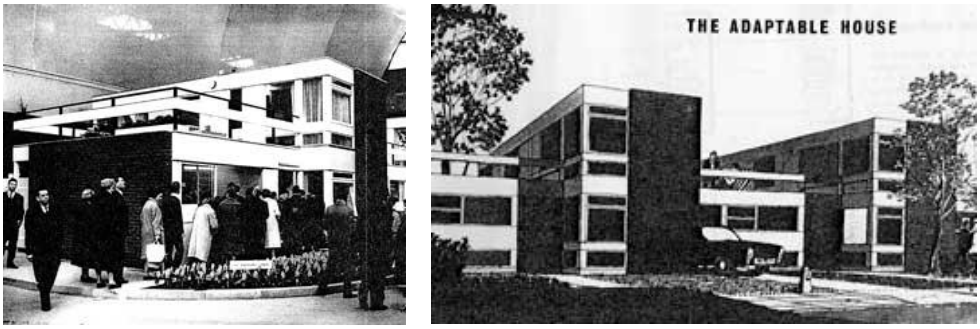


Figure 33 : Front views of Adaptable House by Development Group of the MHLG
Source: (Rabeneck, Sheppard, & Town, 1973)

> The architects at MHLG illustrated this concept with a diagram that differentiated between seven stages in a family's cycle over a period of fifty years starting with marriage, the arrival of two children within five years, another child within the next 5 years, the growing up of all children, their leaving the house gradually up until the final stage from year 35 when the couple is on their own again (Rabeneck, Sheppard, & Town, 1973).

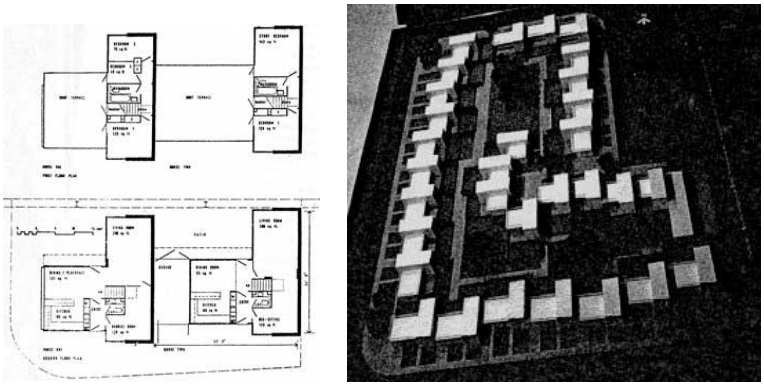


Figure 34 : Infill plan and Top view of Adaptable House by Development Group of the MHLG
Source: (Rabeneck, Sheppard, & Town, 1973)

> Architecturally, this programme is accommodated in a two storey L-shaped house with kitchen, dining room / playspace WC and one additional room on the ground floor. The additional room is accessible both from the entrance hall as well as via a door to the living room and can be used as a hobbies room, bed sitting or guest room. The large living rooms on ground floor can be used for different functions and activities, and subdivided as necessary. Depending on the number of occupants in the house a large space to one side of the staircase on the first floor can be divided into two rooms (Rabeneck, Sheppard, & Town, 1973).

3.6.7 Manipulation of subcomponents

The secondary parts of a building are those elements that are fixed into/onto the dwelling once the structure has been constructed and proceeding to the horizontal and vertical spaces, designing for adaptability giving an easy use and the substitute when the secondary parts require fixing or improvement (Friedman A. , 2002).

3.6.8 The beginning and development of adaptability

Developing the concept of adaptability and meeting the requirements of the housing occupants is important.

The repetitiveness and regularity of mass housing construction encouraged architects to reorganize and restructure these systems by providing inhabitants with the opportunity to pressurize the designers of the house plan to relate to their specific personal pre-requisites and to permit them to play an active role in the housing design plan process. In addition, not only was the variety of needs approved, but afterwards the acknowledgment of developing needs was also built into these strategies (Friedman A. , 2002).

3.6.9 Producing alternatives

On the other hand architects voluntarily accepted the idea of mass production housing and activity required to apply a variety of decreasing the cost producing in housing and activity required to apply a variety of reducing the cost in design strategies (Friedman A. , 2002).

"Breaking down the process of house construction into subcomponents meant an increase of choice and greater potential for adaptability as a design strategy. In some projects, buyers were allowed to participate in various degrees in selecting the finishes to their home" (Friedman A. , 2002).

3.6.10 Multi-use spaces

Another principle in respect of the economical and efficient use of space, and in respect of keeping housing costs low is, the utilization of a square or rectangular floor plan in each housing design plan, which is easily partitionable. Optimum economy was achieved as a result of using the square floor plan. In this case the concept of adaptability enabled a multi-functional space to be incorporated into a limited space (Friedman A. , 2002).

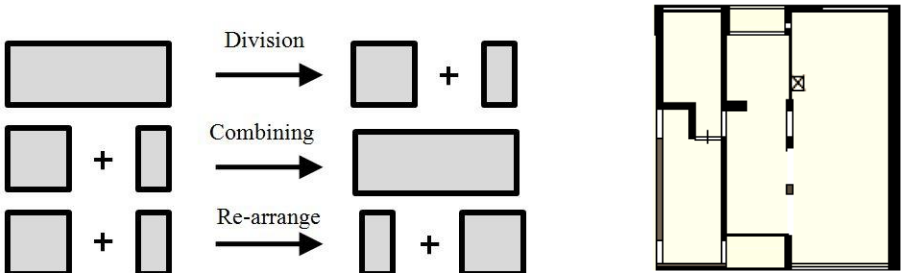


Figure 35: The partitionable structure, support (1)
Source: (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004)

As is shown in figure three developing a partitionable structure is one of the most important strategies in terms of improving the adaptability of a building. This means, therefore, that with the use of partitions, a building can easily be divided into smaller units or units of varying size, which can then be re-combined together to provide a larger unit, which can also be rearranged to perform different functions. According to this opinion, it is important to determine both the smallest and the largest possible units (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004).

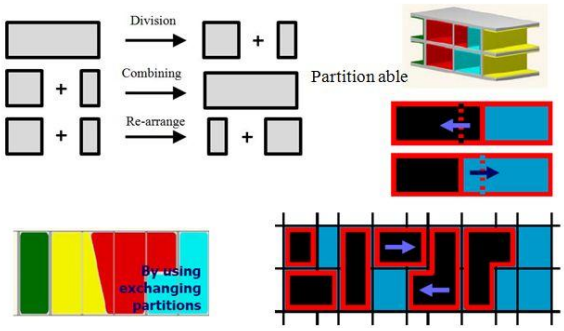


Figure 36: the partitionable structure, support (2)
Source: (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004)

The structure will gain more possibilities for rearranging spaces and exchanging functions by using a structure with inter-changeable partitions, in order to facilitate the integration of a number of different types of units within the same structure (Suet Lin, Chi Lin, Ching Yu, & Chau Yin, 2004).

3.6.11 Open plan residence

The extent of exciting environment in term of square meter in housing form relates to the reasonable price of housing and eliminates the extra stages of, for instance, attaching a bathroom, a traditional second floor, living room, dining room, staircase, extra bedroom and decorative interiors and exterior elements. (Friedman A. , 2002).

"Open Building (OB) is an innovative approach to design and construction that improves the efficiency of the building process, while increasing the variety, flexibility and quality of the product" (Benson, 2010).

"These strategies called for a reorganization of traditional house planning and embodied adaptability as a means to accommodate the present and future demands of the inhabitants" (Friedman A. , 2002).

Open Building is a modern design and building method that specifically addresses the radically changing social and technical environment in which we live and work (Benson, 2010). The purpose of making the best use of the possible range of uses within a limited interior space was enabled by presenting an open floor plan that allows the occupants to define the space according to their specific requirements, in conflict with the designer command of the definition of the space. For example the rooms could be simply transformed as necessary by using inventive features such as sliding walls and movable partitions that permit privacy levels to be customized and rooms to be created to suit of the residents (Friedman A. , 2002).

"Through North America- and increasingly, throughout the world non-residential buildings are constructed in an Open Building (OB) approach" (Kendall S. , 2000a, p. 1).

3.6.12 Variable and moveable partitions

> Interior partitions are a primary feature of the floor plan of any house. They are used to define spaces as well as providing privacy and noise attenuation. Partitions also are used to conceal numerous mechanical systems in homes, such as electrical wiring. Since partitions are the primary means by which the spaces in a home are defined, they are a critical element to address when designing for flexible floor plans. Key features of partitions that support flexible floor plans include the ability to move the partitions, the use of alternatives to full height walls, and methods for making utility runs in partitions adaptable and accessible (Martín, 2005).

As a result in Carasso, Switzerland, in 1973, the architect Luigi Snozzi converted a high-quality changeable partition initially designed for office buildings, into a residential framework to provide a greater degree of adaptability. The design of setting up useful steel partitions was an imaginative transfer of a complicated product from one market to another (Friedman A. , 2002).

“Over the years Metron's work has been concerned with buildings that can be adapted to users' needs over time as not only the demands of an occupant change over time” (Schneider & Till, 2004-6).

“Neuwil residential development in Wohlen, Switzerland is an example of flexibility models with movable non-structural partitions walls. It was built between1962-65” (Loch, 2008).

“Forty years after Neuwil residential was built, the structure’s flexibility proves to be an advantage once again, because, in the meantime, the expectations of tenants with regard to living space and comfort have risen considerably” (Henz, 1965-2003)

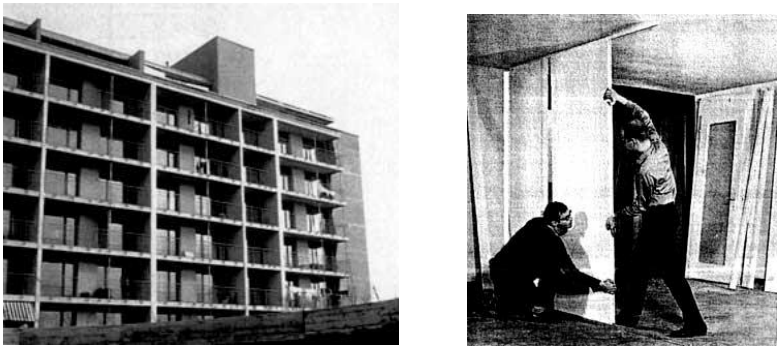


Figure 37: Neuwil residential development in Wohlen front view and interior
Source: (Schneider & Till, 2004-6)

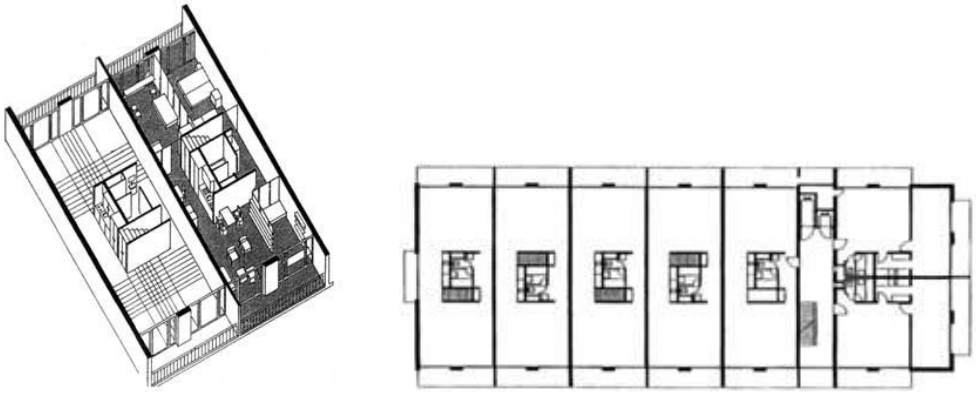


Figure 38: Neuwil residential development in Wohlen front axonometric view and infill plan
Source: (Schneider & Till, 2004-6)

3.6.13 Transformation in home

The designer of the building will consider applying systems that encourage adaptability in housing developments based on the system's involvement in their intentions (Friedman A. , 2002).

"In open architecture, the infill parts may be independently installed or upgraded for each occupant in turn. To make that possible, the base building must be kept as physically distinct as possible room its less permanent infill, the enable the independence of the infill, building cannot be built as a single integrated 'bundles' of technical products or decision" (Kendall S. , 2000a, p. 7).

3.6.14 Transformation of the building in changing times

The solution for characterizing transformations in the housing market is variety and multiplicity. Diversity is effected by the range of buyers searching for a home that best suits their household composition and means (Friedman A. , 2002).

3.6.15 Enlargement and separation

The concept of adaptability can be developed and advanced with the use of some basic elements of technical equipment such as: movable lightweight partitions, other design principles such as the repetitive location of a standard window, thus enabling a potential placing of such partitions (Oxman, Meir-Brodniz, & Amit, 1978).

In respect of the extension and partitioning of the dwelling there are some principles such as:

- "For Enlargement: integration of design approaches and signifies to allow and facilitate development beyond the initial volume (add-on)
- For Separation: integration of design policies and means to make possible division of a capacity into smaller units, as the need go on" (Friedman A. , 2002).

3.6.16 Types of unit

- “Unit designs included a range of highly adaptive to user requirements. housing design that supports the life style of residents is the first step in assisting occupants in the engagement of culturally and environmentally specific activities” (Debicka & Friedman, 2009).
- “First of all adaptability by design is based on the concept that an adaptable dwelling could be created by design predetermination, based on several factors such as floor area, size and type of windows, built elements, day-lighting, physical connections between dwelling space, details and location of services” (Oxman, Meir-Brodniz, & Amit, 1978).
- In any case the issue or concept of adaptability includes and influences the type of the building in which we might choose to live. we can mention about the typology that influence the function of the building and the building type bellow:
- The bungalow dwelling type, typically delivered from one small or single storey house, with the form of the space being either almost rectangular or a one and a half storey or split-level construction. This kind of dwellings type can generally integrate the concept of adaptability into their plans (Friedman A. , 2002).

3.6.17 Ground floor relation in dwelling

- There are many possibilities available to the designer with regard to the location of the house in the plot of ground allocated to it. It can be affected by a number of issues, such as zoning, and urban configuration and it can be many choices such as having a basement floor or to have a divide level in the

building or attaching beside floor for each of these choices we can have many factors that affect the adaptability (Friedman A. , 2002).

3.6.18 Space preparation

– The arrangement of the space preparation is related to the, dimension and percentages of the space, the right of entry, movement and transmission, the management of less important components, e.g. façade, material and services. In considering the influence of dimension and percentage in respect of the adaptability of the housing, study will be required on: adaptable and flexible homes**,** front facade or the side of the main entrances, simple preservation (Friedman A. , 2002). The entrance to single or multifamily homes and the position of the stairs is important since the adaptability and modification of the building configuration from a single unit to a double unit depends on the available enclosed space around the staircase (Friedman A. , 2002).

– For the urban aspects around the house and dwellings the manifestation changed from before to now. There are some design strategies that are important: growth or expansion of the buildings, paying attention to access and circulation, the incred proximity of neighbuorhoods to each other, the position of the wet spaces (services), separating an extended house (Friedman A. , 2002). After constructing the home it will be very hard to change the facade of the building for example putting in a new window or changing the direction of the building. As we know the exterior of the building reflects the image of whatever the home owner wants and it affects the: variety and harmony of the facade and the appearance of any expansion on the façade (Friedman A. , 2002). The strategies of the design plan influence the level of the adaptability in a house. For this reason the presence of a: “Conventional floor system and, engineered floor systems and assembling a structure” is very important

(Friedman A. , 2002). The placement and “Locating a mechanical room, finishing conduits, creating a vertical shaft” are the important items for the services use in homes (Friedman A. , 2002).

3.7 Socio-psychological

3.7.1 Process of adaptability

“Adaptable approach create ‘individual living context’ which are flexible enough to suit specific and changing needs within the framework of a larger scheme” (Lun & Man Hon, 1999/2000, p. 26).

As a result the important description of adaptability in housing is to have the possibility of repair or replacing parts of the physical environment response to new environmental conditions. Generally the first step is the primary design and then the second step is the construction period, where the building contractor is responsible for managing the integration of the adaptability of the projects and the third step is the use, of the building, where, during habitation, the person living there applies and constructed options for adaptability in the dwellings before it considered (Friedman A. , 2002).

The process of adaptability categorize in four parts such as 1) design, 2) construction, 3) use, and 4) manipulation of subcomponents. These classifications are described as following text:

In a design process, the architect tries to achieve adaptability by designing the plan according to the users needs. Another responsibility of the architect is that he should be able forecast the events in the life of the household by creating scenarios that relate to the users. For example, a young couple wanted to change their study to a nursery or finishing the attic and turning it to a game room.

Adaptability during construction allows the architect to offer different choices to the buyers in the design of the plans. They can choose from different layouts with same size and fixture.

After the users move to their homes, households ongoing needs of adaptability starts. This process can be in a simple form such as removing the kitchen wall.

Subcomponents are the elements that are added to the house once the structure is erected according to the user needs such as electrical or computer wiring and heating and ventilation ducts.

Table 3: Types and process of adaptability

Adaptability				
Type		Process		
Structural Adaptability	Functional Adaptability	Design Adaptability	Production Adaptability	Usage Adaptability
Extendibility Standardized Open plan	Versatility Convertibility Ability to separate unit in to two unit Ability to rearrange the furniture	Consider all user needs Given the chance to user to organize the space	Production spaces in different organizations and measurement with same components	Let the user to change their space organization by changing the place of partition walls and interiors without needs to change constructional system.

Source: (By Author)

3.7.2 Planning for adaptability

The integration of the concept of adaptability from the beginning to the end stage of the design process requires, first of all, an efficient and professional evaluation of the characteristics related to the buildings in question. Is changed in the traditional design process and modern pattern. Many of the characteristics that limit adaptability and changing the functions of spaces in a house are because the spaces are usually

designed for only one function and are difficult to convert to be used for any other purpose (Friedman A. , 2002).

Figure 39: One single window will limit the division of the bedroom
Source: (Anderson, 2010)

3.7.3 Decision-Making Level in Open Building

Ended of a third century, over 130 separate residential initiatives, some involving dozens of multi-family buildings have been constructed on principles of support and infill system. Uncountable other projects are starting to join at least some of the objectives of OB, in terms of occupant participation, customer choice, flexibility for subsystem change out, disentangling systems and decision-making processes by level and utilizing proprietary infill technologies. (Kendal & Teicher, 2010, p. 55)

> The concept of levels is the central idea of Open Building. Three levels of decision making are distinguished, being tissue, support and infill. They are separated, yet co-ordinate. The town fabric (tissue level) is of a higher level than the building blocks positioned within the town fabric. Buildings can be demolished and rebuilt, while the town fabric stays the same (Cuperus, 2010).

Decision making levels in open building can be shown as this diagram:

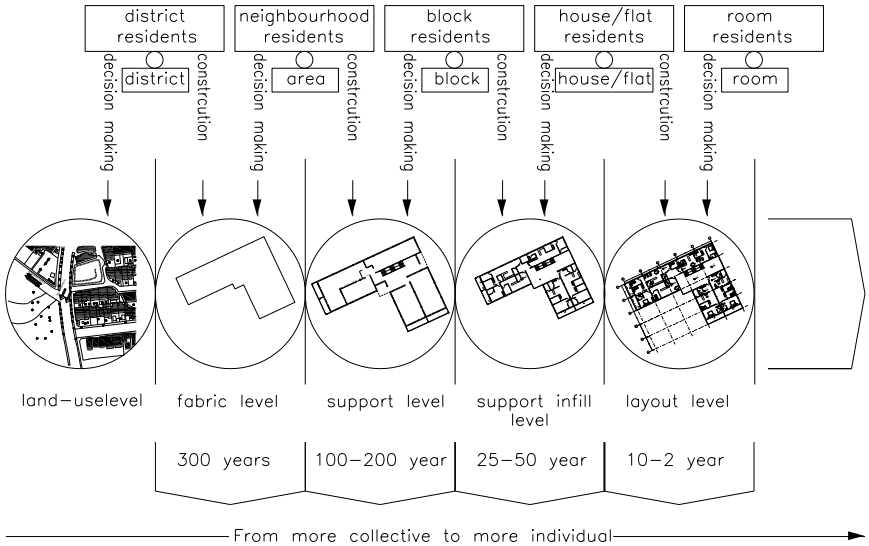


Figure 40: Decision-Making Level in Open Building, Diagram courtesy of Age van Randen.
Source: (Kendall S. , 2000a, p. 6)

All the Decision-Making Level in Open Building levels are shown in figure 29 above and it is according to certain rules of open plan concept. For instance, an urban street pattern, perhaps centuries old, defines plots of land - territorial claims - of varying sizes on which individual buildings are constructed, destroyed and new ones built over a time period during which the street grid remains stable (Kendall D. S., 2009).

> Often, several lots are acquired by one party. In some places and times, economic forces, methods of construction and changes in social patterns results in intensification of the use of spaces between the streets, while in other situations, the opposite is true, and the blocks become more vacant. The characteristic here is that the street grid - on a higher "public" level - remains stable, while the lots divide and aggregate and buildings come and go - on a lower level - within the spatial and infrastructure capacity of the street level pattern. Sometimes, the public space on the higher level is invaded by private interests - either by agreement or by force - changing the balance of power and the structure of the levels (Kendall D. S., 2009).

By studying or considering self constructed houses (houses made for the purposes of self usage), it can be understood that there are some proposals of the architect, which are applied in order to have better settlement, formal configuration and services for the various life styles of people over time. The plans of such types of

buildings can be verified by their users. The inhabitants can apply different changes inside of the buildings, as long as they do not disturb other people in the neighbourhood. Sometimes the alterations and changes can be carried out on the facades or can be applied to none-structural elements of the building; furnishing, or moving partition walls, are some examples of these kinds of changes.

"It is the formal recognition of these levels that is a key characteristic of the open building approach" (Kendall D. S., 2009).

According to John Habraken the open building is, the term used to indicate a number of different but related ideas about the making of environment. These include:

- The idea of distinct Levels of intervention in the built environment, such as those represented by base building and fit-out, or by urban design and architecture.
- The idea that users / inhabitants may make design decisions as well as professionals.
- The idea that, more generally, designing is a process with multiple participants also including different kinds of professionals.
- The idea that the interface between technical systems allows the replacement of one system with another performing the same function. (Such as different fit-out systems applied in a given base building.)
- The idea that the built environment is in constant transformation and change must be recognized and understood.
- The idea that the built environment is the product of an ongoing, never ending design process, in which environment transforms part by part (Kendall D. S., 2009).

"The balance between the freedom of users' decision making and formal control assured by the upper levels is crucial for the environmental and socio-cultural coherence and equilibrium of the building becoming thus adaptable and sustainable" (Nakib, 2009).

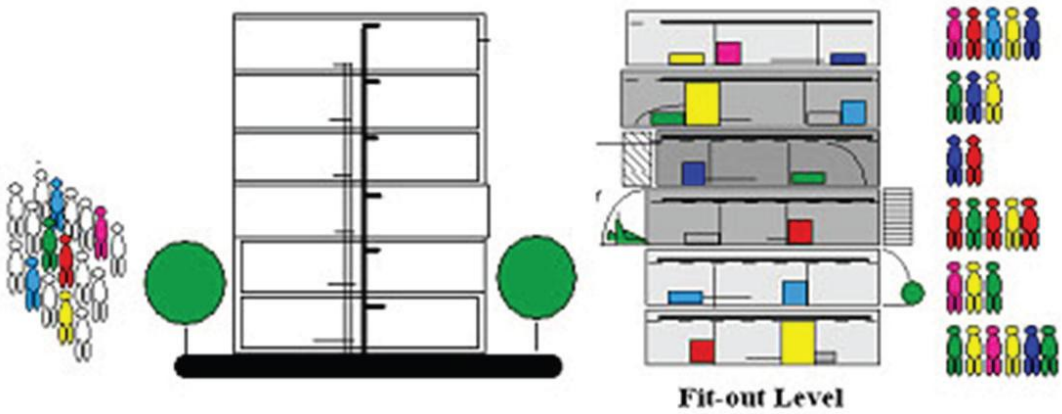


Figure 41 : Decision Making Levels in the Building
Source: (Kendall S. , 1999)

3.7.4 Creation of spaces

The major challenge in applying different functions to a small area was to design with a conscious attempt at creating a spacious setting and move away from the idea of a small house. An importance on relating the house to its environments was significant generally employed to make any different illusion of greater living payment. It is important to provide a good design for outdoor rooms not only extended the dimensions of the house, but they were also not subject to the limitations of government size systems and policy (Friedman A. , 2002).

3.7.5 Adaptability during the development

Existing space was analytically and strongly subjected to a reassessment process in order to recognize the fundamental spatial requirements of a small unit and make the most of adaptability in it (Friedman A. , 2002).

> Despite the spatial limits, the majority of occupants ventured to have more than the essential living room, kitchen, and two bedrooms. Therefore, designers were presented with the added challenge of overcoming the limits of the home's envelope and integrating the prospect of expansion to accommodate the flux of needs surrounding a maturing household (Friedman A. , 2002).

For many home owners, a small home represented a short-term housing solution but in no way did it adequately satisfy any permanent objectives. In order to avoid

the high cost of relocating, many households began to examine lower-cost alternatives. In the interest of responding to this requirement, designers developed strategies, both to allow for expansion within the original house, and to facilitate easy addition. Design for adaptability and expansion represented a considerable departure from the pre-conceived floor plans of traditional design and emerged as an innovative strategy to increase the suitability of a small home to the dynamic of the household by explicitly recognizing the potential for individuals to design and alter the living environment to cater to their evolving needs (Friedman A. , 2002).

3.7.6 Habitation

Starting of the real construction phase think up with normal gathering concentrate with occupants, architects and representatives of the housing agent, where detailed information was shared between all the people involved. This information related to the residence size, type and category, the possible arrangement or design, the structure and location of the elements of vertical services (such as stair cases and elevators),was shown to the households. Also the exact scale model of the project was displayed and developed in order to show the construction process in dimension (Friedman A. , 2002).

"The Hollaburnn project in Austria, which won a competition in 1971, applied Habraken's methodology to offer maximum choice and scope for participation by the occupants while respecting cost limits and conventional technology" (Friedman A. , 2002).

Figure 42: "Wohnen morgen" Hollabrunn, showing the relationship between structure, in April 2005
Source: (Bostenaru, 2005)

3.7.7 Low-rise building adaptability

"An example of a dwelling type with a high accommodation capacity (the potential to accept changes) is the old Amsterdam canal house. These houses are able to keep accepting changes of function because of their oversized load bearing structure and floor areas" (Leupen, Heijne, & Zwol, 2005).

Figure 43: View of Amsterdam - studio (40 m2) in 17th century canal house
Source: (Wempe, 2010)

"A system of zones and margins, also based on Habraken's methodology, was implemented in government-sponsored primary support structure and Housing Assembly Kit (PSSHAK) project in England" (Friedman A. , 2002).

"Gespleten Hendrik Noord apartment block was developed by a group of people who found each other through an advertisement in a newspaper" (Minami K. , 2001).

Figure 44: Street view and interior of Gespleten Hendrik Noord apartment
Source: (Minami K. , 2001)

"Once all future residents were chosen, the planning process evolved issues of flexibility and potential for further development. The subsequent apartments are simple shells, which could be fitted out according to personal taste and requirements" (Minami K. , 2001).

3.7.8 Differentiation of interior and exterior spaces

For internal partitions, the floor slabs were built with a minimum number of supports:

Movable partitions could, in theory, be positioned in intervals at any grid point. For exterior spaces the facades were designed to compare with the plan and preference and choice of the occupant, using different types of modules which were fixed between the structural columns. These contained solid rigid panels, glazed fixed panels, French doors, or a choice of fixed and opening windows (Friedman A. , 2002).

3.7.9 Adaptability in floor organization

"Depending on household composition and lifestyle, various floor plan configurations are available for selection prior to dwelling construction, notably, the size and layout of the kitchen, the bath room and the multipurpose room are included among the elements that can be adapted according to need" (Friedman & Debicka, 2009).

Another theory that related to the Support and Infill design method was postulated by John Habraken in the Matura Infill System (Friedman A. , 2002).

According to Kendall, J. In 1996 : "This system is made of prefabricated packaged of-the-shelf subsystems and parts that are integrated into two elements: the Matrix Tile is basically a modular floor panel that has grooves in it to provide room distribution of primary building services such as drains, water, heating, electricity, and all kinds of pipes and wiring. The baseboard is the secondary distribution system that runs wires for appliances. The Matura System allowed for quick installation and a wider choice of floor plans".

The development of the concept of the practice of adaptability was successful in the European housing market as a result a number of advantages, including the fact that such a concept was completely in line with and supported political purposes (Friedman A. , 2002).

"Infill represents a relatively mutable part of the building. The infill may be determined or altered for each individual household or tenant without affecting the support or base building, which is the building's shared infrastructure of space and built form. Infill is more durable than the base building" (Kendall S. , 2000a, p. 4).

3.7.10 Current choice

A very important part of the builder's home delivery procedure is the ability to make a quick sale and move on the next project (Friedman A. , 2002).

"Habraken's approach contrasted sharply with contemporary proposals of the Japanese Metabolists, French architect Yona Friedman, the 'Town- land Project 'in America's Operation Breakthrough, the proposals of the group SITE and scores of related initiatives" (Kendall S. , 2000a, p. 11).

3.7.11 Space preparation

"Unit designs included a range of highly adaptive to user requirements. Housing design that supports the life style of residents is the first step in assisting occupants in the engagement of culturally and environmentally specific activities" (Debicka & Friedman, 2009).

- Dimension and percentages: the result that the dimensions or the sizes of the whole dwelling or a part of it will have on the building's capability for adaptability, For example a floor of a dwelling has the ability to be changed and adapted.
- Right of entry: looks into how the purpose of one or several accesses will pressurize the current buildings and their future adaptability.
- Movement and transmission: be aware of the position of the circulation directs and capacity income from dimensions (Friedman A. , 2002).

3.7.12 Additions to the dwelling

- Jia Beisi (1995) observed that: "It is a way to fulfill a large variety of needs and change of needs of housing users (dweller and owners) within the same building using the potential means which the building techniques and management system offers".

- Some of the dwellings can be attached on both sides and some of them only on one side and these connections are related to the buyers of the houses, space need and so on and it is related to:
- Changing urban forms, Paralleling and making straight the floors level, The adjust of footstep, Putting on an entrance door, adding on, enlarging, and

separating big and small units, natural light and ventilation (Friedman A. , 2002).

3.8 Economical

3.8.1 Settling on finance

Affordable housing is generally targeted at households which cannot afford to live in the private rental market because they are in housing stress; these are households which pay more than thirty per cent of their household income in rent payments (Terenzini, 2010).

Managing to meet house rental payments for a dwelling is a problem for the households with a low income, and specifically for first time house buyers. Proposing and enabling the building of adaptable housing will have the consequence, hopefully, future, that public and private societies will also adopt and integrate this concept into their building programmes (Friedman A. , 2002).

Usually local authorities have the statutory responsibility of providing and administering low income housing within their areas. To satisfy this function, urban councils have three traditional sources of loadable funds which are; central government, the open financial market and internal funds. (Mutekede & Sigauke, 2007)

3.8.2 The home-building firm

Proceeding to the Second World War, the North American home-building community was, in the main, comprised of the small teams of capable carpenters who would build one house at a time for individual households where the house would be complete before being sold (Friedman A. , 2002).

3.8.3 Classification of quantity and quality

A construction's covering design involves its interior design and arrangements. We can see from more than a few characteristics that each of them transmitted to design, construction of the building (Friedman A. , 2002).

3.8.4 Management of quantities

"Public housing needs to be adaptive to the initial socio-cultural requirements and the evolving needs of the occupants. The ability to do so successfully will extended the dwellings life-cycle, thereby having positive impacts on environmental sustainability" (Friedman & Debicka, 2009).

As Harbraken supposed "it was possible to reinstate the natural relationship or process within built environment" (Kendall S. , 2000a, p. 10).

Habrakaken (1999): residents needed to be able to make autonomous dwelling decision on their own behalf, rather than to be simply provided with units of housing:

"Within that urban structure, independent decisions on the support (base building) level involve the parts of a building which are common on all occupants, those parts which may endure for a century or more" (Kendall S. , 2000a, p. 7).

Types of unit : selected category of dwelling determinate on adaptability

Unit unity : transfer to the relation that a single dwelling unit will have with an neighbouring unit

Ground floor relation: thinking about the consequence that the selected location of the building on the ground will have on the issue of adaptability

3.8.5 Management of less important components

- The facade and covering of the building: the consequent effect that the building's facade will have on the issue of adaptability during construction and use.

- Getting material together and structure: the result that a selection of structural system will have on the whole building's adaptability.
- Material and services: establishing what the effect of location, access to the services in the building and the types of the material used will have on adaptability (Friedman A. , 2002).

3.9 Chapter conclusion

At the beginning of this chapter, the evolution and main definition of adaptability was investigated in order to achieve a better explanation and understanding of the main characteristics, processes and methods of achieving adaptability.

The main aim of this chapter is to invite consideration and thought be given to the need for the provision of adaptability in buildings by pointing out changes which can occur in the basic needs and requirements of residents as well as in the variations in their user characteristics.

The title of this chapter included the physical needs of a house hold in respect of adaptability.

At some future point the number of spaces that will be able to accommodate changes in dimension, users and technology through the use of adaptable and flexible structures and spaces will certainly increase. In order to achieve this, studies with this focus require more consideration and emphasis. The approaches used in order to achieve for the flexibility in the interior design are categorized under the following main topics: planning, the structural system, installation distribution, dividing inner walls and fitting flexible elements' flexibility (Friedman A. , 2002).

As we can see the flexible design permits and enables people to develop and make choices, which are related to the human elements of: Psycho-social needs, Social needs, Aesthetic needs, Behavioral needs, Privacy needs, Physical needs, Security needs, Health needs, Spatial needs, Needs, related to physical Environmental, needs, Economical needs, Technological needs (Friedman A. , 2002).

On the other hand, investigating the reasons for adaptability need was the second aim of this chapter. If a dwelling is not able to cover all the requirements of the occupants, it is not possible to have good household living quality or a satisfactory home life. Therefore, examining and understanding the dissatisfaction due to changing circumstances is extremely important, in terms of designing a sustainable home environment.

Chapter 4

ADAPTABLE DWELLINGS IN SOCIAL HOUSING IN DIFFERENT COUNTRIES

In this chapter case studies in three different countries will exemplify adaptable dwellings and adaptability in housing construction.

The role of adaptability in residential space design has a considerable importance as was mentioned in previous chapters. There are many examples of residential spaces that defend the idea of adaptability.

Lang (1987) states that: “Some buildings are easier to change because of their physical structures” (Lang, 1987).

In the cases which will be discussed in this chapter, adaptability is a design concept that provides the opportunity of flexibility to the residents in their homes. Flexibility and adaptability can be assumed as essential in term of providing sustainable dwellings with alterable, versatile and durable spaces, for future needs.

> Adaptable housing units are designed in such a way as they are, or can be easily modified in the future to become, accessible to both occupants and visitors with disabilities or progressive disabilities. Adaptable housing is also attractive to people who prefer open plan living (Chris, E., 2006).

The case studies will show adaptation proposed to meet the requirements of the present owners, without being too specific or inflexible in the design or form of construction, planning for variations that will adapt to the life-style and, needs and requirements of prospective or existing occupants may support or encourage them to buy the house in the future. Changeability is another advantage of adaptable housing.

As the occupants of the house change so do the functions and lifestyles in and around the house. These case studies will show how simple changes or modifications can prove to be very cost effective when they are integrated and incorporated into the initial design of the house (Courtesy, 2007).

In the following pages, three cases by different architects, places and years will be investigated, that have different kind and process of adaptability.

The cases of this chapter are investigated according to the adaptability types and open building process, the technical way of obtaining adaptable residential apartments, for supporting the adaptability approaches that were explained in chapter 3.The concept of adaptability is examined in respect of various types and degrees with three random cases, in the way of data surveying and internet searching.

The evaluation of studying cases is dealing with functional, structural adaptability and their subheadings are related to the different approaches. On the other hand, open building process, infill and support relationship in residential apartments are also keywords of examination. In all of the cases, decisions about design, production and usage stages are seen that affects also various adaptability types and their usages.

In this chapter, an evaluation format is defined that accommodates general knowledge about, name, place, architect and the production year of the dwelling. In the cases that were designed, design year is given. A general description is placed before adaptability evaluation, also related with adaptability characteristics if the building. Plans of the dwellings were places for understanding the ideas about adaptability approaches as possible as it can be found through the research.

4.1 Case One: Papendrecht in Netherlands

> In the Netherlands, the rent of the cheaper rental homes is kept low through governmental overseeing and regulations. These types of homes are known as “sociale huurwoningen”. In practice this is accomplished by non-profit private housing foundations or associations (toegelaten instellingen). Due to frequent

mergers the number of these organizations dropped to around 430 (2009). They manage 2.4 million dwellings. The majority of the low-rent apartments in the Netherlands are owned by such organizations. Since the policy changes in 1995 the social housing organizations have become financially independent focusing on their role as social entrepreneurs. In most Dutch municipalities there came to exist a certain minimum capacity of social housing throughout the last decades. In many cities such as Amsterdam, The Hague, Rotterdam and Utrecht the percentage of social housing approaches or even passes the 50% mark. The public (financial) supervision is done by the central fund for housing (Centraal Fonds Volkshuisvesting). The Dutch housing policy is based on a concept of universal access to affordable housing for all and the prevention of segregation (Tunstall, 2010).

Papendrecht is located in the western Netherlands, at the crossing of the River Beneden Merwede and the Noord River. The Molenvliet project is located in Papendrecht near Rotterdam. This development is set up as an urban tissue in which buildings form courtyards from which access to the houses is gained. As a result of the fact that these housing units have been designed by users, the plans vary; no two floors plans are same (Minami & Bei-si, 2010).

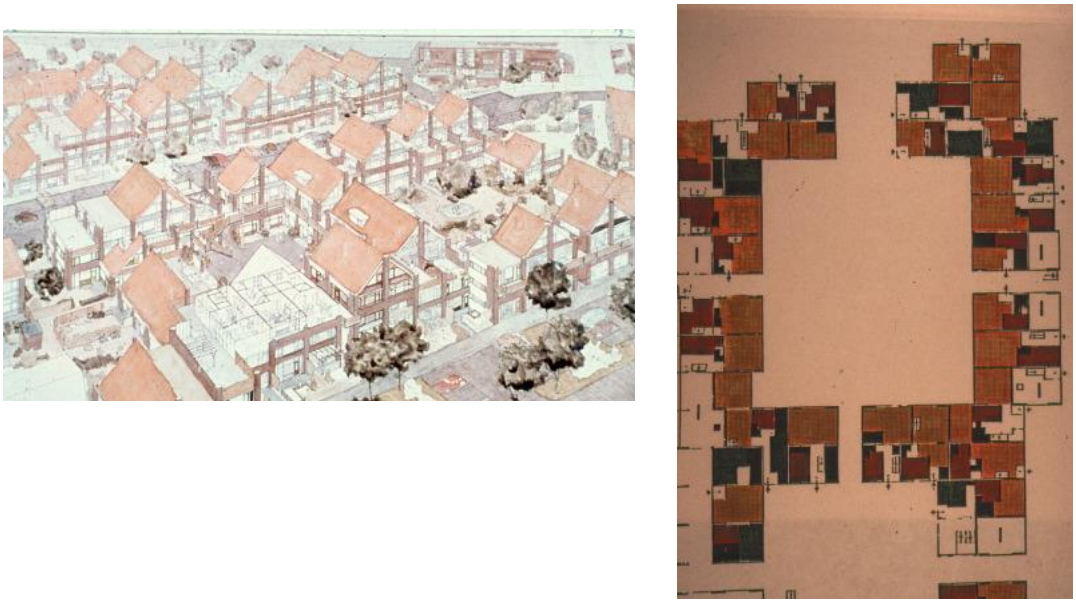


Figure 45: Molenvliet project, Papendrecht, near Rotterdam bird's eye view and different dwelling sizes
Source: (Minami & Bei-si, 2010)

Address: Papendrecht

Work Type: new build

Number of Storeys: 2- to 4

Type of Building: housing estate

Number of Units: 124

The owner of these houses is the Housing Association of Papendrecht, This complex houses there are 124 rental dwellings and 4 offices blocks.

> The Molenvliet development is one of the key Dutch projects that fulfil the promises of the SAR support and infill methodology. Similar to the development in Hollabrunn, the process of user involvement in terms of decision-making starts with the wider context of the overall plan of a neighbourhood. The second step is to negotiate built areas in the form of open spaces and building zones. The third step is the planning of the 'support' structure. The final stage is to design the individual infills, which determine the floor plans and finishes (Minami K. , 2001).

Figure 46 : Molenvliet project: facade and interior of the houses
Source: (Kendall S. , 2000a)

The support structure is a concrete framework with openings in the slabs, it is made using a combination of seven components: floor decks, for vertical mechanical chases and stairs; in concrete piers placed parallel to each other on a 4.8 metre square grid; pitched roofs to provide a habitable attic; wooden frames which act as an armature for specific facade elements; roof terraces located on the flat roof space in the ground floor dwellings; open galleries for upper level access; and large vertical service ducts containing all wiring and piping for gas and water as well as all other connections (Werf & Froyen, 1980).

The principle of support and infill allowed the free subdivision of the structure into a complex of apartments ranging in size from one- to six-room units. The wall piers, using a version of the Dutch ‘tunnel’ system allow apartments to straddle across two or three bays, a principle further developed by the same architects in the Keyenburg project of 1984. Initial decisions about the placement of partition walls were made in conjunction with the future users, who met twice with the architect and a representative of the Housing Association. Contrary to some other developments where tenants were shown possibilities of subdivision, at Molenvliet they were presented with an empty support plan, which was gradually defined through discussions with the occupants (Werf & Froyen, 1980).

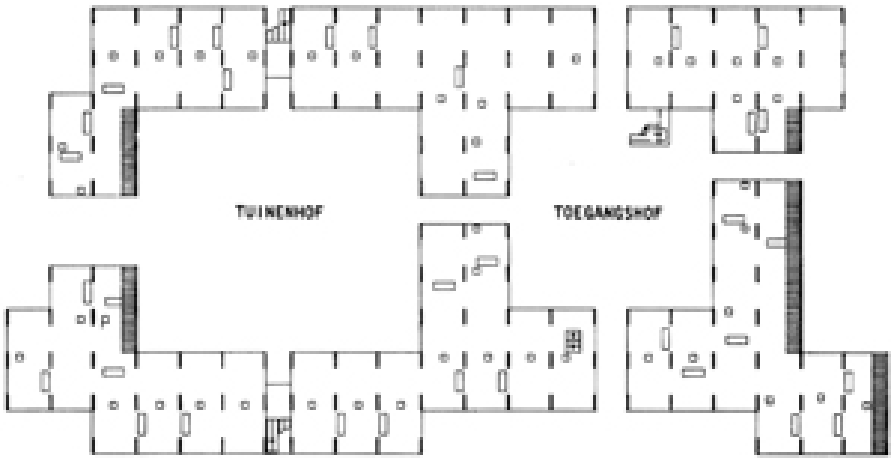


Figure 47: Adaptable support structure in the Molenvliet project
Source: (Kendall S. , 2000a)

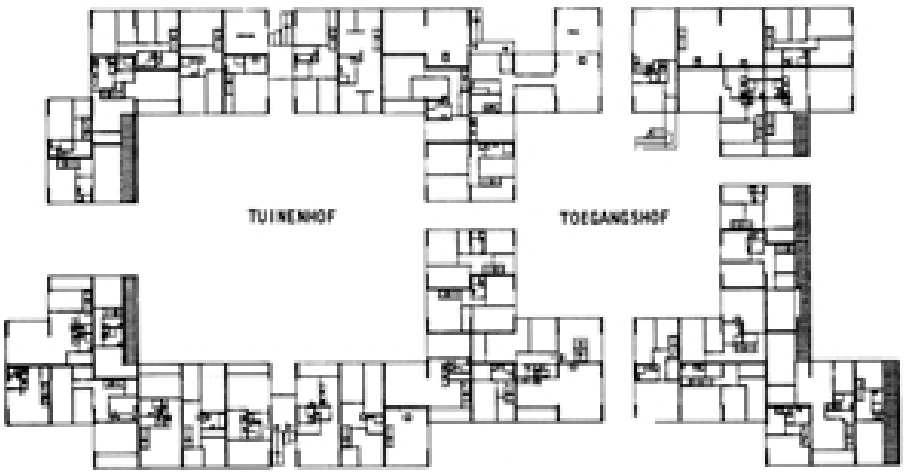


Figure 48: Infill Plans in Molenvliet project
Source: (Kendall S. , 2000a)

4.2 Case two: Adelaide Road Estate

Social housing in England consists of two basic types of housing: property rented from a local authority, commonly known as council housing, and housing rented from what are now termed Registered Social Landlords (RSLs) - a new name for social landlords who are independent of local authorities. Since 1988 more than 400,000 homes in England have been transferred from local authorities to RSLs. This is because there is often a backlog of repair work; transferring and bringing in private investment is regarded as the best way to bring improvements (Field, 2008).

Figure 49 : Street view of: Adelaide Road Estate
Source: (Schneider T.; Till J., 2007)

Address: London

Work Type: new build
Context: urban
Number of Storeys: 3
Type of Building: tenement / apart. House [detached]
Number of Units: 44

"Adelaide Road Estate" is one of the successful social housings, which is designed according to open building principles. The designers are Nicholas Wilkinson and Nabeel-Hamdi. Over 64 dwellings are designed in this project; these dwellings include the following unit types; "2" single units, "13" 3-units, "1" 5-unit, "1" 8-unit, "15" 2-units, "9" 4-units and "4" 6-units.

PSSHAK (Primary Support Structures and Housing Assembly Kits) was developed by Nabeel Hamdi and Nick Wilkinson as a thesis project for the Architectural Association in a practical interpretation of John Habraken's theories of support and infill. Working for the Greater London Council, Hamdi and Wilkinson deployed their system in the design of Adelaide Road Estate,

> comprising of eight small three-storey blocks. PSSHAK was a good solution to a local authority's need of having to respond quickly to changing housing requirements. Using PSSHAK meant that, even though the housing scheme was well advanced on the drawing board, the mix of accommodation could be altered to suit specific demands. It also aimed to demonstrate the feasibility and benefits of participatory design methods in the public sector, the designer acting as 'skilled enabler' instead of the 'expert architect', approaches that Hamdi and Wilkinson have pursued ever since (Sheppard, Rabeneck, & Town, 1973).

The PSSHAK development initially occupied the construction of a basic structural shell, which consisted of load bearing brick cross walls and cast-in-place concrete floors as well as primary electrical and mechanical service points (Rabeneck, 1975).

The walls and floors have 'soft zones', in tactical positions, which can be opened up to allow both vertical and horizontal combination between floors or bays. The infill kits consist of vertical ducts, partitions, doors, cupboards, bathrooms and WCs. The kit was supplied by the Dutch company Brunyzeel and installed in a dry process without the need for interior brick or plaster work (Rabeneck, 1975).

> Tenants, working in small consultation groups, were given 2 weeks to design their own interiors. Architects refined these designs, advised on amenities and costs. Prospective tenants were then able to visit empty shells and review models before making their final decision on the subdivision of spaces. Whilst the initial plans show a wide range of, sometimes, idiosyncratic layouts, the potential for later change was never fully realised, maybe for the simple reason that the local authority failed to pass on the instruction manual (Schneider T.; Till J., 2007).

Figure 50 : Adelaide Road Estate top view of interior and in side of the dwelling
Source: (Schneider T.; Till J., 2007).

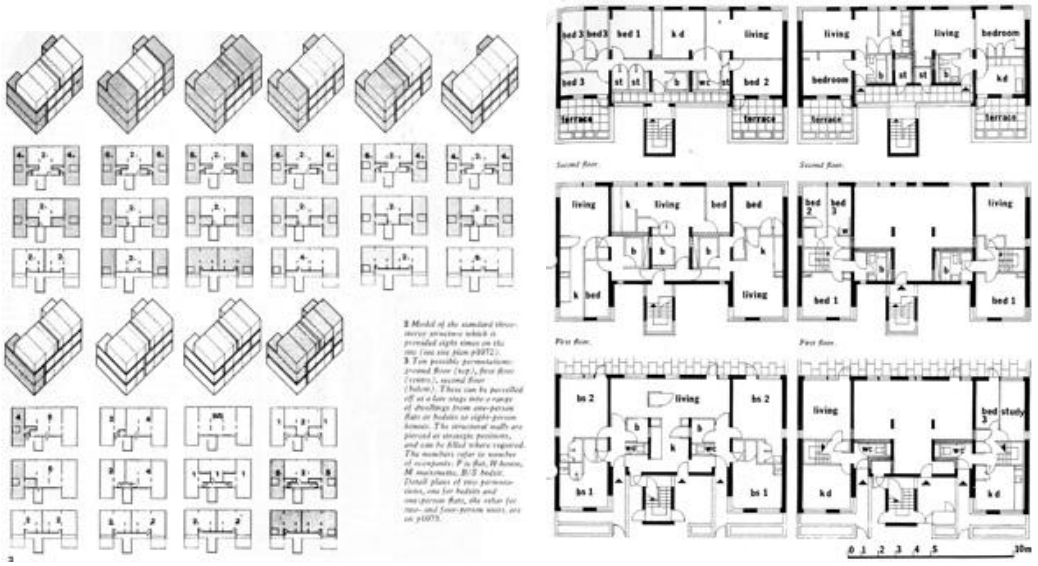


Figure 51 : Left: different dwelling sizes in Adelaide Road Estate in Right: in fill plans of Adelaide Road Estate project
Source: (Schneider T.; Till J., 2007)

4.3 Case three: Next 21 Osaka Gas with SHU-KO-SHA arch. And urban design studio

"NEXT 21, located in Osaka, Japan is an experimental multi-household housing project demonstrating new concepts of multi-household housing units that incorporates sustainable design methods and advanced technologies expected to be used in the near future" (Jong, Brouwer, & Kearney, 2000).

> The NEXT21 project was constructed as an experimental residential complex in Osaka, Japan, by Osaka Gas Co., Ltd. The building was initiated in order to test new models for reducing energy consumption and preserving the environment through waste processing (water and refuse) and greening at the same time as creating apartments that suit and can adapt to individual residents' needs and lifestyles (Sawada & Habraken, 1999).

"In a social perspective it seeks to respond to user's preferences by offering flexibility needed for adaptation of individual units over time. In a technical perspective it seeks ways of building where sub-systems can be installed or changed or removed with a minimum of interface problems" (Kendall S. , 2000a).

The NEXT21 building demonstrates a clear distinction between ‘base-building’ and ‘fit-out’ following the SAR definition: the base-building serves as a collective facility, and the fit-out is different for each unit. The NEXT21 base building includes parking, pedestrianisation air circulation both horizontally and vertically, and two public gardens, one on ground level and one on the roof. Utida declared the base building to be ‘three dimensional urban designs’. Drawing on the full consequences of this analogy, he invited thirteen different architects to design the individual units, in the way individual architects design buildings in an urban scheme as done previously by another firm (Futagawa, Jan-Feb 1994).

Address: 6-16 Shimizudani, Tennoji-ku, Osaka City

Work Type: new build
Location: densely built up urban area, south of Osaka Castle
Number of Storey: 6
Type of Building: tenement / apart. House [detached]
Number of Units: 18
Other Uses: car parking

Figure 52 Image By Toyoshi Matsumoto, Osaka Gas Co. Ltd view of NEXT21 complex
Source: (Japan Institute of Architects , 1996)

“At the same time as the majority of the dwellings during a first phase of occupation between April 1994 and March 1999 were proposed by Osaka Gas, otherwise the dwellings were designed by the residents themselves” (Sawada & Habraken, 1999).

Theses apartments completed in October 1993, precisely demonstrate the principle of the Open Building movement, and they are regularly used as an example of the advantages of a support and infill approach. It is obvious that the building

reaches different needs and time horizons, both in terms of social occupation but also in terms of construction, with the last human being differentiated according to the specific life duration of each factor (Habraken J. , 2003).

> Building elements are divided into two groups: long-life elements that provide the communal structure (columns, beams and floors), and short-life elements in private areas (partition walls, building services and equipment), which can be adjusted without disturbing the overall integrity of the system. This is clearly expressed in the aesthetic of the building, with a stable and relatively ordered structure framing a more diverse infill suggestive of change (Habraken J. , 2003).

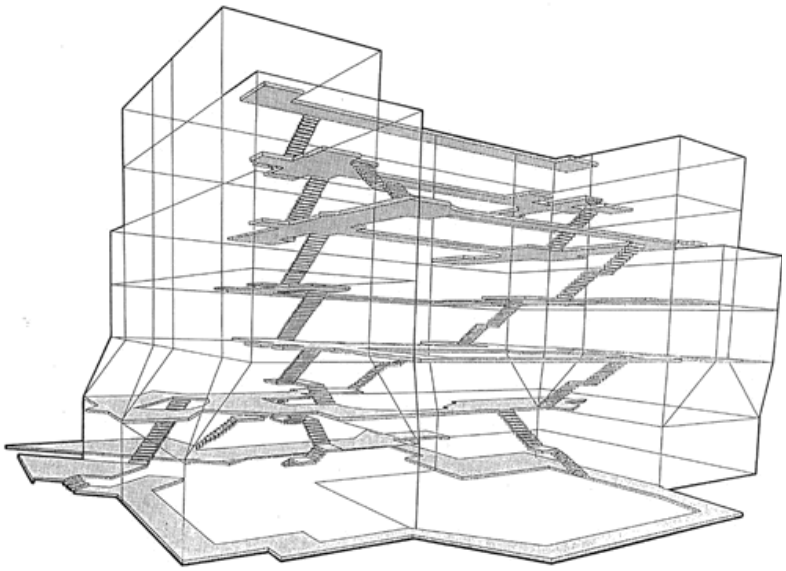


Figure 53: Image By Toyoshi Matsumoto, Osaka Gas Co. Ltd axonometric view of NEXT21 complex
Source: (Japan Institute of Architects , 1996)

> Wall components are based on a modular system and can be placed anywhere on the predetermined grid. The services form a separate constructional layer. Wiring and piping for gas, water and electricity are located in raised floors or suspended ceilings. When parts have to be exchanged, or when systems have to be renewed, panels in the ceiling or floor plates allow easy access (Kamo, 2000).

"The residents of the Next21 projects improve their residential environment by themselves. Relationship between residents and the residential environment is important in maintaining better residential environment. Residents' attachment to their residence and their active involvement in building management will improve their residential environment" (Ozaki, 2010)

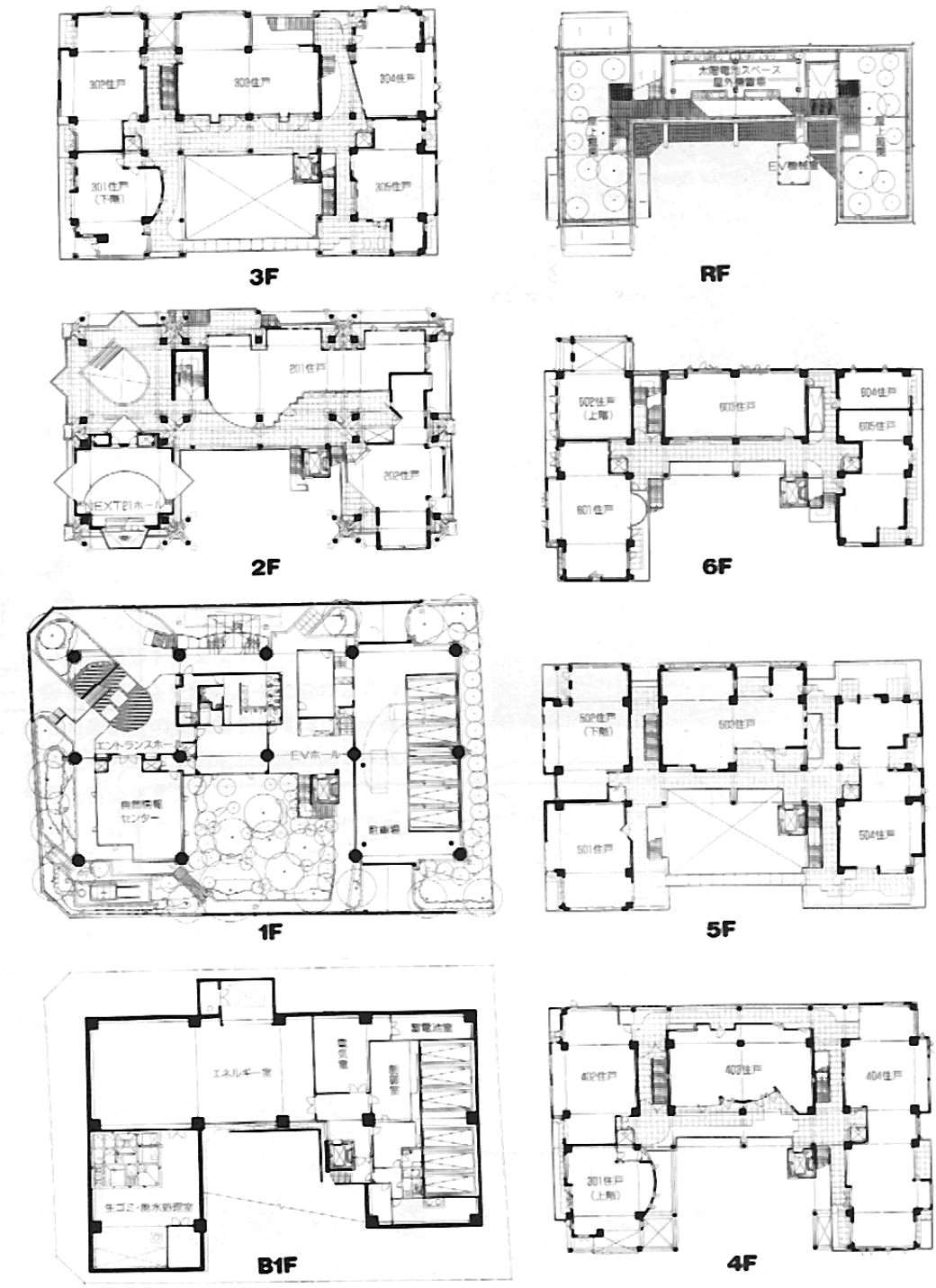


Figure 54: Variable sizes of NEXT21 project and variable infill plans
Source: (Japan Institute of Architects , 1996)

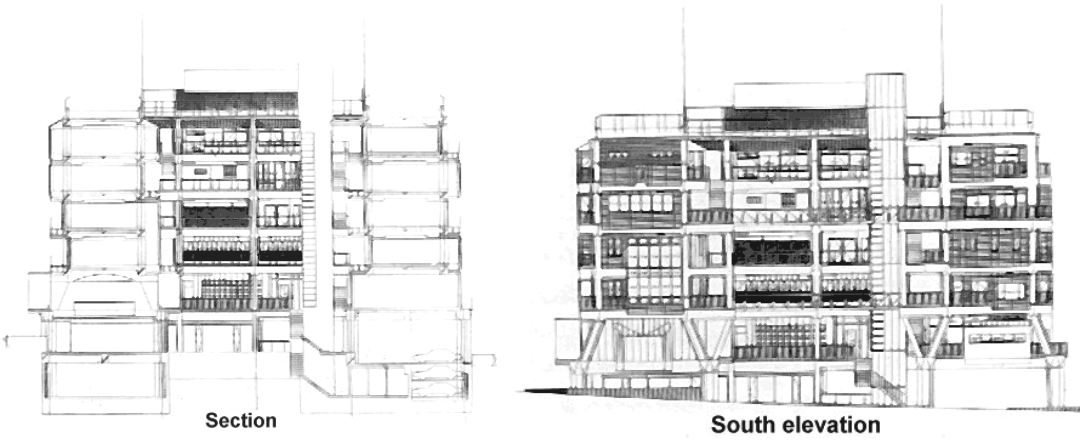


Figure 55: Section and elevation of NEXT21 project
Source: (Japan Institute of Architects , 1996)

In Phase 2, focus was on the creation of a new community, relationship between residents and the residential environment. Surveys were conducted on the evaluation of the residential environment, including building and green areas, and how to create a new community as well as evaluations on each residential unit. Before moving into the complex, residents met to talk about how to manage three-dimensional streets and green areas and how to create and manage a better residential environment. Residents were given further opportunities to hold meetings and carry out cooperative work to improve and maintain their residential environment (Ozaki, 2010).

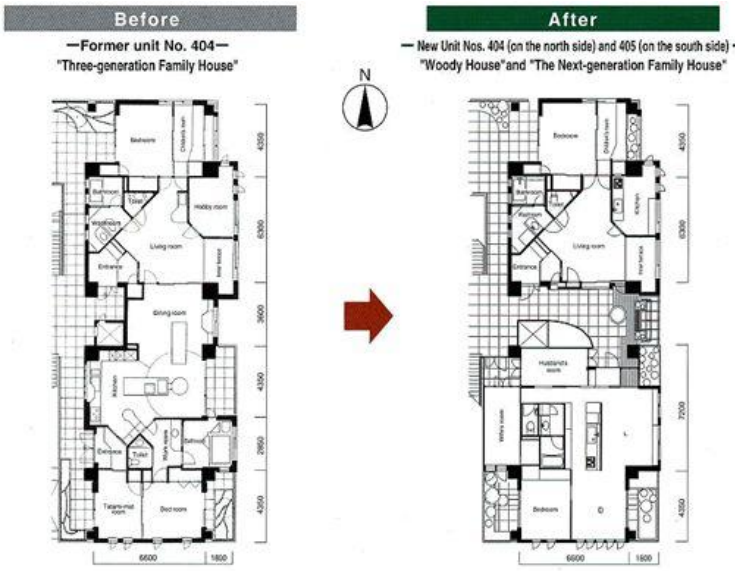


Figure 56: remodelling of the plan in Next21 project
Source: (Ozaki, 2010)

The residential unit 404 called "the Three-generation Household House" underwent major renovation to divide it into two units. On the assumption that young households would live there, these units were named 404 "Woody House" and 405

"the Next-generation household house". A 3-dimensional street was established, and external walls were newly constructed between the two units. In unit No.404 on the north side of the building, almost all the infill was recycled, and in unit No.405 on the south side all the infill was disposed of and a completely new housing plant was used with the moving of the exterior wall minimized (Ozaki, 2010).

In this complex for rooms were designed for individuals and one bedroom also dining room. It is unspecified that the personal rooms selected for husband and wife in the other hand would be used as offices, as a result the private rooms have entrances connected directly to the outdoor area. In private spaces rooms can also be created for single people to live together (Ozaki, 2010).

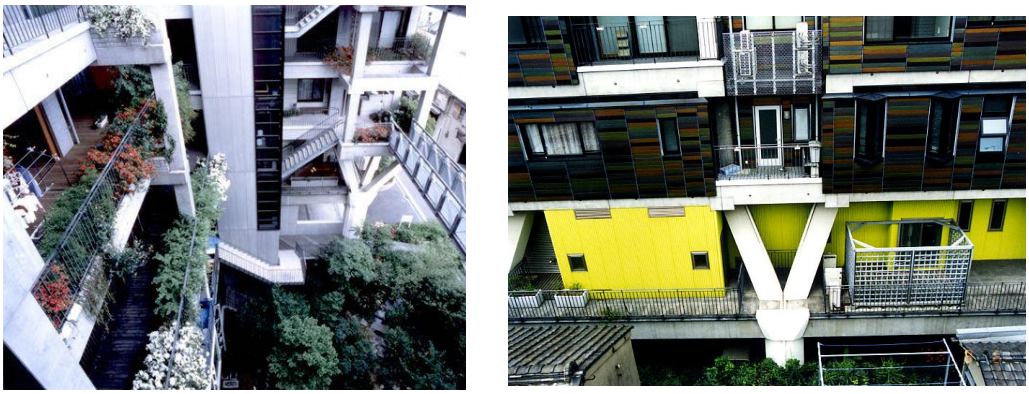


Figure 57: Court yard view and front view of NEXT21 housing complex
Source: (Japan Institute of Architects , 1996)

Finally, it is worth pointing out that:

Maximizing the issues around everyday living comfort by ensuring the: adsorption of daylight, delightful views, good air quality, suitable sound insulation, efficient temperature and humidity control, requisite safety provision, is also very important.

- Efficient planning for: users to have adequate and ease of movement in the space offered and planned, verification of the necessary safety precaution and

regulations, capability of preparing the consumers needs, mixture of structures with utilities.

- Planning for ease of alteration or change with: simple and modular designs, easily adjustable to people's needs.
- Minimizing the useful spaces with: the reduction of courtyard areas, reduction of air ducts spaces, maximizing the mixture between elements of structure and utilities, reduction of the use of the false ceiling.
- Reduction of building costs by with: reducing the space required for powerhouse structure and utilities, simplifying the use of space, the harmonization of the structure with utilities.
- Reduction of the building's maintenance needs with: the use of perdurable easily accessible materials.
- Maintenance and improvement of natural values with: mixture between wild nature and animals, paying attention to green nature (Masoud, 2007).

4.4 Chapter conclusion

The case studies that were examined in this chapter were designed according to the concept of adaptability. The dwelling examples that show different kinds of residential spaces have different degrees and forms of adaptability. The different forms and types of adaptability offer the possibility of comparison in terms of the issue of adaptability between different residential apartments, with their differing constructional systems, and interior designs.

As is seen in the case studies that selected, it was shown examined that the most different and complex form of adaptability type is the ability to separate and rejoin spaces with the use of movable partitions and the ability to adapt interior dividers for

future needs. Second is the ability to convert space from one function to another without any structural modifications.

Another important peculiarity which can offer adaptability is an open plan and free structure system, which features dominant the case study examples shown. These study examples also demonstrate that movable partitions, open plan and free structure systems are the most important features and indicators of an adaptable dwelling.

In conclusion characteristics provide the possibility of obtaining most of the forms of adaptability types that were identified in the selected cases.

Chapter 5

THREE EXAMPLES OF LOW INCOME SOCIAL HOUSING IN NORTHERN CYPRUS

In this chapter the history and style of social housing in Northern Cyprus will be discussed. These social housing projects are built by government, cooperative and local authorities to the minimum standards of dimensions and facilities, which meet the legislation for residential buildings. They are stable and cheap.

Moreover, until June of 1998, totally 3275 housing units been constructed.2616 of these houses were built by the governments of TRNC by the Ministry of Housing and rest of 659 are built by the cooperatives (Hoşkara, 1999)

> The social housing has a very systematic organization with laterally reversed apartments as well as the common halls and entrance between two apartments. These naturally connecting elements that facilitated sometimes almost encourage the combining of apartments as well as the common halls and entrance between two apartments (G.Welling & Leupen, 2008).

The household users could be classified according to their needs in terms of dwelling. The type of household and the number of children is important. However, the needs of households change over time. It is, therefore, important to construct low cost dwelling of differing sizes to meet a variety of familial and economic needs. It is important that the users can identify with their dwelling and feel satisfied. Nowadays social Housing Corporation is open to define the spatial composition of the home by themselves (Moller-Jensen V. , 2008).

Household living arrangements, homeownership status, income and access to household or social support all combine to create the living environment of the household (Barrett, Twitchin, & Kletchko, 2006).

There is a requirement for the partial development of supported housing models targeted towards the needs of the household. With differing levels of need, it is appropriate to ensure the availability of a variety of supported housing arrangements ranging from intensive residential care to less intensively monitored independent living arrangements. High-quality supported housing that provides a living environment supporting basic functioning and is conducive to meeting the social integration needs of people is an important requirement of people who are weak and/or vulnerable a policy challenge to be met (Patrick Barrett, Twitchin, Kletchko, & Ryan, 2006).

Since human beings have lived in dwellings, the dwellings have constantly changed, remodeled, renovated, and updated. Most old houses have multiple layers of wallpaper or paint, new additions/extensions, altered floor plans, whole new kitchens and bathrooms and modernized mechanical systems. Occupants demonstrate a lot about their constantly changing lives in their homes (Benson, 2010).

5.1 History of social housing in Cyprus (1930-2000)

> Social housing is not a novel issue for the Turkish Cypriots. Even before the First World War, an important social housing scheme was implemented in Nicosia. Therefore, before starting to analyze recent developments in this issue, it is also important to consider and give mention to the past developments (Dreghorn, 2009).
> A social housing settlement should consist of minimum forty dwelling units. According to the same legal framework non-profit cooperatives are also authorized to build social housing in accordance with the definitions and conditions stated. Such cooperatives are established within the body of public institutions such as some banks, unions security forces, teachers, labour, etc. According to this legal framework construction of social housing began in 1983 and dwelling having 100Sqm, 85Sqm, 60Sqm began to be habituated from 1986 on (Baytin, 2005)

The social housing in Northern Cyprus began to be developed in the 1930s, in Nicosia, and was the responsibility of Nicosia's municipality. The cost of the apartments was below the average, the occupants could rent or buy the apartments and the cash were paid to the municipality. Following Greek-Cypriot atrocities in 1964, a significant percentage of the Turkish- Cypriot population had to leave their homes and move to more secure housing cooperatives which were under the control of the Turkish-Cypriots. After some time the Turkish-Cypriots, who lived in this closed society, moved and spread all over the island. Immigrants were provided with the short term accommodation in tented camps, warehouses, schools and other governmental buildings (Gazioglu, 1993).

> Early in 1965, the Turkish- Cypriot administration developed a Refugee Housing Project to upgrade the living conditions of at least some of the refugee households. Within six years, in 65 different urban and rural settlements, 1,513 dwelling units had been built and allocated to the neediest households. Of these units, 247 had one bedroom, while the rest had two. The floor area ranged from 46 Sqm to 70 Sqm. Of the 1,513 units, 503 were prefabricated, while for the rest brick was used as the construction material. At present, most of these dwelling units are still inhabitable and are being occupied by low-income households. The government allocates these units to eligible households and collects no rent (Gazioglu, 1993).

Between 1966 and 1971 the government built apartments for the migrant people the general information is shown in the tables below,

Table 4 : Apartments built for the migrant population shown yearly

Apartments built for the migrants shown by year						
Year	1966	1967	1968	1969	1970-71	Total
Number of units	130	206	512	424	241	1513

Source: (Dreghorn, 2009)

The apartments were all located in different parts of the island such as Nicosia 901 units, Famagusta 33 units, Kyrenia 111 units, Larnaca 116 units, Limassol 120

units and Paphos 232 units, giving a total number of 1,513apartments build particularly for migrant people who would need shelter. This social housing at this time (1966 -1971) had two bedrooms and a floor area of between46 and 70Sqm46 to 70 Sqm (Dreghorn, 2009) .

The number of Turkish immigrants from the south to the north was less than that of the Greeks that migrated from the north to the south, the housing stock available in the north exceeded the demand, and thus, little new construction took place in the late 1970s and early 1980s in the northern part of the island

"It was only after the 1980s that new housing developments became one of the major components of urban developments in order to answer the changing needs felt at social, economic and cultural levels. From this period onwards, housing environments have shown two different trends, mass housing and individual housing" (Gazioglu, 1993).

> During the late 1990s and early 2000s, the situation in respect of housing developments changed. The government initiated no other social housing projects after June1998, despite the fact that there was an increase in demand especially from the ever-increasing university student population. The needs and requirements of the users and the larger society had changed. Local people started investing in second homes, to accommodate their changing needs. There was also an increase in foreign investments in the housing construction sector. In addition to the increasing number of private individual housing units, planned multiple housing developments became the major construction activity and a leading sector within the economics of the country (Önal Hoskara, Tevfikler Çavusoglu, & Öngul, 2009).

5.2 Social Housing process in Cyprus

"While the traditional Cypriot house was evolving under the influence of the physical and cultural factors of the island, the traditional urban Cypriot house had also started its own evolution under this new culture, and it became one of the most identical architectural forms in the urban areas of the island" (Numan & Pulhan, Living Patterns and Spatial Organization, 2001, p. 35).

"According to the Social Housing Law, citizens of the Turkish Republic of Northern Cyprus are eligible to apply for social housing if they do not own a house and do not have sufficient financial resources to build one for themselves" (Gazioglu, 1993).

In addition, Economical levels of the households should be estimated by the authorities. The number of children in the household, the ratio of the rent to the total income of a household and also some other similar factors are the defining criteria for establishing a household's financial statues. Finally, the government chooses the eligible households whose situation meets aforementioned mentioned criteria, and is able to pay 15-20 per cent of the deposit amount (Department of Social Housing, 1980).

> The interest rate for social housing loans has been 68 per cent. Occupants pay 20 per cent of the interest and the government subsidizes the remaining 48 per cent. As of April 1993, the interest rates reached 80 per cent, of which occupants paid 30 per cent and the government the remaining 50 per cent (Department of Social Housing, 1980).

According to the comments of the occupants of the social housing, the government has provided four types of options for payments on the houses. Thus, they have 5 installments or more in 10, 15 and 20 years, respectively. Those people, who are able to finish their instalments earlier, have the opportunity to do so if they wish and, therefore, their loan could be finished sooner, thus saving on the interest part of the payment, of course, According to the security reasons, beliefs, customs, ethical attitudes and generally some specific and fixed reasons, the inhabitants consider their houses as part of their estate and, therefore, a valuable place, for which the money owing on it should be re-paid as soon as possible; thus ensuring their ownership earlier (Department of Social Housing, 1980). According to the comments

of the people, 1300 households have already re-paid their loans in full and are now in ownerships (Department of Social Housing, 1980).

5.3 Housing organization in Cyprus

> The first housing cooperative estate was designed in Göçmenköy, a suburb of Nicosia, in 1981, by Is-Coop (Workers' Cooperative Development Society) and Türk-Sen (Trade Unions Federation). Between 1983 and 1989, 360 units were completed in Nicosia by these two organizations. Four other housing cooperatives managed to build 290 units in Nicosia for their members during the same period (Department of Social Housing, 1980).
> The planning system in Northern Cyprus is creating an unstable and disorganized situation, which results in disappointing, low quality living environments, both in physical and social terms. The lack of the contribution of national policies and/or regulatory bodies in respect of contemporary concepts on urban growth and planning -such as sustainable development, a compact cities approach, ecological concerns, etc., as well as the lack of development control over rapid urbanization, both in urban and rural settlements, constitute the two main negative inputs in relation to the development of urban environments in general, and to housing environments in particular (Önal Hoskara, Tevfikler Çavusoglu, & Öngul, 2009).

Housing cooperatives are the constructors of the social housing projects. Official permission for building construction work and the selection of suitable sites with appropriate rates are arranged under the supervision of the government. Many of the Housing cooperatives companies, are supervised and controlled by the government during the administrative process, the planning and the building of the projects. Some of the housing cooperatives meet a number ongoing problems during the work of the projects, such as a lack of/or inadequate management, design faults, and a lack of formal and clear planning arrangements and agreements in the initial construction stages, slow building progress and other similar problems. These problems contribute to make the building process irregular and inefficient. Those eligible households involved in any such project obviously agreed quality standards and delivered to them by the pre-agreed date.

Being one of the major housing contributors/ providers within the cities of Northern Cyprus, the mass housing groups are located in different districts,

especially in the main cities of Lefkoşa, Famagusta, Iskele, and Girne (Önal Hoskara, Tevfikler Çavusoglu, & Öngul, 2009).

Table 5: Examples of Mass Housing Units in different regions

Examples of Housing	Type/Region
	Samanbahce Row Houses /Nicosia
	William Caruana's Row Houses for Subsidized Workers / Nicosia
	Government Social Housing – Row Houses / Famagusta
	Private Apartment Type of Social Housing / Famagusta
	Private Apartment Type of Housing of the Private Companies / Kyrenia

Source: (Önal Hoskara, Tevfikler Çavusoglu, & Öngul, 2009)

Compared to Nicosia, the other two major cities, Gazimağusa, and Girne demonstrate different housing preferences. In Famagusta, detached houses are in the highest percentile of (51.4%); followed by the apartment blocks (22%) and then the semi-detached houses (20%) being either designed as standing

side-by-side or as very low-rise apartment style buildings. Based on the observations of the authors, it can be argued that the underlying reason for Famagusta's high percentage of detached housing is that, the local people tend to rent the houses in which were re-located following the 1974 intervention and in which they then settled down and reminded. Mainly to university students and now prefer to build their own houses usually with a piece of garden ground. This is due to the fact that the houses they were allocated for their use after the division of the island could, it seems, never perceived as their 'own', which fact is very clearly obvious in respect of the general condition of the houses, all those years of living in an unstable political state (Önal Hoskara, Tevfikler Çavusoglu, & Öngul, 2009).

5.4 Government proceedings act in Cyprus (1980-1993)

Between 1984 and 1992, the government successfully implemented three housing schemes and built 1,528 units (Table 5). Government programmed projects have been more successful than those of cooperatives in terms of financing, the number of units built, coordination, administration, design, quality and timely delivery. Recent official announcements indicate that financial resources needed for the Fourth Phase have been made available by the Turkish government (Department of Social Housing, 1980).

A short time ago, the government also started a new project which provides building sites and partial credit to those who want to build their homes in rural areas. By 1996, 1,384 building sites had been allocated to eligible households for this purpose. The aim of this approach is to encourage young couples to stay in rural areas and to prevent rural-urban migration (Gazioglu, 1993).

PHASE I: (1984-1986)

Phase I was financed by the government -258 out of 298 units built in this phase were duplex and 40 were apartments. Nicosia ranked number one in terms of the number of units The average cost per unit was approximately UK£12,828.

PHASE II: (1985-1989)

Phase II was financed by the Ministry of Finance in Saudi Arabia, and completed in three parts -260, 300 and 488 units built in each part respectively. Of 1,064 units, 640 were located in Nicosia. The number of apartments is 184 .The average cost per unit was UK£13,000 - UK£13,450 (Table 5).

PHASE III: (1990-1992)

Phase III was financed by the government. Of 240 units built in this phase, 104 are located in Nicosia. All of these units are apartments .The average cost per unit was approximately UK£16,752.

PHASE IV: (1993-Present)

In Phase IV, 504 units were financed by Turkey's Social Housing Fund and 632 units by the government of the Turkish Republic of Northern Cyprus. All the units are apartments, with 608 in Nicosia, 336 in Famagusta, 112 in

Kyrenia, 64 in Güzelyurt and 16 in Lefke. The average cost per unit is approximately UK£14,188 for 85 Sqm units and UK£10,016 for 60 Sqm units (Department of Social Housing, 1980).

Table 6: Cost of state social housing in Northern Cyprus

PHASES	NO. of UNITS	UNIT COST, TL	COST in UK£	UNIT COST, UK£	EXCH. RATE	
Phase I	298	1,874,568,474	6,290,500	3,822,744	12,828	490
Phase IIA	260	3,234,193,108	12,439,203	4,034,336	13,448	925
Phase IIB	300	4,078,104,722	13,593,680	6,503,643	13,327	1,020
Phase IIC	488	9,166,513,730	18,783,838	6,392,402	13,099	1,434
Phase III	240	18,749,920,000	78,125,000	4,020,585	16,757	4,664
Phase IV	1,134	305,285,206,968	269,210,941	17,793,624	15,691	17,157

Source: (Department of Social Housing, 1980)

It is not easy, even if it is possible, for a low-income household to pay for such a dwelling unit even with the state help for people on a low income of a lower loan interest rate. It is not amazing, but most of these units have been occupied by households who have managed to pay 15 to 20 per cent of the cost as a down-payment and have enough of a regular income to pay back the balance over a five to twenty year period (Department of Social Housing, 1980).

"Ownership of a car, colour TV sets, video recorders, washing machines, dishwashers and modern furniture are reliable indicators of the material well-being of occupants. These households could easily afford to repair the units with no need of government help when required" (Department of Social Housing, 1980).

"The smaller dwelling units of Phase IV have enabled more households from lower-income groups to apply for eligibility. Now the government plans to build

houses for rent for those who cannot afford to make the down-payment and monthly mortgage payments" (Department of Social Housing, 1980) .

Social housing systems have realized a great deal of what was expected from them.

> The positive and negative sides of the implementation are lessons learned from the past to be used to create better projects in future. Design of units, concerns of energy-saving, the patterns of the building sites, emphasis on using more local building materials, quality of workmanship, coordination, administration, eligibility and similar aspects need to be analyzed in more detail in order to allocate better scarce resources and create livable environments for the community (Gazioglu, 1993).

5.5 Some brief information on three examples of low income social housing in Northern Cyprus

"In individual apartments most of the low-income households buy the lands, accessible and affordable for them, mostly on the basis of monthly instalments, design their dwellings themselves according to their own needs and tastes –generally based on around and are aspired to have" (Baytin, 2005).

Another type of private housing is the villa type. This type usually belongs to high income households, such as households who have businesses abroad. They may, in fact, actually live abroad and only use their villas in Northern Cyprus for a few months a year for their holidays (Baytin, 2005).

> Social housing settlements should consist of a minimum of forty units. According to the same legal framework non-profit cooperatives are also authorized to build social housing in accordance with the definitions and conditions stated. Such cooperatives were established within the body of public institutions such as in some banks, unions of security forces, of teachers and labour, etc. According to this legal framework construction of social housing began in 1983 and dwellings with a floor area of 100Sqm, 85Sqm and 60Sqm were built and inhabited from 1986 onwards. Social housing is of two types as follows:
>
> a. Multi-storey apartment-house type,
> b. Low-rise, single-household dwelling type: This type can be in detached, semi-detached or row style or form (Baytin, 2005).

The major focus of this thesis is apartment, single-household dwelling types.

"The dwellings belonging to this type are located in small gardens, have an entrance hall, a kitchen and toilet in the ground floor, three bedrooms and a bathroom with closet on the upper, first floor" (Baytin, 2005).

The survey details and outcomes given in this paper of 200 local governmental social housing scheme in Famagusta, (Tr. Gazimagusa), Nicosia,(Tr. Lefkosa), Iskele (Tr.Trikomo) and Kyrenia,(Tr. Girne) demonstrate how local authorities have identified how important the concept of adaptability is. The questionnaires were put to the inhabitants of the case study areas: Viz. Nicosia, Famagusta and Kyrenia (in April 2010). A hundred of the questionnaires were completed by residents of Famagusta, which include government funded and controlled social housing and private social housing estates, the Caesar Resort, 50 by Nicosia and 50 by Kyrenia citizens. Since the majority of residents are Turkish speakers, the questionnaires were translated into Turkish and taken from both English and Turkish languages from inhabitants. (Appendices "A and "B") Some Turkish speaker friends have helped the author during the translation and distribution of the questionnaires. The results for the analysis of the 100 questionnaires taken are illustrated in appendix C, D and E by the use of some charts and tables.

The respondents were selected from, 3 and/or 4 storey buildings. Some of the chosen respondents from these social housing areas refused to answer the questionnaires, because they thought that the interviewers were likely to be governmental officers; however, some other respondents tried to respond to the questionnaires with patience and interest. The majority of the respondents did not have a high level of educational background; however, a few of them were university students and could be classified or considered as educated persons. These groups were mainly interviewed in Kyrenia.

Figure 58: Appointment with a kind household from one of the flats in the social housing in Famagusta
Source: (By Author, 2010)

5.6 Analysis of the three examples of low income social housing in Northern Cyprus

5.6.1 Example 1: Famagusta: "İsmet İnönü Bulvarı"

This social housing area located in Famagusta is situated beside the "İsmet İnönü Bulvarı". The site is close to traffic lights and a mosque. Some of the houses in this state are located facing to the street, whilst others are to the rear of these and are arranged in four or five rows. They are all designed as five storey buildings and the sizes of these apartments vary. For example, one of these apartment's areas are different to each other. One of the apartments is 60 Sqm and 26 of these apartments are 100 Sqm. Some of the ground floor apartments are used as shops. The buildings are placed side by side and between the apartment blocks there are some empty spaces for access to the car parking area, albeit, originally the ground floor was totally designed as a parking area, however, during the construction of the project the ministry of social housing decided to change the function of the parking area to shops as a way of creating some job opportunities for the residents.

Consequently the social housing in Famagusta are situated in two different locations. One of them is located next to the “Gazi-Mustafa Kemal Bulvari”. These houses are arranged in four rows and are all duplex buildings. The important fact about the duplex buildings is that they are not more apartments. Perhaps this is due to the need for people to have independent living space and that they prefer not to live in an apartment block.

The above mentioned houses have a kitchen and living room downstairs, a yard or a garden to the rear and three bedrooms and a bathroom upstairs. The parking space is located placed in the front garden to the side of the building.

Figure 59: Street view of a part of a social housing area in Famagusta in 2010
Source: (By Author, 2010)

Figure 60 : Cross view of a part of a social housing area in Famagusta in 2010
Source: (By Author, 2010)

Figure 61: Front and Rear views of a social housing are in Famagusta in 2010
Source: (By Author, 2010)

Famagusta social housing was built 35 years ago. The social housings are located in " İsmet İnönü Bulvarı " and the researcher visited 50 of the apartments. These apartments are one storey buildings and the majority of respondents (48%) are four person households. The other respondent households are three and two person households. The majority of the answers in the questionnaires are from respondents who are/ were government employee in Famagusta (41.30%). The remaining responses were received from people in the 40-50 age brackets (36%), in the 30-40 (26%) age bracket and finally, in the 50-60 age bracket 20%. The respondents in the social housing in Famagusta were: firstly government employee, secondly housewives, thirdly free employment.

The major reasons for people residing in these houses are: 1) financial and budget related reasons (40%), 2) area of the house (34%), 3) location (20%) both financial and location (6%) that more explanations are seen in appendix C with chats and diagrams.

The general statistics collated from the information gathered from the residents in response to the questionnaire can be summarized thus: changing the interior arrangement of the apartments according to the needs and number of person in the household is: a) possible (56%) b) impossible (44%). The ones who believe in the possibility of applying changes firstly prefer to alter change the kitchen and services,

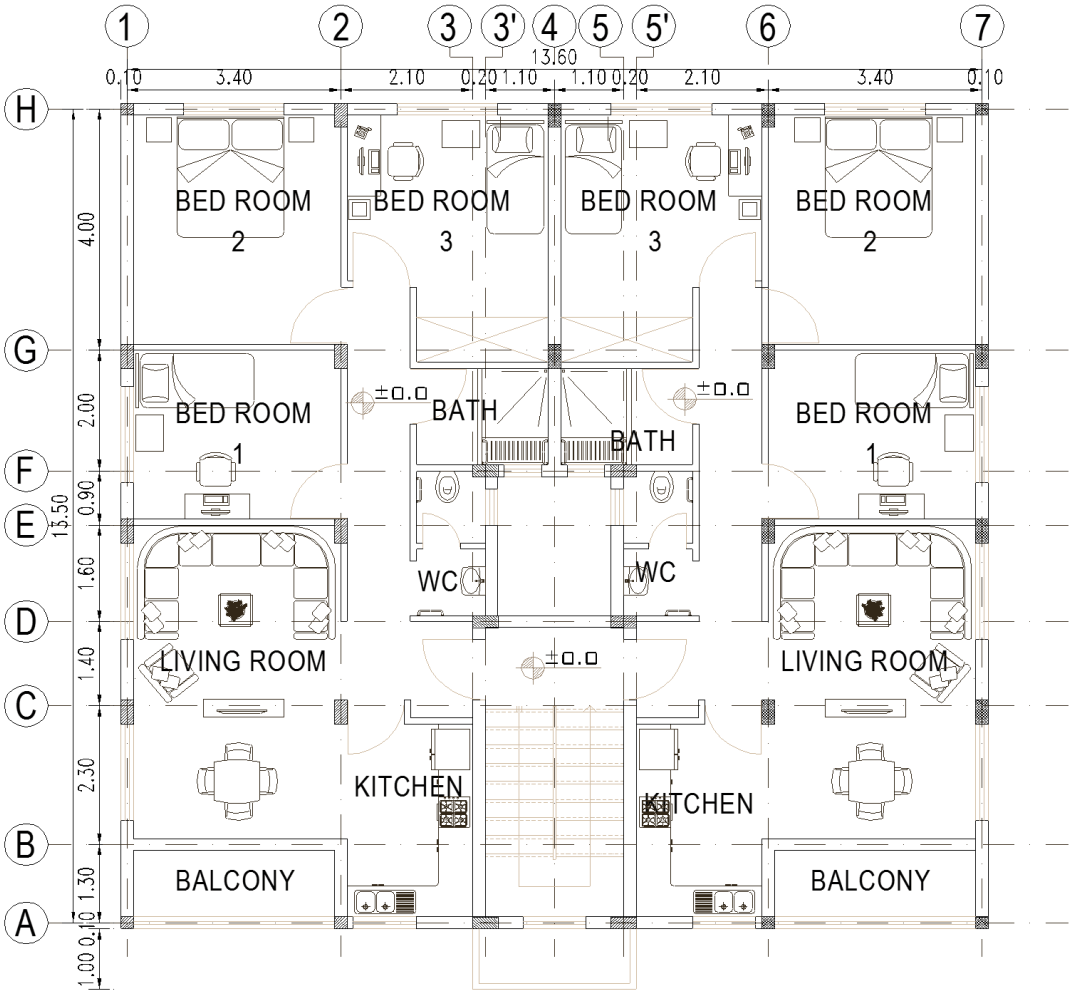
secondly as they are interested in having larger bedroom and living room spaces, 54% prefers to have bigger kitchens, 16% prefers to have alteration to the kitchen and the bathroom, 12% prefers to have changes to the bedrooms, 12% to the living room. Generally, 4% of people do not want any changes in their apartments.

According to the prepared statistics, 48% of people can afford to apply changes to the interior arrangement of their houses, 28% cannot carry out these kinds of changes because they are either retired and cannot afford it or others have a low income. 24% of people are likely to be in a position able to apply changes to their apartments in the future.

42% of the inhabitants have announced that they has already applied changes to their houses whilst, 58% have applied no changes at all. 67% declared that it was possible to update and adapt the houses with new technology. From the point of view of the respondents, 14% believed that it was possible to integrate their own ideas into the design plan and the actual construction before the building is completed. (Creating the skeleton of the building) and then taking up residence and effecting any requisite changes or alterations at that point. They would prefer it if the government organized things in this way for then in the future. As aforementioned further social housing construction is planned in the future, primarily, in Famagusta. Finally, 70% of the respondents were not satisfied with their apartment and would prefer to effect some interior changes, however, many of the desired changes are not possible, on account of the aforementioned reasons. The reminder of the respondents (30%) do not wish to make any changes to the apartments. The government does not object to any alterations or changes being made to the houses as long as these are limited to interior spaces only and do not affect the exterior or urban spaces. If they affect the

urban features of the houses are affected by their changes, penalties would be payable to the government.

In conclusion, the most important adaptability factors from the point of view of the users which can be identified in social housing are primarily are, plan of the flats, secondly the family situation according to their income, thirdly size of the apartments and finally, the existence of sufficient space along with appropriate housing design plans.



Drawing 1: Typical floor plan of two 85 Sqm flats
Source: (By Author, 2010)

Drawing 2: Front elevation
Source: (By Author, 2010)

5.6.2 Example 2: Nicosia: "KonutlarMehmet Ahmet Kucuk Caddesi Sosyal Konutlar, Sht Sonay Beyzade Sk & Hasan Bilgen Sokak"

The social housings in Nicosia is located in the following streets; Mehmet Ahmet Kucuk Caddesi Sosyal Konutlar , Sht Sonay Beyzade Sokak & Hasan Bilgen Sokak. The duplex houses are in "Sht Sonay Beyzade Sk". One of the problems within Nicosia is that there are not enough houses in the city. Some new social housing is planned as follows: 280 houses, which are 85 Sqm with two bedrooms.

The social housing in Nicosia was constructed 35 years ago, as with that of in Famagusta. The researcher visited 50 houses in the street: "Konutlar Mehmet Ahmet

Kucuk Caddesi". These apartments are 4 storey buildings and the majority of respondents (58%) are 4 person households. The other respondent households are 2 and 3 person households (18% of the respondents). The majority of the answers in the questionnaires are from respondents who are/ were students in Nicosia (36%). The remaining responses were received from people in the 40-50 age brackets (30%), in the 50-60 (18%) age bracket, retired people (10%) and finally, in the 30-40 age bracket 6%. The respondents in the social housing in Nicosia were: students 14%, retired persons (majority), business men, teachers or government employees.

The major reasons for people residing in these houses are: 1) financial and budget related reasons (46%), 2) the district of the housing (28%), 3) both financial and location (14%) and location (12%) that more explanations are seen in the appendices with chats and diagrams.

The general statistics collated from the information gathered from the residents in response to the questionnaire can be summarized thus: changing the interior arrangement of the apartments according to the needs and number of persons in the household is: a) possible (62%) b) impossible (38%). The ones who believe in the possibility of applying changes prefer to alter change the bedrooms and the kitchen as they are interested in having larger bedroom spaces, 28% prefer to have bigger bedrooms and kitchens, 16% prefer to have alteration to the kitchen and the bathroom, 12% prefer to have changes to the living room, 4% to the dining room and services. Generally, 8% of people do not want any changes in their apartments.

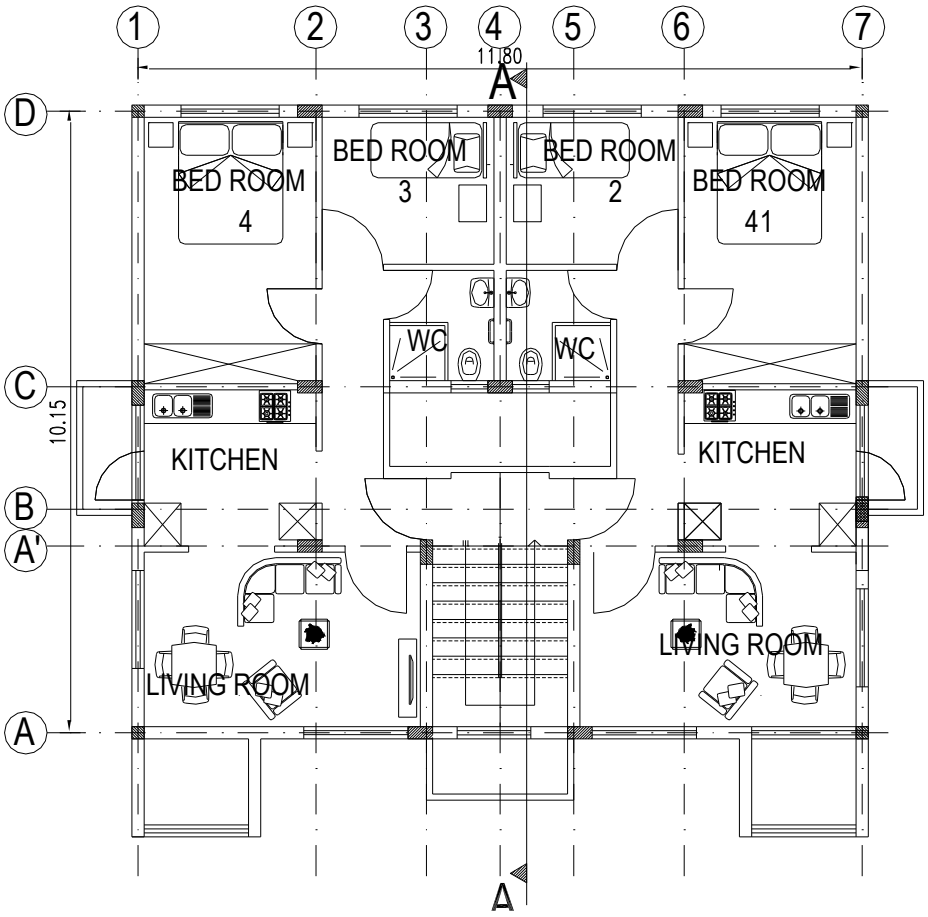
According to the prepared statistics, 38% of people can afford for to apply changes to the interior arrangement of their houses, 34% cannot carry out these kinds of changes because they are either retired and cannot afford it or others have a low

income. 28% of people are likely to be in a position able to apply changes to their apartments in the future.

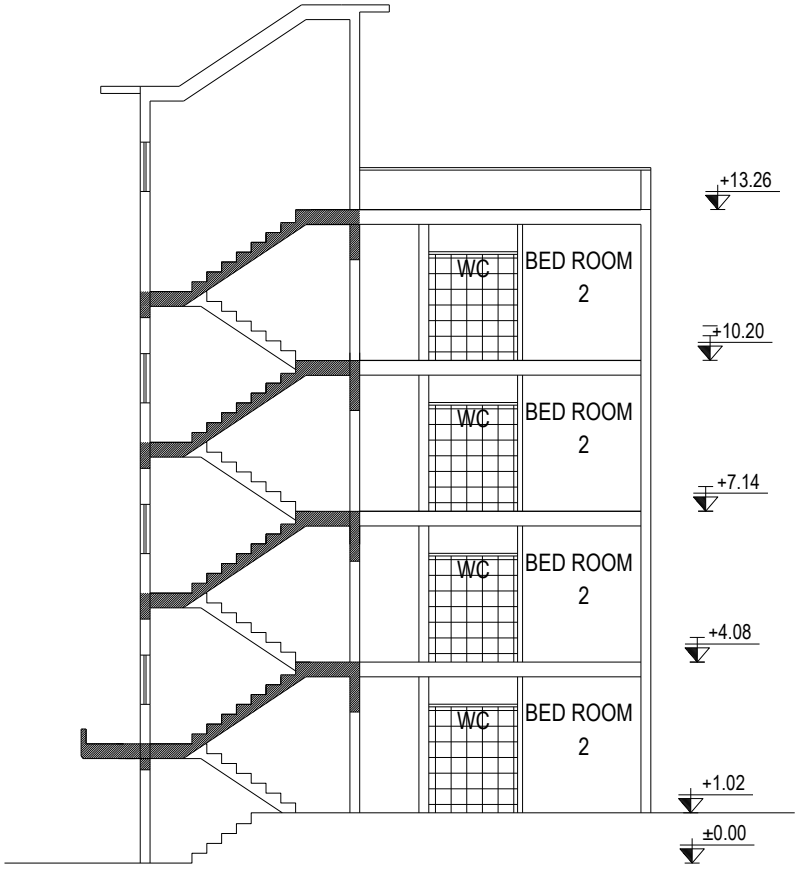
46% of the inhabitants have announced that they have already applied changes to their houses whilst, 54% have applied no changes at all. 79% declared that it was possible to update and adapt the houses with new technology. From the point of view of the respondents, 50% believed that it was possible to integrate their own ideas into the design plan and the actual construction before the building is completed. (Creating the skeleton of the building) and then taking up residence and effecting any requisite changes or alterations at that point. They would prefer it if the government organized things in this way for then in the future. As aforementioned further social housing construction is planned in the future, primarily, in Nicosia. Finally, 72% of the respondents were not satisfied with their houses and would prefer to effect some interior changes, however, many of the desired changes are not possible, on account of the aforementioned reasons. The reminder of the respondents (28%) do not wish to make any changes to the apartments, the majority of people in this group being either retired or students who have only rented the houses for a short period of time. The government does not object to any alterations or changes being made to the houses as long as these are limited to interior spaces only and do not affect the exterior or urban spaces. If they affect the urban features of the houses are affected by their changes, penalties would be payable to the government.

In conclusion, the most important adaptability factors from the point of view of the users which can be identified in social housing are primarily are, the existence of sufficient space along with appropriate housing design plans and secondly, the size of the households and their financial level.

In the below pictures and plans below we can see the organization of the plan with section, elevation and the situation of the social housing in Nicosia (As it was mentioned before the plans of the social housing in Northern Cyprus is similar to each other):



Drawing 3: Typical floor plan of two 60 Sqm flats
Source: (By Author, 2010)



Drawing 4: A-A Typical section
Source: (By Author, 2010)

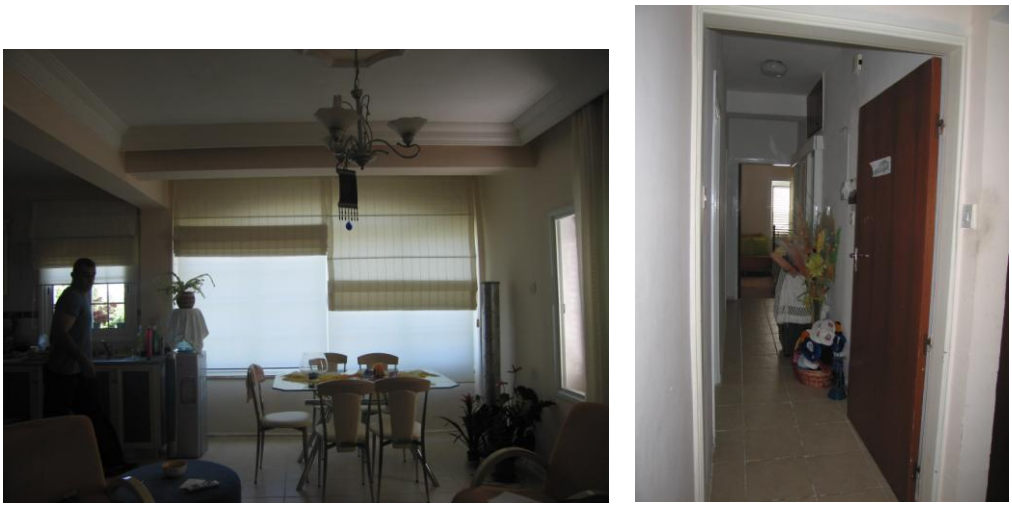
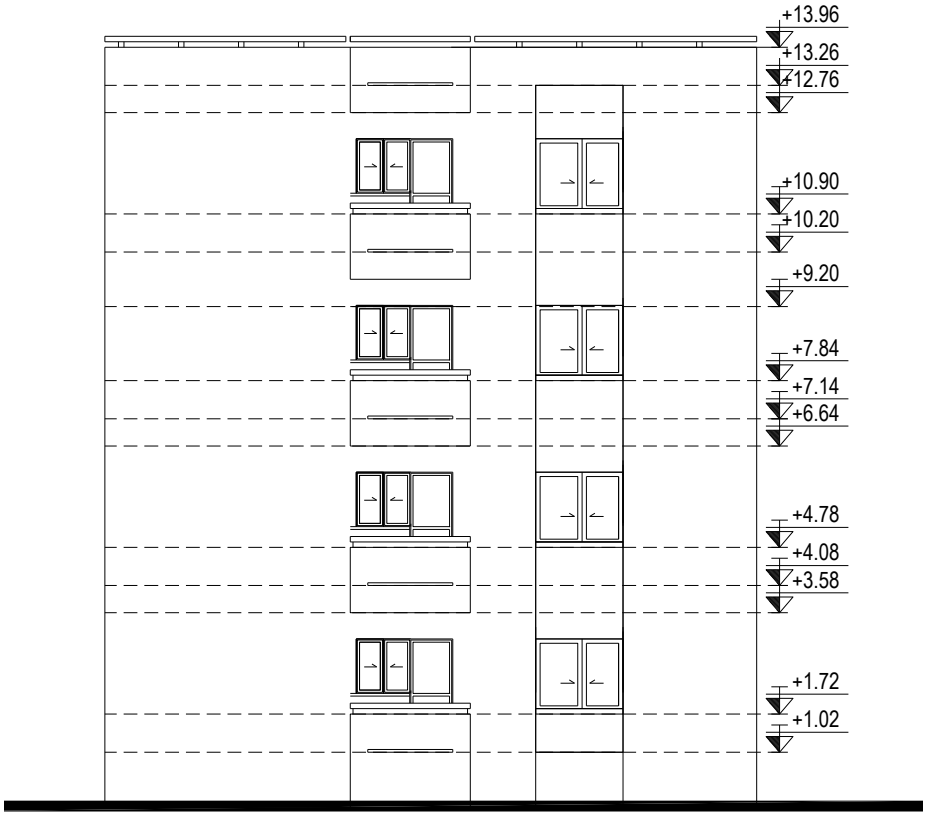


Figure 62: View of inside of the social housing apartments in Nicosia
Source: (By Author, 2010)



Drawing 5: West elevation
Source: (By Author, 2010)

Figure 63: View of the location from social housing apartments in Nicosia
Source: (By Author, 2010)

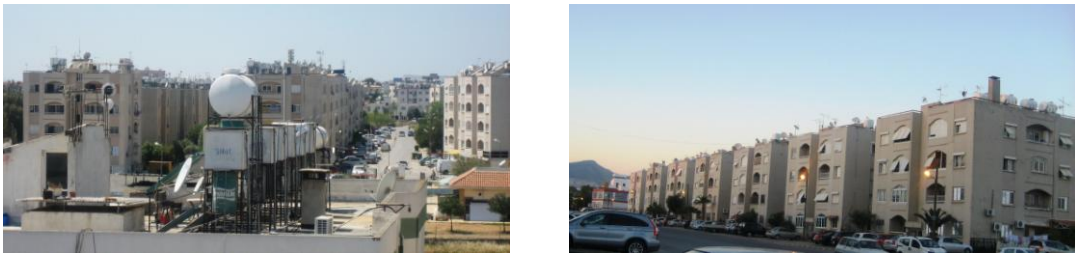


Figure 64: View of the location from social housing apartments in Nicosia
Source: (By Author, 2010)

Figure 65: Top view of the location from social housing duplex in Nicosia
Source: (By Author, 2010)

5.6.3 Example 3: Caesar Resort: "Karpas peninsula or the Panhandle, the easternmost part of Northern Cyprus on the Mediterranean coast"

Caesar Resort apartments are located on the "Karpas Peninsula or the Panhandle", which is a coastal area situated in the eastern part of Northern Cyprus. It is 5-minutes walk from this area to the sea (600m) and it is located next to the village of Iskele, which is, ten minutes from Famagusta. There is also a further hotel under construction close by which will prove to be a future economical asset to the area.

These apartments cost around 20,000-25,000 £. The style of the design of this apartment is inspired by the "Roman Style". (The names of the apartments mentioned are inspired from Roman language (Roman Style)).

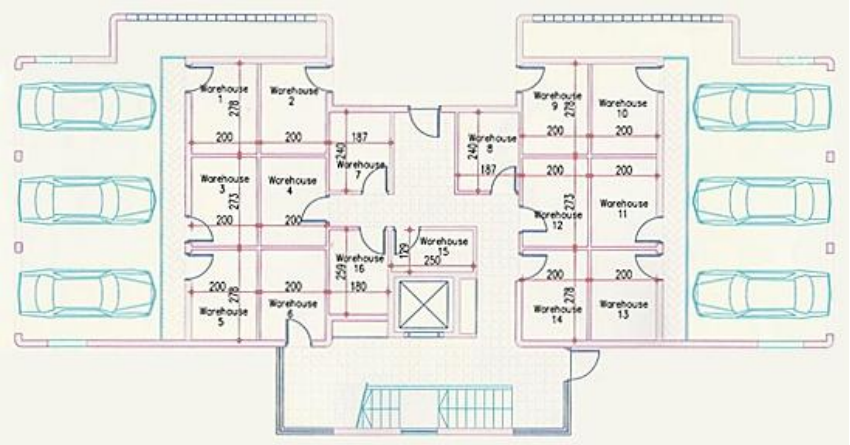
Some parts of these apartments are rented to Eastern Mediterranean University students. There are services (transportation facilities) supplied for the residents and each apartment has a lift and each unit has storage space on the ground floor.

Figure 66: View of the location of Caesar Resort apartments in Iskele
Source: (By Author, 2010)

These apartments are designed in such a way that they can be adapted to suit and/or meet the budgets of different residents. This provides different options for the residents or tenants. These suites are either without bedrooms or have one, two or three bedrooms. There are also some penthouse apartments. The names of these mentioned apartments are as follows:

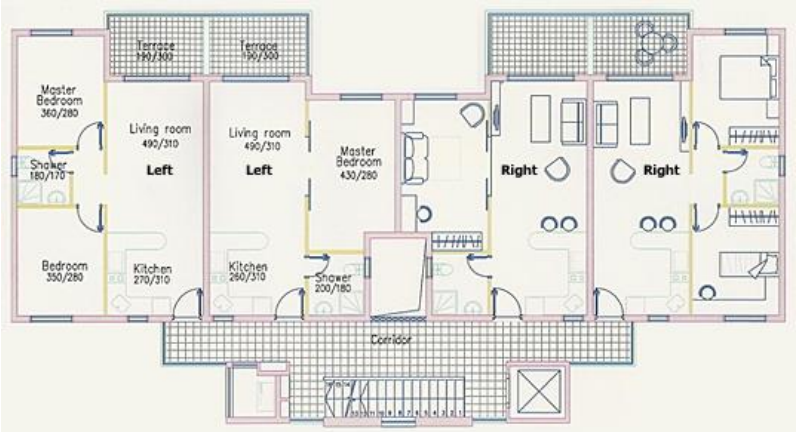
– Augustus, Brutus, Cassius

The first apartment block has five storeys some apartments have one bedroom (64 msq) and some have two bedrooms (75.5 msq), which includes a kitchen, bathroom, master bedroom and a living room with a balcony.



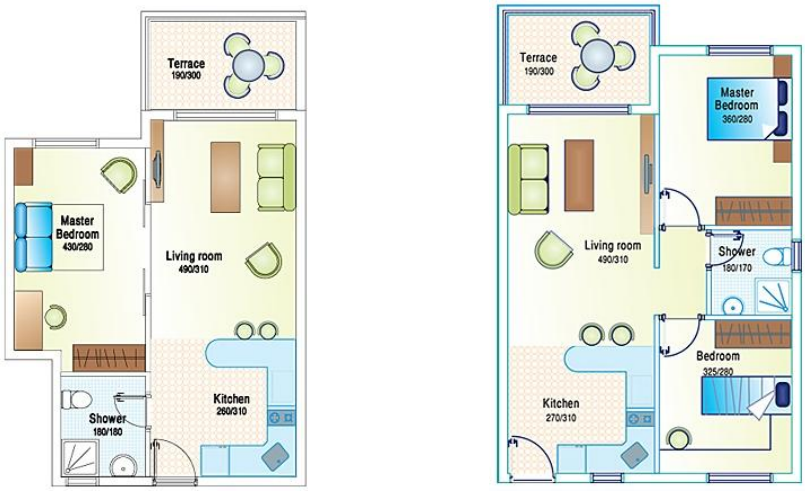
Drawing 6: Augustus block, Ground floor plan

Source: (Afik, 2010)



Drawing 7: Augustus block, General plan of 1to4.

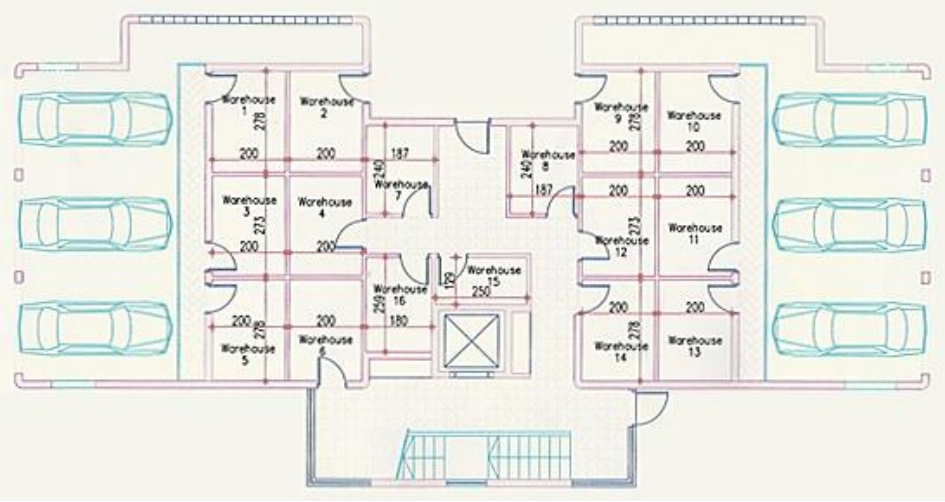
Source: (Afik, 2010)



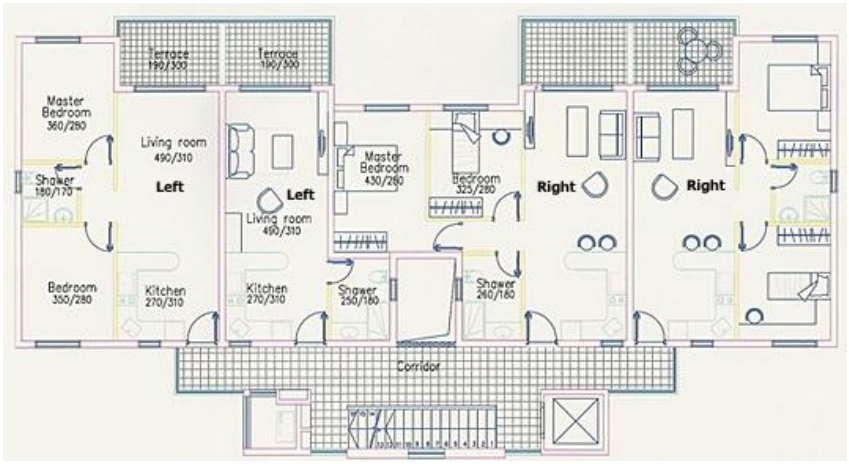
Drawing 8: Augustus block, one bedroom apartment plan64 Sqm and a two bedroom apartment plan 75.5 Sqm
Source: (Afik, 2010)

– Claudia, Claudius, Constantine

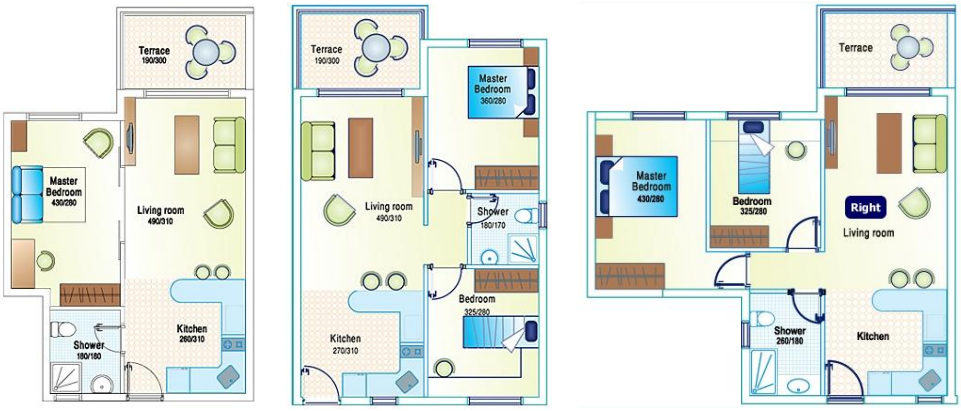
It is also a 5 story building that contains studio flats, one and two bedroom units of 75.5 msq and 80 msq respectively.



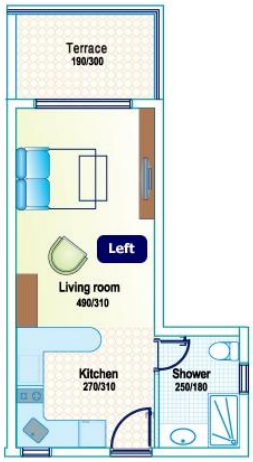
Drawing 9: Claudia block, Ground floor plan
Source: (Afik, 2010)



Drawing 10: Claudia block General plan of 1to4.
Source: (Afik, 2010)



Drawing 11: Claudia block, one bedroom apartment plan64 sqm, two bedroom apartment plan 75.5 sqm and 80 sqm
Source: (Afik, 2010)



Drawing 12: Claudia block, Studio apartment plan
Source: (Afik, 2010)

– Titus, Valerius, Victorius, Silvanus

It is a 7 story building. It includes one bedroom, two bedrooms and a penthouse on the top.

– Maximus

It has ten stories. This apartment has three bedroom houses. On the sixth floor, three bedroom houses are located. In the 7th and 8th floor, there is one, three bedroom flat and four, two bedroom flats. In the 9th and 10th floor, there is one, three bedroom flat and three, two bedroom flats.

Drawing 13: Maximus block, ground floor apartment plan
Source: (Afik, 2010)

Drawing 14: Maximus block, plan of floors 1 to 5.
Source: (Afik, 2010)

Drawing 15: Maximus block, plan of floors 6 to 8.
Source: (Afik, 2010)

Drawing 16: Maximus block, plan of floors 9 and 10.
Source: (Afik, 2010)

Since these apartments were constructed in 2007- 2008, there has been an attempt to improve and/or provide new technology in these houses such as the provision of an elevator for each building and offering better storage facilities etc. The structures of the apartments are of reinforced concrete frames. Floors are covered with ceramic tiles, balconies are relatively big, the sewage and water system is centralised and there are internal and external parking spaces (for some apartments).

There is a small amphitheatre to the south part of the site. There is an outdoor pool in the middle of the complex and there are some sport facilities and also an

indoor pool. There is tennis ground outside of the complex and a small café and restaurant for use by the residents in their leisure time. There is also a barber, a childrens' play ground with a mini golf course and a multipurpose hall which, on occasions, offers some entertainment activities such as childrens' painting facilities and mini football pitches.

As well as providing entertainment and other activities, these facilities can also provide work or encourage community/volunteer participation for some of the residents.

For the purposes of researching this paper I visited these apartments and distributed fifty questionnaires amongst the residents. The analysis of the results and their subsequent comparison with social housing schemes revealed that most of the residents of the Caesar Resort apartments are young couples, students and English households. The site plans and plans are shown below:

Figure 67: Site plan of the location of the Caesar Resort apartments in Iskele
Source: (Afik, 2010)

In the Caesar Resort apartments we are faced with a different type of statics, in respect of the fact that these buildings have been built recently, there are 2 or 3 people living in the majority of these apartments with range between 20 and 30.

Most of the English people have bought or rented these apartments because of their relatively low price and/or costs the fact that they are new builds. However, many of the residents do live there permanently but use their apartments there only for holidays or week-end retreats etc. sixty five percent of the residents are students and have these apartments as their permanent address in Northern Cyprus.

People choose Caesar Resort apartments primarily because of its location; as it has a very good view to the sea, and secondly, because of the relatively low rental cost of these apartments. The locations of the apartments were not so important to the residence, since, only 11% of them chose the apartments based on its location. 80% of residents had an academic education and the rest held high school diploma.

Some of the residents of the Caesar Resort apartments claimed that they not have the opportunity to alter the interior of their apartments according to their needs, for example, the size of the rooms. 70% of the residents did not wish to change anything in their apartments and they were happy with the way that their apartments were, but on the other hand 30% wanted to change something, for example, to have a separate kitchen and alter some features in their living rooms.

The remaining residents of these apartments do not consider it necessary to have adaptable apartments, because most of them are students, casino workers or the dancers. Therefore, they do not need big rooms; they only require a quiet place for resting after a long and exhausting day at work.

Most of the English people bought or rent these apartments because of its low price and the fact that these apartments have been built recently. However, they are not living there permanently and they use their apartments only in holidays as a perfect getaway.

More importantly, many of the Caesar residents of these apartments stated they did not have sufficient money to make any alterations to their apartments although they were optimistic that their economical situation would improve in future.

Furthermore, as aforesaid, Caesar resort apartment complex has been built for two years. Therefore, the residents have only lived there for two years or less so they have not yet changed anything in their apartments. In contrast, residents of the older social housing scheme that are thirty-five or so years old tend to alter or change their apartments.

66% of the residents agreed with the fact that their apartments were improved with advancement of new technologies. In addition, also suggested that it is much better that residents participate in the designing of the inside of their units according to their needs. For example, they prefer a bigger and separate kitchen instead of large bedrooms.

It was interesting that as many as 60% of the residents did not want to change anything inside of their apartments and only 40% wanted different interior designs. The Caesar Resort is privately owned and has no government connections. Therefore, 60% of the residents that claimed that are not permitted to change anything in the interior of their apartments without the official consent of the company which owns the property. The most important issue in respect of adoptability for the residents was, first and foremost, the shape of their apartments (Shape of the apartments means the design considerations defined by the architect, and the way these apartments have been designed as shown in the plan of the flat), and secondly, the size of their living space.

These apartments, therefore, can be described as relatively adaptable and with a little work and some minor changes, they can be more adaptable.

Figure 68: Axonometric view of a block of the Caesar Resort apartments in Iskele
Source: (By Author, 2010)

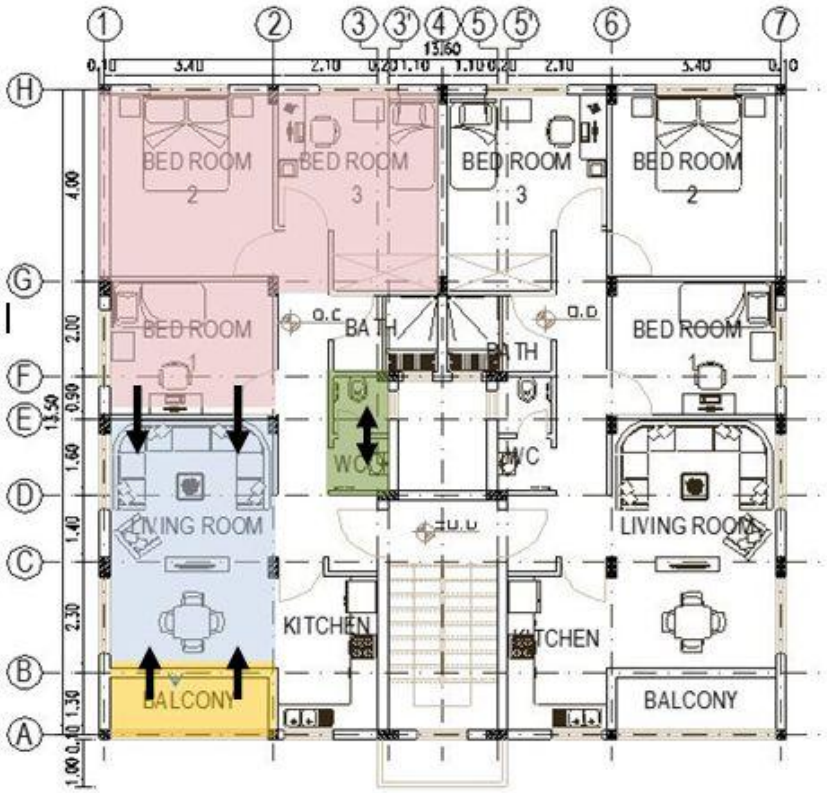
Figure 69: Front and back view of a block of the Caesar Resort apartments in Iskele
Source: (By Author, 2010)

5.7 Changes made by the households in social housing apartments in Famagusta, Nicosia and Iskele

Most of the people in North Cyprus are inhabitant of social housings. Some of the major changes which they have applied into their apartments are as following; firstly, addition of balconies to the small kitchens in order to increase the kitchen spaces, this has been seen in Famagusta, Lefkosa and Girne examples. Secondly, addition of the balconies besides the living room to the living room spaces. Thirdly, addition of one bedroom to the sitting or living room spaces in small families, this is mainly seen in the buildings with around 100 Sqm area. Lastly, in almost all of the buildings, the

bathroom areas have been changed by the users (this is illustrated in building plans in this chapter).

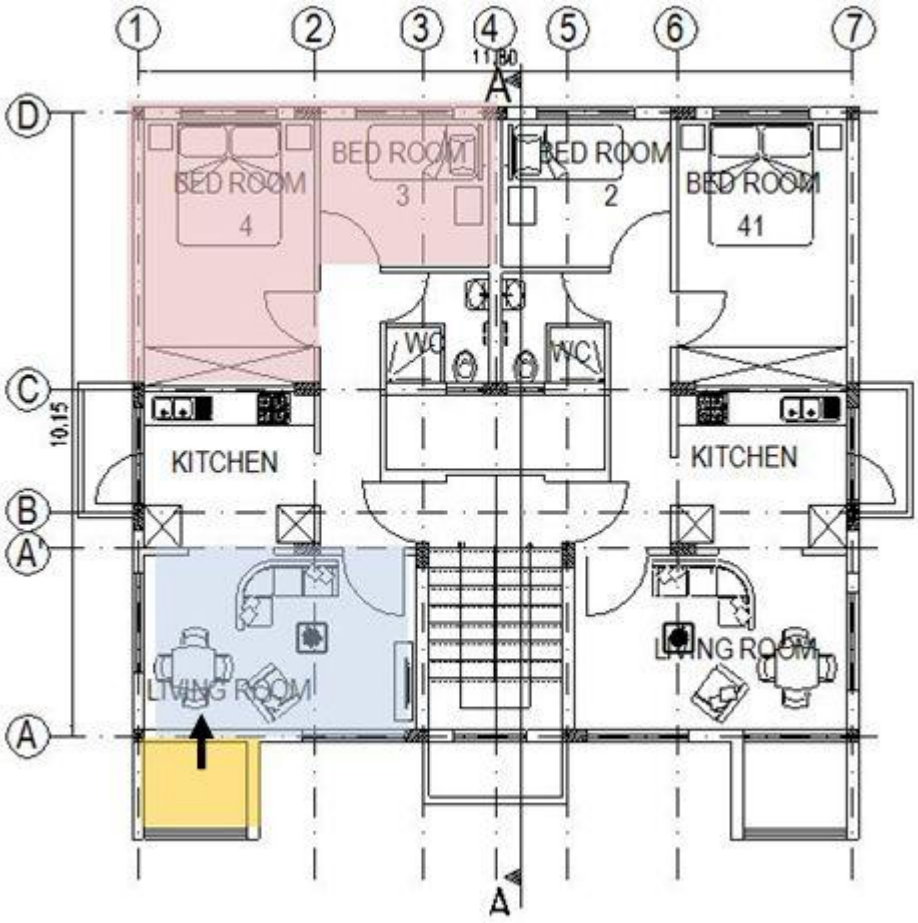
Accordingly, Plan 17 and 18 presenting the example of **c**hanges in typical floor plan of two 85 Sqm and 60 Sqm flats of social housing apartments in Famagusta and Nicosia, which one of them has two bedroom and the other one has three bedroom.these changes also obvoiuse in the Figures,



Drawing 17: Changes in typical floor plan of two 85 Sqm flats of social housing apartment in Famagusta and Nicosia
Source: (By Author, 2010)

Figure 70: Changes in kitchen and living room in plan of two 85 Sqm flats of social housing apartment in Famagusta
Source: (By Author, 2010)

Figure 71: Changes in bathroom, toilet and living room in plan of two 85 Sqm flats of social housing apartment in Famagusta
Source: (By Author, 2010)



Drawing 18: Changes in typical floor plan of two 60 Sqm flats of social housing apartment in Famagusta and Nicosia
Source: (By Author, 2010)

Figure 72: Changes in kitchen in plan of two 60 Sqm flats of social housing apartment in Nicosia
Source: (By Author, 2010)

Figure 73: Changes in facades of social housing apartment in Nicosia
Source: (By Author, 2010)

Some of the changes, which have been applied into the architectural plans of social housings of Famagusta and Nicosia by the users according to their needs and requirements, are indicated in the above illustrations. These changes have been reflected into building facades as well as plans. In spite these apartments, the Ceaser resorts have been kept in the original form without implementing any kind of changes because these apartments have been recently constructed and are made by the private construction sector.

5.8 Chapter conclusion

As seen in chapter 5, three examples of social housing in Northern Cyprus were investigated, dwellings that can have the possibility for adaptation. The households

had already changed some parts of the apartments according to their usages and requirements.

In these social housing apartments, we can have adaptable plans for future needs by modifying them.

Since these social housing apartments were constructed to meet the needs of low income households, in the future we can also have such apartments designed using the adaptability approach.

The examples also examined in terms of years for defending the change through the years, but it cannot be stated a definite increase or decrease, although, in respect of the investigated case studies it is anticipated that there will be significant technological advances and/or changes, in the near future.

Finally by applying functional adaptability, especially in respect of movable partitions, which is one of the most dominant elements of adaptable spaces, also structural adaptability that the most important factor in designing the adaptable dwelling we can have more adaptable social housing in Northern Cyprus.

After the examination of the case study in the town in Northern Cyprus, there are a few specific determinations concerning are adaptability ideas are as follows:

- Movable partitions, open plan and free structural systems are the most dominant indicators of an adaptable dwelling.
- Ability to have the free replacement of the service zones increases the adaptable character of a dwelling, because of the ability of unlimited changes to the spaces.
- Adaptability in daily usage, which can be achieved with movable partitions and adaptable furniture.

– Functional and structural adaptability are supports of each other terms of increasing the adaptability level of a dwelling.

Another outcome of the investigation is that, the examples that are shown can be designed in terms of open plan methods, although these examples have limited structural adaptability in their design.

Chapter 6

GUIDE LINES TOWARDS ADAPTABLE OPEN BUILDING IN NORTHERN CYPRUS

In this chapter, some propositions and solutions are mentioned which are necessary to apply to the essential adaptability principles for social are are housing in Northern Cyprus. As an example of these propositions, the following aspects need to be considered: structure supportive solutions, capacity to change, variable floor size, adaptability of floor plan, room design and plans, infill system and its effect on windows and the facades of the buildings.

1. Size of the apartment blocks and variable room/floor plans.
2. Concepts and solutions so that adaptability and the provision of a convenient living space for the prospective inhabitants is an integral part of the structural method. This method should take into account the size and number of the rooms. The size and number of the flats can be changed after construction. Generally, it can be said that an apartment design and layout and the room sizes should be flexible and altered when construction is complete.
3. Infill system: This method is also used to provide adaptability. Application of changes in kitchen, bathroom, furniture arrangement and partition walls are some of the possible changes.
4. Elevation: This can be done with low cost material and is economically beneficial.

One of the other possible solutions that can be taken into consideration is the adaptability principle in respect of infill plans and unit size of the apartments, so that

they can be replaced after fifteen to twenty years. For example, with new plans, the ideal adaptable apartment should incorporate all these possibilities, as well as being able to, meet and satisfy the needs of its residents.

> As a result the need for adaptable architecture supports the servant role, as it has done for most of human history. A flexible approach to our environment is now necessary for a wide range of reasons:24-hour work patterns based in the home; changing household size and groupings; ecological issues that are questioning the desirability of commuting; lifestyle issue that envisage a more fulfilling personal life; and the possibility of remote working due to communications technology (Kroneburg, 2007).

6.1 The necessities of implementing adaptability principles

Affordability and economical facilities available for the users can be used to apply the necessary adaptability principles into houses, but before doing this there is an essential need to analyze and comprehend the main three requirements; functional, socio- psychological and economical. The impressive items in adaptability can be defined as following;

A- Rearrangements in living spaces become necessary when there are changes in household organization. Specially, in today's coral households and new type of houses, living conditions are so much influenced by age of the children and parents and also their needs and requirements throughout time. Marriage and separation of children from the household on one hand and probability of joining the grandparents to the household on the other hand emphasize the importance of having flexibility in the houses; this kind of changes in traditional houses used to get reflected into the house spaces by implementing new spaces through the houses. These changes could accommodate three generations of the household at the same time in the same house.

B- In some cases, when there are changes in activities of the household members, the uses of living spaces through the houses changes accordingly.

In the past these kinds of changes used to happen by the type of occupations. As an example, small workshops in the houses such as rug production workshops could be changed into new spaces with different functions. In the contemporary age, concentration of working spaces in the work centers, workshops and factories among the cities and also progresses in local and global communication facilities have reduced the usage of working spaces through the houses; however, some domestic working spaces still exist.

C- In the new type of houses, appearance of new life style may require rearrangement in furniture of the houses. In the traditional houses, these kinds of changes used to be seen less than today and the function of the spaces would remain relatively the same as the initial considered functions. The occupied space of load bearing walls in the old houses is now free to be used as furnishing space in the new houses.

Since definition of every architectural space is defined by its existing components, creation of flexible spaces is dependent on flexibility of its components. Generally, in every built environment, three kinds of organizations can be recognized: fixed space, semi-fixed space and variable space. According to this kind of categorization, fixed spaces are made of unmovable elements such as; load bearing walls, ceilings, floors and windows. Usually, design of the fixed spaces is in a close relationship with structural systems and knowhow of the relative era.

Semi fixed spaces are the spaces, where are changeable by means of changing the furniture or furnishing arrangement. Even in some cases this definition is not limited to furniture, but it also includes the rearrangement of other elements. For example in traditional Japanese houses, the internal walls can be changed to create different spaces for various activities during the day.

Variable spaces exist, when two or more persons have communication with each other as users of the space. This kind of space is not recognizable as a visible space out of human mind; however, it can be perceived by persons; it is also related to the hidden function of the space. In spite of the modern architecture in which transparency of the spaces is achieved by visual connection and common usages of the spaces, traditional architecture provides commonality between the spaces by creating multipurpose spaces, multifunctional spaces and fluent functions.

In a flexible design, structure is flexible to be responsible to various requirements. This kind of flexibility is more than the ones provided by just semi-fixed elements. In a flexible residential building if the necessary issues are already implemented on the structural system, the internal walls are changeable for responding to the needs of users in different times. The buildings which are designed and constructed as flexible and adaptable buildings are more durable. Proper implementation of flexibility concepts needs precise programming and organizing issues; otherwise, interior spatial arrangements will be in mess and disorder.

A-The role of architects;

- Provision of a fundamental organization for the users, which is respectful to the life style and occupation of the users and also the existing environmental issues
- Consideration of psychological organizing principles in design of the spaces that reflects the personal and psychological needs of the users into the spaces. This kind of approach can be achieved by respect to tradition, local culture and needs and affordability of the users.

Thus, in both of the mentioned items as the roles of architects, the architect is aware of cultural and traditional habits of local people and consequently, is trusted by people.

A-Variability (multifunctional spaces)

Variability is the capability of carrying various functions in the space. This kind of flexibility deals with two variables: space and time. The space of a residential unit can be used for several functions at the same time and also can be used for different functions in various times.

Variability can be achieved by a special kind of geometrical order in plans, easy and clear access to the facilities of the building or considering specific dimensioning in the room sizes. The most important specifications of the variability are as following;

1- Easy and clear access to the rooms
2- Integration of functions in one space and reduction of waste spaces in circulation spaces
3- Efficient use of circulation spaces to provide easiness in the connection of spaces
4- Following the existing façade designs in the houses

Variability has been the most effective and fundamental issue in provision of flexibility in traditional Iranian housing design. There are a couple of reasons for this fact; firstly, the capability of changing the space functions throughout time can be obtained by this approach and secondly, since this approach does not need open spaces and new structural design methods, traditional building methods and daily activities of the users could be easily adapted with it.

B-Adaptability (daily and seasonal moves)

Adaptability is the capability of the space to be organized parallel to the new conditions and requirements. In the new residential buildings, adaptability is defined as fulfillment of the new requirements by changing the internal walls and adopting new installments in the houses; these changes should be done without changing the total area of the house unit. In fact, adaptability comprises all of the interior changes such as; the change of the organization, character of the space, detailed elements and space interrelationships. In the programming of new residential complexes, the most sufficient methods to attain adaptability are the use of unfixed internal elements and possibility of combining them. As an example, when the space of kitchen, bathrooms and entrance is steadily designed, the other spaces can be adapted with other functions.

C-Changeability (articulation and combination)

In an adaptable residential design, changeability is defined as increase and decrease in quantity, articulation and combination of the spaces and also capability of changing into the initial considered design after applying reduction or enlargement in the space area. In this case, adaptability is responsible to additions in number of household members. In other words, changeability supplies possibility of changes in the unit area; either increase or decrease. The concept of changeability is related to changes of the total area, spatial requirements and the form of the residential unit. The need to this kind of adaptability might be related to long term or short term requirements. The long term ones get generated by changes in number of household members and their need to have more spaces. The short term ones appear by other reasons.

Defining the types of flexibility and the concepts of each one in various scales provide the possibility of doing accurate analysis in a defined domain. Consequently, some specifications of the spaces such as; functional, organizational, spatial, fixed elements, semi fixed spaces and variables become more efficient in defining the flexibility issues in the space. According to the results of the analysis, conceptual principles of flexibility are more efficient than technological and industrial methods in design of the residential buildings.

Adaptability of residential spaces with new needs and requirements of the households, responsibility to various functions at the same time and the use of common spaces in residential units in different scales are some of the important issues to be considered in residential designs. Adequate use of flexibility concepts increases the efficiency of the spaces in where those principles are applied in compare with the other spaces with the same area. Hence, the relationship between quality and quantity of the house space is not a direct relation; instead, it is related to design principles and innovation of the designer.

6.2 To make housing more adaptable

"So you can change rooms around at will; you can take down a wall without worrying that the ceiling will fall down. Any wall can be moved without harming the building's structure" (Mccabe, 1998)

> Architecture that is designed for adaptation recognizes that the future is not finite, that change is investable, but that framework is an important element in allowing that change to happen. Adaptable buildings are intended to respond readily to different functions, patterns of use and specific users' requirements (Kroneburg, 2007).

Adaptability in housing is so vitally important because the majority of people are often confronted with unpredictable economical problems at some point in their lives. In the event of such situation arising, adaptable housing can be very helpful

and supportive for everybody at any age. On the other hand, adaptable housing also has some other positive points as well; firstly, from a scientific view point, adaptable housing enables the structures to be flexible to meet the requisite needs of the prospective users/tenants/residents. This adaptability is not only important in respect of new arrangements and/or change of functions, but it is also creates or contributes to an efficient and economically viable situation for future users, which might, otherwise, not have been the case.

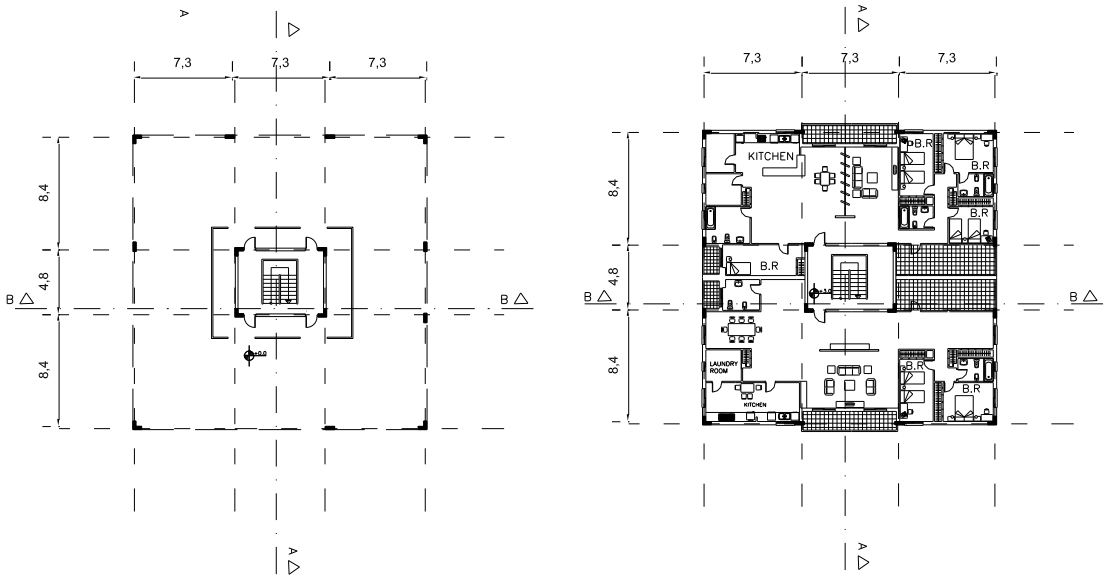
Secondly, adaptability enables the residents of the apartments to remain in their houses for a longer period and adapt it to meet their new needs and requirements rather than moving to another house. The provision of new utilities and facilities like installing lifts or using energy efficient material in 4-5 story buildings, can be identified as some of the probable applications to these buildings in the structure.

The concept of adaptable housing is not a new thought. There are buildings already designed with adaptability concepts, in a simple and efficient manner. Generally, it can be said that in the future, adaptable housings will be open plan, more flexible in respect of rebuilding issues and more economical for the users.

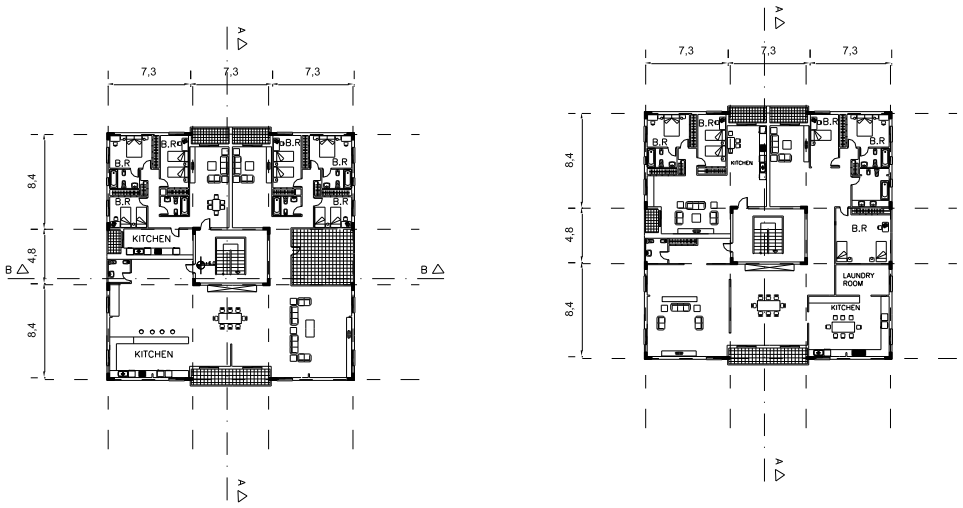
At some point in our lives, all of us feel the urge to benefit from our houses. It is, therefore, describe, if not actually essential that our houses are adaptable and affordable and that they can, if required, also accommodate visit and short stays from household and friends and also accommodate and be adapted if, for example, a resident was temporarily incapacitated for a period or had some other illness or an accident, which rendered him/her housebound for these reasons or simply by dint of age. Moreover, people with disabilities or households with elderly member or children all require an apartment that is designed in such a way as meets their needs.

Having an adaptable house can reduce the problems in our lifestyle and maximize our connection to our community and society.

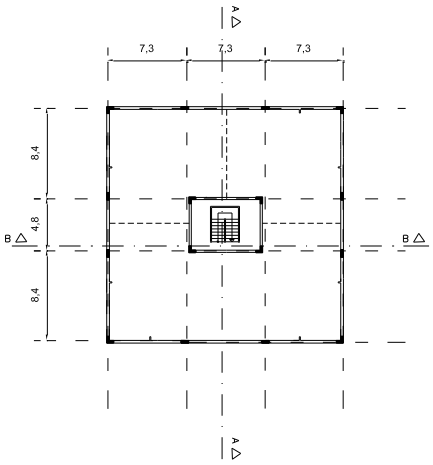
In my opinion, apartments in future should be more adaptable and affordable; this is the only way that people can live comfortably, safely and without attachments. In the drawings below we can see one simple example of a support and infill adaptable building.



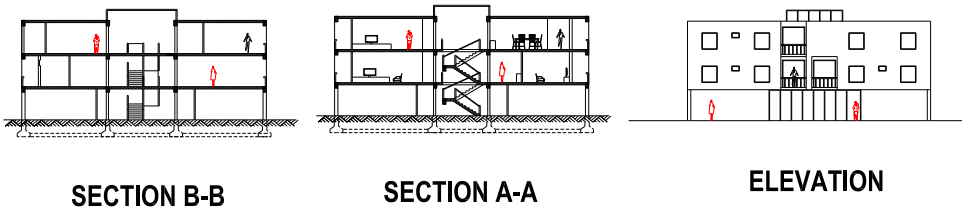
Drawing 19 : Ground and first floor infill plan
Source: (By Author, 2010)



Drawing 20 : First and second floor infill plan
Source: (By Author, 2010)



Drawing 21 : support plan
Source: (By Author, 2010)



Drawing 22 : Sections and elevation
Source: (By Author, 2010)

Application of changes in traditional construction methods and the introduction of new approaches which are appropriate to modern and contemporary architecture which is required to deal with new problems and challenges that have never arisen before. The problems, challenges and obstacles that current architecture takes them into consideration are too broad and complicated. The selection of suitable locations for erecting sustainable buildings is a vital issue. In this regard, some fundamental matters arise whilst considering design plan issues; such as:

- Is it a correct decision to construct buildings, which are supposed to be sustainable within a crowded city fabric with heavy traffic, noise and air pollution?

- Will the lack of resources and the existence of pollution in the design sites be influential in the success or failure of the projects in terms of sustainability issues?
- How will the essential need for creating maintaining and sustaining a relationship between buildings and green urban areas be achieved? (Margolius, 2002)

As well as the above mentioned issues and problems, economical factors and the construction management of the projects should also be seriously taken into consideration. The clarification and contemplation of initial building costs and also the costs of construction processes are really necessary at the outset.

Another important issue is the provision of the required correlation between human life and technological achievements of the modern age. Technical and technological applications of architecture should be considered in parallel or conjunction with human psychological needs, whilst also paying attention to and not to ignore the none-physical needs of human.

In other words, adaptable architecture is remarkable from an ideological point of view, complicated from a practical and application point of view and truly difficult from a design view point.

One of the useful techniques to achieve adaptability is to increase the height of the ceilings and making the circulation space longer. Although, this is not very cost efficient but it is necessary in order to achieve the required adaptability. Therefore, it is very important to pay more attention to the designing of spaces which is based on volume rather than on area. (Leupen, Heijne, & Zwol, 2005, p. 101)

> The need and necessity to economize on production these days places limits on the potentials of changeability in the future, walls separating dwellings largely

coincide with the load bearing structure, where soundproofing requirements are achieved through sheer mass. A building with a frame as load bearing structure and flexible party walls is more able to accept future changes (Leupen, Heijne, & Zwol, 2005).

"We need to develop new dwelling types that are able to accommodate changes of programmes, also where space and use requirements are as yet unknown. Planning mechanism like the land use plan should create more room for building for non-specific ends" (Heddema, 2005, p. 31).

> The idea is that dwellings should be conceived from the outset so that they can be adapted easily at a later point in time if necessary, leaving open the possibility of having the flexibility connecting or dividing rooms. The advantages for this are the concepts of usage-neutral floor plans, which allow retrofitting to increase accessibility with a minimum of expense and effort. (Schittich, 2007)

6.3 Housing information and technical advice should be made available to the users or residents of social housing projects

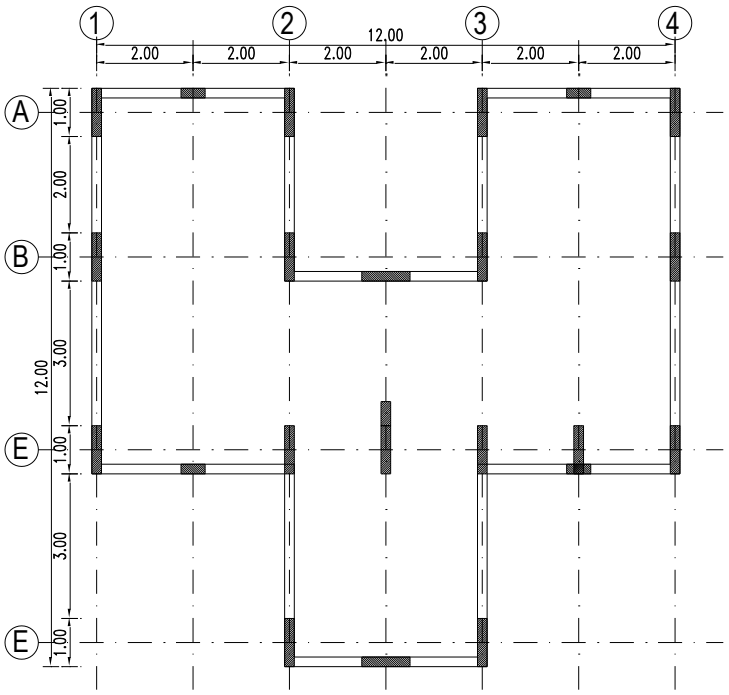
> There are complex forces that influence design in "house building", consequently the design and development of the associated housing environments. with the exception of the architectural perspective, development and design of housing environments are affected and influenced by natural factors, i.e. topography, climate, water and soil conditions, by physical factors, i.e. land-use patterns, designers' approaches, and by socio-cultural factors, i.e. the demographic structure of society, user requirements, existing economic conditions within the region or country, and existing laws and regulations regarding urban policy, i.e. the legal framework with respect to urban growth and development (Önal Hoskara, Tevfikler Çavusoglu, & Öngul, 2009).

> Christopher Alexander (1963) suggests that it is thus necessary to decentralize or better distribute the supervisory powers of the whole design process. He questions:
> 1. What does the level of competence of the project superintendent have to be?
> 2. What is the scope of the architect?
> 3. Who plans out and controls common space between the houses?
> 4. Who establishes the final plans of the houses?
> 5. Alexander also ponders on whether construction entails implementing standard components or rather a creative implementation of the standard processes? The answers to each one of these questions constitute guiding principles which should be respected by the new system of production of the habitat that they institute. (Kohlcass, 2006)

Even if participation is not possible, we should aim to make housing more adaptable in any case.

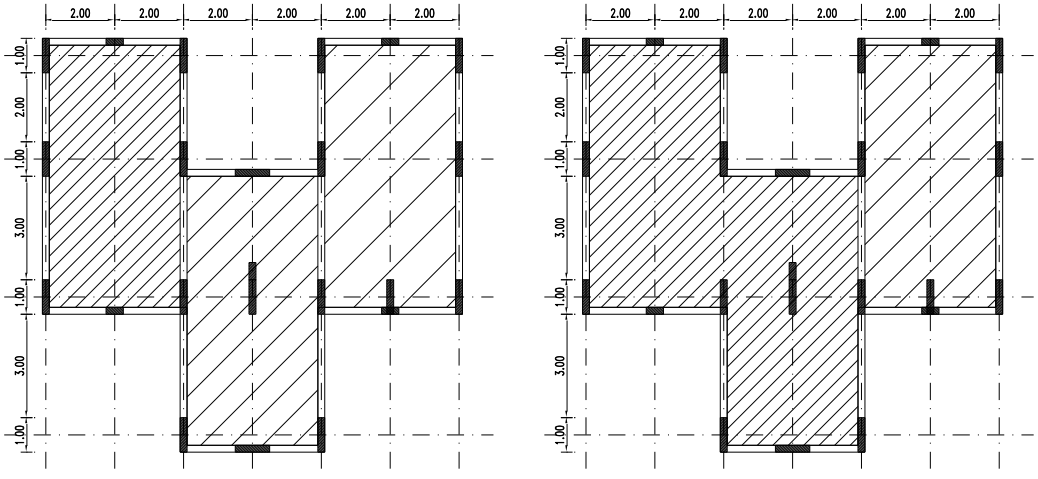
> Today the dwelling is part of a monolithic building construction today, today we can build supports with the techniques of today, and this does not yet mean industrial production of detachable units. The dwellings are completed in the supports in accordance with existing techniques. Once supports are built, it becomes worthwhile to start producing detachable units. A new production stream has come into being. Of both production streams together make housing possible, a difference in wear life then becomes evident. The production stream with the shorter life must produce at a higher rate (Habraken J. N., 1999).

We have seen adaptable social housing in Papendrecht in Netherlands, Adelaide Road Estate in England and Next 21 Osaka Gas with the SHU-KO-SHA arch and urban design studio in Japan. All of these projects were designed according to adaptability principles and the researcher illustrated this, showed them in the case studies used. In the future we can develop the ability to incorporate adaptable design into social housing buildings in Northern Cyprus by following the principles of the infill and support system in the design planning and process. We can also show what an infill and support system looks like, and demonstrate the solutions for reusability in open ended designs, as can be seen in the drawing below, one simple solution for infill and support system.



Drawing 23 : plan of adaptable support structure
Source: (By Author, 2010)

In plan No. 21 it can be seen that a building is designed in such a way that it can be adaptable in every way, and it can be increased or reduced in size by adding or subtracting from the adjacent or neighbouring apartment. It is clear that in every plan we can develop optimum adaptability but only on the condition that the supports are designed in such a way that no difficulties arise when the infill is added.



Drawing 24 : Alternative plans of adaptable support structure
Source: (By Author, 2010)

For example it is demonstrated in drawing No.22 that the units were divided as a response to meet the needs of the user. In future the apartments should be designed in such a way that the support system does not interfere with the plan of the interior. On the other hand, the users should be included in the designing stage, this theory can be distinguished in one unit support like the connection between the structural framework and the infill component. However, the second matter can be the main issue in some cases when the government or other authorities who control the incomes of the people with low profit would accept to take the responsibility.

When the unit is designed as in drawing No. 22 it could be changed in any way that the user's needs require. It has the potential for the floor plan to be changed from time to time. In other words, the support should have the possibility to give the users the chance to change the infill according to their needs.

Habraken claimed that supports should stay an architectural product and promote specific kinds of familiar spaces, since this will finally encourage more layout possibilities. Otherwise, a client might retreat from creating a space which is his own, and rely on floor plans which have been evaluated and tested for example in the neighbouring apartments. (Kohlcass, 2006)

6.4 Applying open building principles in Northern Cyprus

In Northern Cyprus the support is traditionally built of reinforced concrete slabs and piers with brick veneer a part of the slabs are left open to accommodate vertical mechanical equipment services. The support includes all exterior doors, windows, public stair the roof and the main mechanical system.

The basic structural shell support in constructed with load bearing cross walls and reinforced concrete floor pieces in the appropriate places to allow for long term adaptations, the project support system was developed by setting out a statement of

objectives both theoretical and practical. These included increasing the range and quality of choice satisfying individual user needs encouraging phased renewal and adaptation.

The support structure of the building is designed in a shape, which is readily adaptable into a variety of differing apartment sizes to accommodate the varied life style of the users in each building. The vertical circulation staircases were isolated from the main body of the building to allow for any future changes to the place. Meanwhile, the stairs are; located in the middle of the building's front elevation to provide easy access to all the floors.

In order to show the benefits of adapting open building principles in various aspects such as; social, economical and cultural, three major implements have been considered in this research. Firstly, three projects were selected from three different parts of the world: The Netherlands, England and Japan. Secondly, three complexes are chosen from social housings scheme in Northern Cyprus to study their adaptability according to the issue of the support and infill system. Lastly, a series of suggestions and propositions are given to provide or offer the possibility of adaptability to Cypriot social housing. This means that the proposed items can help the designers, governors and the related authorities to act more parallel to each other and construct more adaptable buildings. This implement not only enhances the quality of interior spaces, but it also increases the affordability of housing for a number of people in the community.

6.5 Chapter conclusion

At the end of this chapter, and as a result of the research carried out in this study, the mistakes and absences, both in terms of the law and regulations and also at the design stage can be easily identified and the future design plan process for social

housing can be done in a more informed and considered manner by the architect(s) doing this work, either privately and/or as constructed by the /or for the government.

Nowadays, the rapid development of technology creates continuous change in respect of life-styles and everything related to this. However functional changes, according to household requirements decrease the functional life of buildings, whereas new construction techniques and designing types provide building with a longer life span. Adaptable design planning is one of the most important factors in respect of extending or prolonging the lives of buildings. Providing the continuity of this adaptation is the principle targets of current architecture, and the importance of the concept of adaptability is strongly advocated for these types of residential buildings.

The adaptation of dwellings by their residents to suit their varying needs has always been a part of human habitation, till past to nowadays.

It is obvious that the need for the adaptation of dwellings according to changing requirements and needs is a given constant, in past and future.

With developing technology, met of technology the application methods and processes involved are also becoming more developed, but the need for the adaptation need is ongoing.

Chapter 7

CONCLUSION

It is suggested that open building principles and methods are suggested to be introduced into and executed in respect of social housing in Northern Cyprus. Not only as a way of helping to solve building and construction problems, but also to, hopefully, resolve the issue of uniformity and inflexibility in terms of the general approach and attitude towards the issue of social housing and its construction.

As it was mentioned before the process of adaptability are categorized in four stages: 1) design, 2) construction, 3) use, and 4) manipulation of subcomponents. The product of living in a adaptable apartment is that the households are in a environment that is designed according to their needs and requirements and it is suitable for them based on their budget and income.

Study and analysis of the results from the questionnaire surveys, personal interviews and comments from residents in Northern Cyprus, which were carried out in Famagusta, Nicosia and Iskele districts of the island, indicate some general key points about implementing adaptability in Northern Cyprus. These points focus on the needs and requirements of the users of the houses.

As it is understood from the research, it can be said that implementation of adaptability in the buildings has some positive points such as: having more resistance in case of hazards, durability and sustainability, capability of enlarging the spaces, adaptability and flexibility of the apartment plans and their interior arrangements and also application of the needs and requirement of elderly people into the buildings.

Proper achievement of the mentioned items depends on support system and infill system.

It is also concluded from the research that the required space of families who live in social housings in Northern Cyprus with social needs and situation considering that 12% of people in Northern Cyprus are jobless and are in the age 15-24. The government has decided to legally ban the employment of foreigners to provide more job opportunities for Cypriots. This can increase the economical ability of Cypriots and provision of residential spaces for themselves. As it has been mentioned, some social housing buildings had been planned to be constructed in Nicosia (Lefkosa). Since, these buildings are cost efficient for people; it can be beneficial for their users from economical viewpoint. Obviously, the mentioned social housings can be designed and made according to "open building principles".

The needs and requirements of people will change according to the conditions of society throughout time. If the buildings get designed according to open building principles, local people can invest on enhancement of their living spaces according to their needs.

Since, the amount and number of private building constructions are increasing in Northern Cyprus; the government can provide a better respond to the people's need by their own help (people's help).

Thus, a general change in design of the social housing in Northern Cyprus, which includes support of structures and infill of the apartments, should be applied. The social housing in Northern Cyprus has some problems such as small kitchens, further balcony, and lack of elevator in the apartments for use by physically challenged people and no internal parking. The paper presents initially, with some generalized comments and information on housing surveys and social housing in chapter 2. In

this chapter some examples are also given. In chapter 3, the definition of adaptability, adaptability principles and the positive points of open plan buildings are described in detail. In this part of the research three cases from Japan, England and Netherland are also mentioned and analyzed in order to clarify the issues. In chapter 4, the research highlights social housing in Northern Cyprus and considers some theories about social housing design in the future and the guidelines of open buildings, “either private or governmental planning and constructions”.

It is important to consider the amount of variations in design, planning and the construction of private or governmental projects. It is also necessary to regard the size, limitations and room variations. Due to these considerations, some propositions and solutions are identified in respect of support of structures and adaptability.

In view of all the above mentioned points and issues, it is concluded that it is clearly possible to implement the concept and effect the construction of adaptable social housing in Northern Cyprus in the future. Some infill guides are also given to make the interior spaces adaptable with the use of low cost and economically efficient materials.

At the end designers should not only understand the technical flexibility of the building instead architects should understand people desires.

REFRENCES

Ada, W. (1998/1999). Home for Non-conventional Hosehold. *Open hose internatinal* , 40-41.

Afik, A. (2010, 01 01). *Caesar Resort* . (A.S. Afik Ltd.) Retrieved Dec 25, 2009, from Caesar Resort on the east coast of Cyprus: http://www.caesar-resort.com

Allison, M. (2010, March 11). *Social Housing*. Retrieved July 23, 2010, from myUKinfo: http://www.myukinfo.com/en/housing/social-housing

Alpar Atun, R., & Pulhan, H. (2009). Learning from housing:Aretrospective narrative of housing environments in North Cyprus. *Open House International , 34*, 82-93.

American Association of Business Publication Editors. (2009, January 01). *Wonders of the world*. Retrieved April 11, 2010, from Bloomberg BusinessWeek: http://images.businessweek.com/ss/07/11/1107_renzo_piano/source/7.htm

Anderson, F. (2010, January 25). *Bathroom Interior*. Retrieved April 16, 2010, from Modern Interior decoration ideas: http://lux-interior-design.blogspot.com/

Arcan, E. F., & Evci, F. (1999). Mimari Tasarima Yaklasim. *Tasarim Publication Group* , 113-120.

Barrett, P., Twitchin, S., & Kletchko, S. &. (2006). Patrick Barrett, Stephen Twitchin with Sharon Kletchko, Faye Ryan. *Social Policy Journal of New Zealand* , 154.

Baytin, A. P. (2005). *IS IT A 'METAMORPHOSIS': A QUALITATIVE RESEARCH ON SOCIAL HOUSING IN THE CITY OF GAZI MAGUSA.* Fmagusta: Department of Architecture, Faculty of Architecture.

Beckett, M. (2010, Oct. 01). *Affordability, flexibility, and choice*. Retrieved Oct. 06, 2010, from Housing Horizons: http://www.guardian.co.uk/housinghorizons/comment

Beisi, J.; Wong, W. (1998). *Adaptable Housing Design.* China: Southern University Press.

Benson, T. (2010, April 07). What is Open Building? *Bensonwood Homes* . London, 6 Blackjack Crossing, Walpole NH, England.

Betts, J. (2008–2010, June 01). *Hammersmith United Charities*. Retrieved April 16, 2010, from Supporting communities, preventing social exclusion and tackling need: http://hamunitedcharities.org.uk/grants/reports/supporting-communities-preventing-social-exclusion-and-tackling-need/2-background-information-on-hammersmith-and-fulham-and-the-targeted-areas-and-wards

Biddulph, M. (2007). *Introduction to Residential Layout.* Amesterdam: Architectural Press.

Bostenaru, M. (2005, May 28). *Wohnen morgen, architect Ottokar Uhl*. Retrieved April 16, 2010, from Photo.net: http://photo.net/photodb/photo?photo_id=3374622

Branson, H. C. (2010, June 09). *Human Rights and Equal Opportunity Commission (HREOC).* Retrieved June 23, 2010, from Australian Human Rights Commission: http://www.hreoc.gov.au

Bringolf, R. J. (2004, August 1). *Adaptable, Accessible or Adjustable?* Retrieved October 12, 2009, from Article of the Month: http://www.e-bility.com/articles/adaptablehousing.php

Chan Shek Lun, C. (1999/2000). Adaptable Housing in Hing Wah Estate II. *29*, 18.

Chiu, R. L. (2004 , June). Socio-cultural sustainability of housing: a conceptual exploration. *Housing, Theory and Society* , 65 - 76 .

Chris, E. (2006). *Provisions for adaptable housing by local government in New South Wales.* Sydney: Shelter NSW.

Clayton, M. (2010, 01 01). *Neutra's VDL Research House*. Retrieved April 11, 2010, from Lots Of Essays.com: http://www.lotsofessays.com/viewpaper/1692076.html

Cook, P. (1972). *ARCHIGRAM*. Boston: Princeton Architectural Press.

Courtesy, R. M. (2007, June 16). *Housing for life.* Retrieved August 02, 2010, from THE ADAPTABLE HOUSE: www.thebuildingcentre.com/.../adaptable_housing.php

Cuperus, Y. (2010, August 26). *Open Building connects concepts*. Retrieved Sep. 29, 2010, from OBOM Strategic Studies: http://www.obom.org/PAGES/Concepts2.html

Debicka, E., & Friedman, A. (2009). Flexible Design of Public Housing In Iqaluit. *Open House International , 34*, 26-35.

Department of Social Housing, T. (1980). *Patent No. 0392 227 0173.* Nicosia,TRNC.

Design Center, M. (2005). *Housing Types.* University of Minnesota, College of Architecture and Landscape Architecture. Twin Cities (UMTC): Northwest Corridor Development Approach.

Dielemana, F. M., & Everaersb, P. C. (1994). *From renting to owning: Life course and housing market circumstances.* Utrecht: Faculty of Geographical Sciences, Utrecht University, The Netherlands.

Dreghorn, W. (2009, October 13). *Business and economy in North Cyprus*. Retrieved May 15, 2010, from Social Housing in North Cyprus: http://www.cypnet.co.uk/ncyprus/economy/econ10.htm

Field, M. (2008, January 30). *Housing*. Retrieved June 18, 2010, from UKorbit: http://www.ukorbit.com/housing-advice.htm

Ford, H. (2010, August 01). *Dymaxion House*. Retrieved August 31, 2010, from The Henry Ford: http://www.hfmgv.org/museum/dymaxion.aspx

Freeman, H. L. (2010, Sep. 23). *Patent application title: Multi-direction expandable house*. Retrieved Sep. 29, 2010, from patentdocs: http://www.faqs.org/patents/app/20100186327

Friedman, A. (2002). *Adaptable House: Designing Homes for Change.* New York: McGraw-Hill Professional.

Friedman, A., & Debicka, E. (2009). Flexible design of public housing in Iqaluit00. *Open house international , 34*, 26-30.

Futagawa, Y. (Jan-Feb 1994). GA Japan Environmental Design. *Environmental design* , 1.

G.Welling, D. H., & Leupen, D. B. (2008). The DANISH DWELLING:in between permanent and changeable conditions. *Time Based Architecture International* , 2.

Gazioglu, T. (1993). *Social housing Schemes in the TRNC.* Nicosia: Northen Cyprus Monthly-Kibris.

Geraedts, R. (2008). Design For Change Flexibility Performance Indicators. *1st I3CON Conference,Industrialised, Integrated,Intelligent Construction* (p. 28). Leicestershire: Loughborough University.

Glynn, S. (1998-2010, 01 01). *Rietveld Schroder House*. Retrieved April 11, 2010, from galinsky: http://www.galinsky.com/buildings/schroder/index.htm

Gray, E., & Roquebrune, C. M. (2002, March 17). *ArchiSeek*. Retrieved April 11, 2010, from Eileen Gray: E-1027, Roquebrune Cap Martin: http://ireland.archiseek.com/tesserae/000007.html

Gray, E., & Roquebrune, C. M. (2008, December 24). *Eileen Gray* . Retrieved July 25, 2010, from ounodesign: http://blog.ounodesign.com/2008/12/24/eileen-gray-e1027-house/

Habraken, J. (2003). Making Urban Fabric Grained:Aresearch Agenda. (J. Beisi, Ed.) *International conference on open building* , 27-32.

Habraken, J. N. (1999). *Supports.* London: Urban International Press.

Habraken, N. (2000). *The Structure of the Ordinary.* London, England : The MIT Press.

Habraken, N. (2002, February 02). The uses of levels. *Open House International* .

Habraken, N. (1970, February 02). Type as a Social Agreement. *N.J.HABRAKEN SELECTED READINGS* , p. 20.

Habraken, N. (1976). *Variations.* Massachusetts: Laboratory of Architecture and Planning at MIT.

Habraken, N.J. (1976). *The Systematic Design of Supports.* Massachustts: Laboratory of Architecture and Planning at MIT.

Hamdi, N. (1999). *Housing Without Houses.* New York: Van Nostrand Reinhold.

Heddema, F. (2005). Interview met Frank Bijdendijk van Het Oosten. In B. Leupen, & J. Van Zwol, *Time-Based architecture* (p. 249). Rotterdam: 010 Publishers.

Helderman, A., Mulder, C., & van Ham, M. (2003). The Changing Effect of Home Ownership on Residential Mobility in the Netherlands. *Housing Studies , 19*, 602-605.

Henz, A. (1965-2003). *Wohnhaus Neuwil in Wohlen 1962-1965.* Zurich: Mertun-Planen und Bauen .

Hikenutty, M. (2007, 11 27). *Richard and Dion Neutra - Van der Leeuw (VDL) "Research" house*. Retrieved April 11, 2010, from Waymarking: http://www.waymarking.com/waymarks/WM2NQK_Richard_and_Dion_Neutra_Van_der_Leeuw_VDL_Research_house

Hoşkara, E. (1999). Kuzey Kibris'ta Konut Alaninda Uygulanabilir Yapi Sistemleri. ITU,Istanbul, Northern Cyprus: Unpublished MSC Thesis.

Hoyt, D. (2007, August 05). *Maison de Verre Maison Dalsace*. Retrieved August 31, 2010, from essential-architecture Paris: http://www.paris-architecture.info/PA-018.htm

Ignatieff, M., & L'opposition, C. (2010, April 16). *city+of+Jerusalem*. Retrieved April 16, 2010, from SodaHead: http://www.sodahead.com/united-states/which - middle - eastern - country -is -your -favourite / question-778109/?page=3&link=ibaf&imgurl=http://www.greatdreams.com/war/Jerusalem_from_mt_olives.jpg&q=city%2Bof%2BJerusalem,

Japan Institute of Architects . (1996, May 10). Sustainable Design Guide-2. *Committee for the Osaka Gas NEXT 21 Project* , pp. 70-73.

Jong, J. K., Brouwer, R., & Kearney, J. (2000). *NEXT 21:A Prototype Multi-Family Housing Complex.* Michigan: College of Architecture and Urban Planning University of Michigan.

Kamo, M. (2000). Construction System and remodeling Experiments at Experimental housing Next21. *Continuous Customization in Housing* , 87-94.

Karni, E. (2008). Openings in facades and adaptable dwelling space. *Open House Intenational , 33*, 37-45.

Keles, R. (1999, April 26-27). Urban Development and Sustainable Management fot the Meditteranean Towns(Turkey). *Paper presented to the meeting of Working Group for Urban Management/Mediterranean Commission for Sustainable Development* , 17.

Kendal, S., & Teicher, J. (2010, Sep. 29). *Residential open building.* Retrieved Sep. 29, 2010, from Google Books: http://books.google.com/books?id=Dw4gFwwPhSkC&pg=PA31&lpg=PA31&dq=decision.making+level+in+open+building&source=bl&ots=FGswM9KVMe&sig=o0Wvl.WzKt5bkq7O4uZoUz8vUzM&hl=en&ei=_RujTJrEGYnJswbo3KWKBQ&sa=X&oi=book_result&ct=result&resnum=3&ved=0CBoQ6AEwAg#v=onep

Kendall, D. S. (2009, Sep 16). *open-building.* Retrieved June 17, 2010, from Open building implementation: http://open-building.org/ob/concepts.html

Kendall, S. (1999). *Base Building and Fit-out: Principles for 21st Century Building.* Great Britain: RE - Building Maintenance and Management conference.

Kendall, S. (2000a). *Residential open buildings.* London: E & fn spon.

Kendall, S., & Dekker, K. (1997, Feb 02). Open building. *Open House International* , p. 15.

Kohlcass, P. (2006, April 10). *order and flexibility in large-scale housing projects.* Retrieved July 25, 2010, from everything:

http://everything2.com/title/order+and+flexibility+in+large-scale+housing+projects

Komut, M. (1996). *Housing Question of the 'Others'.* Ankara: Chamber of Architects of Turkey.

Kroneburg, R. (2007). *Flexible Architecture Responds to Change.* London, England: Laurence King Publishing LTD.

Lang, J. (1987). *Creating Architectural Theory: The Role of the Behavioral Sciences in Environmental Design.* New York: Van Nostrand Reinhold Company Inc.

Leupen, B., Heijne, R., & Zwol, J. v. (2005). *Time-Based architecture* (illustrated ed.). (B. Leupen, R. Heijne, & J. v. Zwol, Eds.) Amsterdam: 010 Publishers.

License, C. C.-A. (2009, Desember 08). *Leendert van der Vlugt*. Retrieved March 29, 2010, from Wikimedia Foundation: http://de.wikipedia.org/wiki/Leendert_van_der_Vlugt

Loch, S. (2008). Flexible Dwellings in Germany,Austria and Switzerland. *Time-Based Architecture International , 3*, 76.

Lun, C. S., & Man Hon, C. L. (1999/2000). Adaptable Housing in Hing Wah Estate II. *Open House International* , 26.

Margolius, I. (2002). *Architects + Engineers = Structures.* (D. M. Golabchi, Trans.) Tehran, Iran: Academy Press (May 6, 2002).

Martín, D. C. (2005). *Concept Home Principles -Flexible Floor Plans.* U.S.: U.S. Department of Housing and Urban Development's Office of Policy Development and Research.

Masoud, A. B. (2007). *Intellectual Trends of Western Contemporary Architecture Postmodernity and Architecture 1960-2000.* Esfahan, Iran: Architecture and Urbanism Literature.

Mccabe, D. (1998, April 23). *Avi Friedman's revolution*. Retrieved July 31, 2010, from McGillReporter: http://reporter-archive.mcgill.ca/Rep/r3015/friedman.html

Miller, & Hillis, J. (2010, April 10). *Adaptable Living*. Retrieved April 14, 2010, from Master Builders Association of the ACT: http://www.mba.org.au/public/page.php?id=79

Miller, J. (2010, April 13). *Adaptable Living*. Retrieved April 13, 2010, from Master Builders Association of the ACT: http://www.mba.org.au/public/page.php?id=79

Minami, K. (2001). Open building in the Netherlands - an evaluation. *Open house international* , 59-66.

Minami, P. K., & Bei-si, P. J. (2010, June 10). *Open building*. Retrieved June 17, 2010, from N. John Habraken: http://www.habraken.com/html/molenvliet.htm

Moen, J., Evans, R., Proctor, S., & Ogorzalek, A. (2002). Pcko: New Hall, Harlow', in Building for Life. In C. f. Environment (Ed.), *National Conference London* (pp. 10-13). London: Commission for Architecture and the Built Environment.

Moller-Jensen, L. (2008). Social housing project realized at 2 locations. *Time-Based Architecture* , 28.

Moller-Jensen, V. (2008). Social housing project realized at 2 locations. *Time-Based Architecture* , 28.

Mutekede, L., & Sigauke, N. (2007). Low Income Housing Finance -Post Independence Experiences,Prospects and Policy Implications for Zimbabwe. *ENHR 2007 International Conference 'Sustainable Urban Areas'* (p. 21). Rotterdam: Low Income Housing Finance -Post Independence Experiences, Prospects and Policy Implications for Zimbabwe.

Nakib, F. (2009). Technological Adaptability, an Approach Toward. *Conference On Technology & Sustainability in the Built Environment* (p. 16). Algiers: King saud university - College of Architecture and Planning.

Numan, I., & Pulhan, H. (2001). Living Patterns and Spatial Organization. *Open House International* , 34-41.

Numan, I., & Pulhan, H. (2005). Transitional Space in the Traditional Settlements of Cyprus. *Journal of Architectural and Planning Research , 22*, 82-90.

Oktay, D. (2001). *Planning housing environments for sustainability:Evaluations in Cypriot settlements.* Aralik, Istanbul: Yapi-Endustri Merkezi A.S.

Oliver, P. (2003). *Dwellings.* New york: Phaidon Press Limited.

Önal Hoskara, Ş., Tevfikler Çavusoglu, B., & Öngul, Z. (2009). Legal Frameworks and Housing Environments in North Cyprus. *HOUSING* , 81-100.

Oxman, R., Meir-Brodniz, M., & Amit, J. (1978). *Survey of Design and Development of Dynamic Housing System.* Israel: Israeli Ministry of Construction and Housing and the Technion Research and Development Foundation.

Ozaki, H. (2010, May 13). *Osaka Gas Experimental Residential Complex*. Retrieved June 21, 2010, from Osaka Gas Co.Ltd.: http://www.osakagas.co.jp/indexe.html

Pallasmaa, J. (1994, January 01). *Identity, intimacy and domicile: notes on the phenomenology of home*. Retrieved July 09, 2010, from Architecture vs. home: http://www.uiah.fi/opintoasiat/history2/e_ident.htm

Palmer, J., & Ward, S. (2008, Sep 01). *The adaptable house*. Retrieved Oct. 05, 2010, from Technical Manual,Design for lifestyle and the future: http://www.yourhome.gov.au/technical/fs32.html

Patrick Barrett, P., Twitchin, S., Kletchko, S., & Ryan, F. (2006). THE LIVING ENVIRONMENTS OF COMMUNITY-DWELLING. *Social Policy Journal of New Zealand* , 154.

Rabeneck, A. (1975). The new RSSHAK. *Architectural Design* , 629-33.

Rabeneck, A., Sheppard, D., & Town, P. (1973). *Housing flexibility?* London: Architectural Design.

Rapoport, A. (1969). *House Form and Culture.* Milwaukee: Prentice Hall; Facsimile edition.

Rhyner, K. (2004). Social housing in Nicaragua-Simplicity with style. *Open house international* , 100.

Sadler, S. (2008, 1 1). *Archigram – Architecture without Architecture.* Retrieved April 11, 2010, from Haecceity Inc. Online Publishing Portal: http://haecceityinc.com/book_review/Archigram%20book%20review.pdf

Sandler, L. (2010, March Monday). *Flexible Floor Plans Create Adaptable Homes.* (f. William Peter Hamilton , Editor) Retrieved March 29, 2010 , from The Wall Street

Journal:http://www.realestatejournal.com/buildimprove/19990629-sandler.html

Sawada, S., & Habraken, J. (1999). *Experimental apartment building.* Osaka, Japan: Domus.

Schittich, C. (2007). *In Detail: Housing for People of All Ages: flexible, unrestricted, senior-friendly.* (C. Schittich, Ed.) Munich: Birkhäuser Architecture.

Schneider T.; Till J. (2007). *Flexible housing.* Oxford: Architectural Press.

Schneider, T., & Till, J. (2004-6, 1 1). *Flexible Housing*. (A. a. Council, Producer, & University of Sheffield School of Architecture) Retrieved March 26, 2010, from Flexible Housing: http://www.afewthoughts.co.uk/flexiblehousing/about.php

Sejima, K. (2009, November 09). *Design Boom.* Retrieved July 23, 2010, from 'pile up' house concept by hans zwimpfer: http://www.designboom.com/weblog/cat/9/view/4290/pile-up-house-concept-by-hans-zwimpfer.html

Sheppard, D., Rabeneck, A., & Town, P. (1973). Housing flexibility. *Architectural Design* , 698-727.

Städtebau, a., & Stadtrand, Z. (2003). Zürich Nord: Zu den Siedlungen Eichrain (Theo Hotz) und Stöckenacker (von Ballmoos Krucker Architekten).

Suet Lin, N., Chi Lin, C., Ching Yu, C., & Chau Yin, C. (2004). Infill system for a living and working space. (N. WILKINSON, Ed.) *Open House International , 29*, 19.

Terenzini, F. (2010). *NSW Guide to Managing Affordable Housing Dwellings Using the State Environmental Planning Policy (Affordable Rental Housing) 2009.* Sydney: NSW Department of Human Services.

Thomson, F. (2005). *Towards Barrier Free Housing for an Ageing Australia:Accessible, Adaptable and Universal Design.* South Melbourne .

Till, J., & Schneider, T. (2007). *Flexible Housing.* London: Architectural Press.

Till, J., & Schneider, T. (2005). Flexible housing:opportunities and limits. *Architectural Research Quarterly* , 157-166.

Tipple, G. (2000). *Extending Themselves: User Initiated Transformations of Government-built Housing in Developing Countries* . Liverpool: Liverpool University Press .

Tunstall, D. R. (2010, June 12). *Public housing.* Retrieved June 17, 2010, from Wikipedia: http://en.wikipedia.org/wiki/Public_housing

Von Vegesack, A., & Schwartz-Clauss, M. (2002). *Living in motion design and architecture for flexible dewlling.* Zurich: Vitra Design Museum.

Waibel, M., Eckert, R., Bose, M., & Martin, V. (2007, April). Housing for Low-income Groups in Ho Chi Minh City between Re-Integration and Fragmentation Approaches to Adequate Urban Typologies and Spatial Strategies. *ASIEN 103* , 59-78.

Wales, J., & Sanger, L. (2010, March 26). *Maison de Verre*. Retrieved April 11, 2010, from Wikipedia: http://en.wikipedia.org/wiki/Maison_de_Verre

Weiner, J., Gould, D., Parsia, H., Fawkes, P., & Lachut, S. (2008, October 23). *PSFK*. Retrieved July 23, 2010, from Tetris Style Housing Creates Flexible Living Options: http://www.psfk.com/2008/10/tetris-style-housing-creates-flexible-living-options.html

Wempe, E. (2010, Oct.. 05). *Amsterdam - studio (40 m2) in 17th century canal house*. Retrieved Oct. 06, 2010, from Expatica Communications B.V.: http://expaticanl.franglo.com/classifieds/page-119983.html#images

Werf, F., & Froyen, H.-P. (1980, May 01). Molenvliet-Wilgendonk. *Hrvard Architecture Review* , pp. 161-169.

Wilkinson, N. (2000). Open building concept and recent practice. *Open House International , 25*, 34-43.

Wolfgang iron, D. -I. (2010, 01 January). *Wohngebiet Sauerland · Wiesbaden*. Retrieved August 31, 2010, from Dietz · Joppien Architekten AG:

http://www.dietz-joppien.de/projekte/chronologisch/wohngebiet-sauerland/4.html

APPENDICES

Appendix A: Sample of the questionnaire that given to the households living in social housings in Famagusta, Nicosia and Caesar Resort in Eglish

The questionnaire for the interview with the users of the social housing in Famagusta, Nicosia and Caesar Resort*:*

Name:

Job:

Number of residents:

☐ Own Rent ☐How Long? ☐

Apartment has how many stories? ☐

- Tell me about yourself, Brief information about yourself?

  Age ☐

- Why did you choose this project to live in?

  Budget ☐ Location ☐ Both ☐

- What is your job?

  Employee ☐ House wife ☐ Retired ☐Engineer ☐

- Has anybody done academic studies in your family?

  Yes ☐ No ☐

  Diploma ☐ Master ☐ PHD ☐ Non Educated ☐

1) Is it possible to make change (according to the space need and size of the unit) in your unit?

   Yes ☐ No ☐

2) If you have possibility to change (according to the space need and size of the unit) your unit which part would you like to change?

   Bedrooms ☐ Kitchen ☐ Service (Bath-WC.) ☐ Living room ☐ Dining room ☐

3) Do you need any adaptability in your unit in terms of the room type's spaces family unit requirements?

Yes ☐ No ☐

4) Is there any possibility for you to make your home adaptable according to the budget of your family and your wishes?

Yes ☐ No ☐ Maybe in the future ☐

5) Have you ever changed any part of your unit according to your family needs?

Yes ☐ No ☐ If yes which part ☐

6) Can we update this building with new technology?

Yes ☐ No ☐

7) Are you satisfied with your apartment or you want to change it (according to the space need and size of the unit)?

Yes ☐ No ☐

8) If there is possibility for you to change your unit according to your requirements can you get any permission from the ministry of social housing?

Yes ☐ No ☐

9) What do you say are the most important factors in adaptability:

	Most important		Least important
	1	2	3
Configuration of the plan	☐	☐	☐
Size of the dwelling	☐	☐	☐
Space need for each family	☐	☐	☐
Family situation according to the income	☐	☐	☐

Appendix B: Sample of the questionnaire that given to the households living in social housings in Famagusta, Nicosia and Caesar Resort in Turkish

Bu anket Magusa, Lefkoşa ve Girne de ki sosyal konutlar ile ilgili bir araştırmadır. Birkaç dakikaknızı bu soruları doldurmaya ayırırsanız minnetar kalacagım.

Bu anket Gazi magusa, Lefkoşa ve Caesar Resort de ki sosyal konutlar da ki kullanıcılar için bir ankettir:

İsim:

İkamet ettiğin bina da ki durumun:

☐ Sahibi ☐ Kiracı ne kadar süredir? .....

İkamet ettiğin bina kaç katlı bir yapıdır? ……...

Kendinizle ilgili kısaca bir tanımlama:

Yaş: ……

Meslek: …….

Neden bu projede yaşamayı seçtiniz?

Bütçe ☐ Yeri ☐ Her ikiside ☐ Daire Sqm si ☐

Mesleğiniz nedir?

İşçi ☐ Ev hanımı ☐ Emekli ☐ teknesian ☐

Ailende akademik uzerine yapan kimse varmı?

Evet ☐ hayır ☐

Lise mezunu ☐ Üniversite mezunu ☐ Yüksek lisans ☐ Doktora ☐

(aileniz de en yüksek eğitim seviyesine sahip ?)

1) Daire de değişiklik yapma şansınız mümkün mü?

Evet ☐ Hayır ☐

2) Değiştirme şansınız varsa tercihiniz nedir?

   Yatak odaları ☐ mutfak ☐ banyo- tuvalet ☐oturma salonu ☐ yemek ☐ salonu

3) İstenilen mekanlarda sizin ve cocuklarinizin ihtiyaclarini karsiliyan oda tiplerine göre uyarlanabilir mi?

   Evet ☐ Hayır ☐

4) Ailenizin bütçesi: sizin ve ailenizin isteklerini , yapmak istediğiniz evi karşılar mı?

   Evet ☐ hayır ☐ belki ☐

5) Dairenizde herhangi bir değişiklik yaptınız mı ailenizin ihtiyaçlarına göre?

Evet ☐ hayır ☐ varsa bir değişiklik……..

6) Bu binayı yeni teknolojiye göre yenileyebiliyor mu yuz? (isitma systemi,mutfak,banyo,...)
   Evet ☐ hayır ☐

7) ınşaat yapılma suresı ıçınde sızın ıhtıaclarınızı karsılyan mekan planlaması sansı ıstermısınız?
   Evet ☐ hayır ☐
8) Daireniz den memnun mu sunuz yoksa değiştirmek istermisiniz? (mekan ve dairenin ebatlarına göre)
   Evet ☐ hayır ☐
9) Eğer herhangi bir ihtiyaçlarınıza göre dairenizi değiştirme imkanı olursa, sosyal konut bakanlığın dan izin alabiliyormusunuz?
   Evet ☐ hayır ☐
10) Adaptasyon için en önemli etkenler size göre nedir?

	En önemli 1	2	en önemsiz 3
Plan Biçim :	☐	☐	☐
Konut ebatları :	☐	☐	☐
Ailenin mekan ihtiyacı:	☐	☐	☐
Aile nin bütçesine göre :	☐	☐	☐

İlginiz için teş ek kürler☺

Katılımcılarınekbilgileri…….....

Appendix C: Famagusta: “İsmet İnönü Bulvarı "

According to the survey done by the author, 24% of the residents who live in the social housing of Famagusta are 4 person households the approximate figures are shown in the table below,

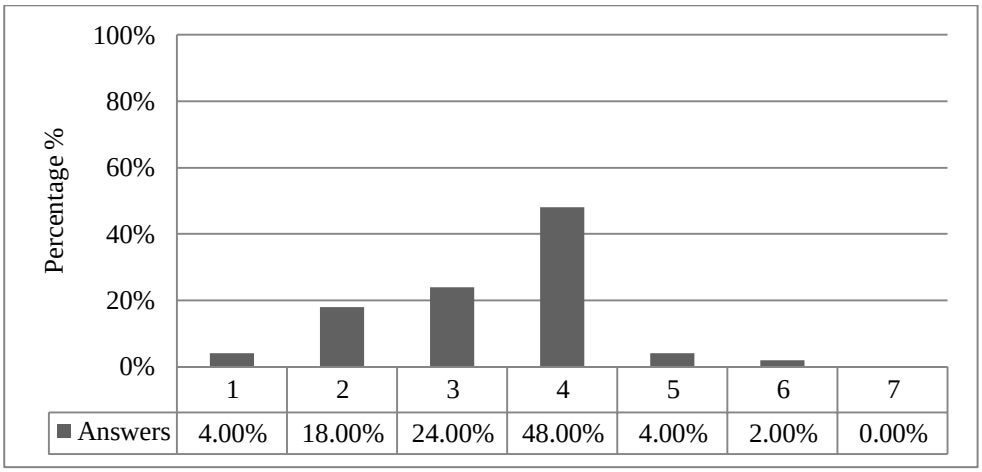


Chart 1 : The percentage of the residents in each units
Source: (By Author, 2010)

Nearly all the people who answered the questionnaires in the social housing in Famagusta were aged between 40 to 50 ages.

Table 7: An analysis of the ages of the 50 residents that live in social housing in Famagusta

Age between 20 and 70	20-30	30-40	40-50	50-60	60-70
Number out of 50 questionnaire	5	13	18	10	4
Percentage	10.00%	26.00%	36.00%	20.00%	8.00%

Source: (By Author, 2010)

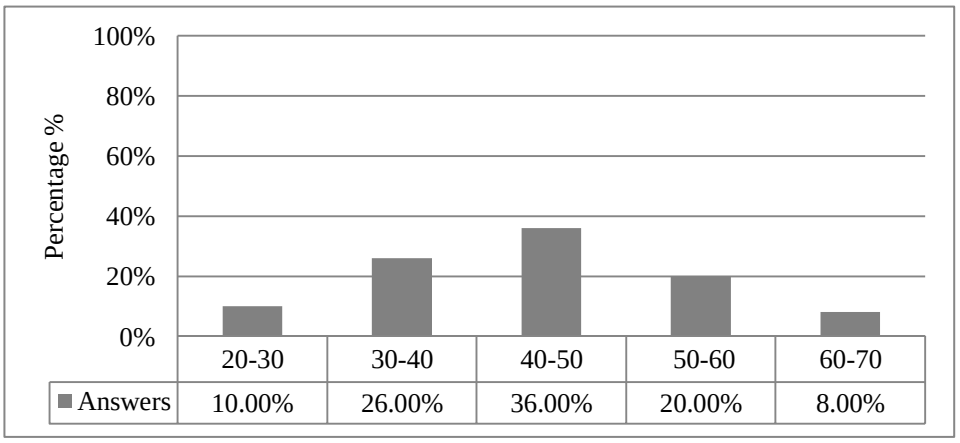


Chart 2 : The percentage of the residents between the ages of 20 and 70 years old of in 50 units
Source: (By Author, 2010)

All of the respondents of the social housing questionnaire in Famagusta are parents and they are all over 20 years old. The majority of them are between 40 and 50 years old. Additionally the occupation of the residents who answered the questionnaires was included - 41.30% were government employees, 30.34% were housewives, , 15.22% were self employed or in free employment, 11.11% were in miscellaneous types of work or occupations, such as studying, , casino work , barber and etc. the majority of responders were housewives; the approximate figures are shown in the table below,

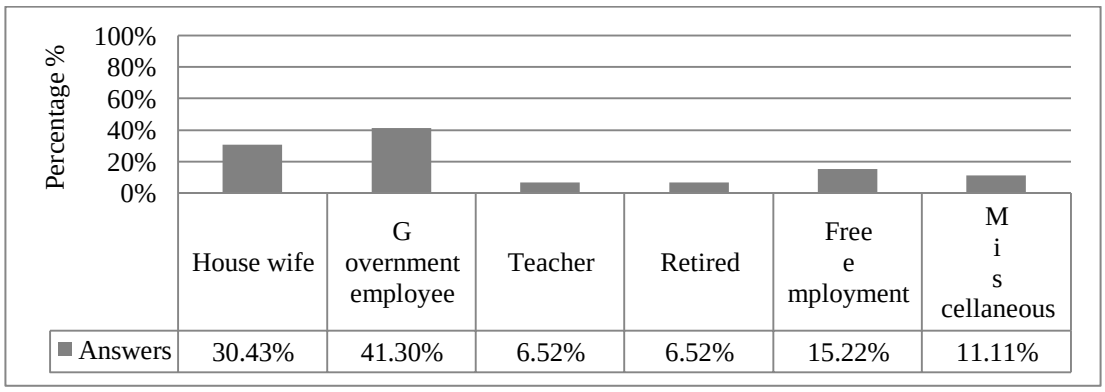


Chart 3 : The chart show the percentage of the respondents to the questionnaires
Source: (By Author, 2010)

According to the results of the questionnaire survey distributed to the social housing residents in Famagusta, the main reason for the residents choosing social housing was financial (40%) ; This fact is generally clear without the survey results to back it up since this housing is constructed by the government specifically for low income families. Eventually, the families can apply and receive a loan from the banks, to buy their houses and repay the loan in installments. The results are shown in the table below:

Table 8 : The table shows the reason for the households to select social housing apartments

Reason of selecting social housing for live	Budget	Location	Budget & Location	Area of the house
Number out of 50 questionnaire	20	10	3	17
Percentage	40.00%	20.00%	6.00%	34.00%

Source: (By Author, 2010)

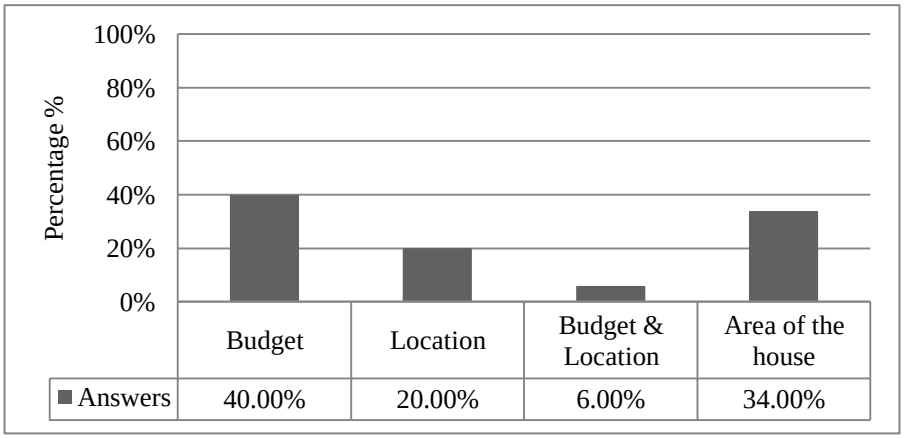


Chart 4: This chart shows the percentages result of the reasons for choosing social housing in which to live
Source: (By Author, 2010)

The result of the questionnaire survey From 50 families in social housing in Famagusta shows that 56% of residents of the units had academic education and 44% of them had studied to secondary school level.

Analysis of the questionnaires distributed to 50 units of the social housing apartments in Famagusta "İsmet İnönü Bulvarı"

As adaptable design has the capacity to respond to the changing lifestyle of dwelling occupants.

"Schneider and till (2005) indicate that "adaptability is seen as something that gives the user the choice as to how they want to use spaces instead of architecturally predetermining their lives." (Till & Schneider, Flexible Housing, 2007)

According to the figure taken from 50 households from Famagusta social housing area, 56% of the people declared that it is possible to change the interior arrangement of the houses according to their needs and desires. Generally, in the households with few number of persons (around three persons), there is satisfaction from the arrangement of spaces, they are interested in large living rooms and there is not much desire for implementing various changes; while, in households with more number of members (around seven persons) there is the desire of applying some changes and adding more bedrooms instead of having large living rooms. As the results shoed in 50 units 28 occupants want to change their apartment and 22 of them don't want any changes. The results shown in the chart below,

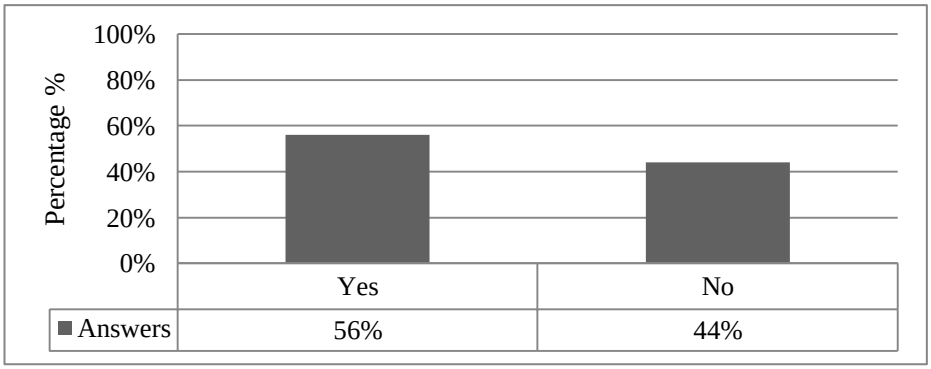


Chart 5 : Percentage of Possibilities for making changes according to the space needed and the size of the rooms in the unit
Source: (By Author, 2010)

Most of the occupants of social housing in Famagusta believe that their kitchens are too small and would prefer to enlarge them (54% of the occupants are of this opinion). Most of them have already added balconies to their kitchens and have thus enlarged their kitchen areas. Some of them have removed the wall between the bedrooms and increased the bedroom size by making two bedrooms into one. The results are shown in the table below,

Table 9 : Percentages of preference of the despondence for changing one space

Number out of 50 questionnaire	Bedroom	Kitchen	Services	Living room	Dining room	No one	Kitchen +Service	Kitchen+ Living room
Percentage	12.00%	54.00%	2.00%	0.00%	0.00%	4.00%	16.00%	12.00%

Source: (By Author, 2010)

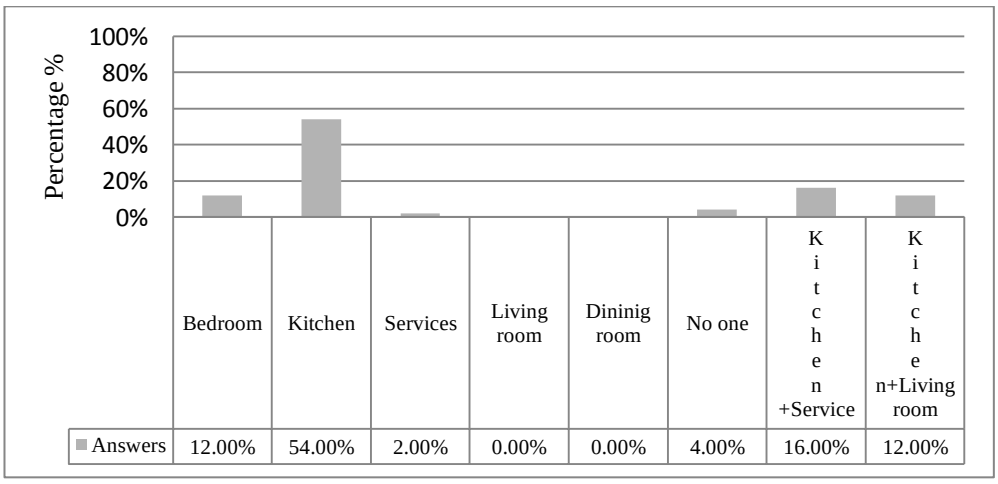


Chart 6 : Percentages of preference of the respondents for changing one room in the dwelling
Source: (By Author, 2010)

The needs and requirements of families and households can change over time, for example, the needs and desires of a 2-member family are different from a 4-member family. When the children grow up and become adults; consequently, their

needs and expectations change. In these buildings the majority of people do not believe in the necessity of applying changes according to the age of the children in the families; just 34% of the respondents think that more rooms or bigger rooms are necessary for the more adult children. The results show that 17 households agreed with this and 33 did not agree. , The final result is shown in the chart below:

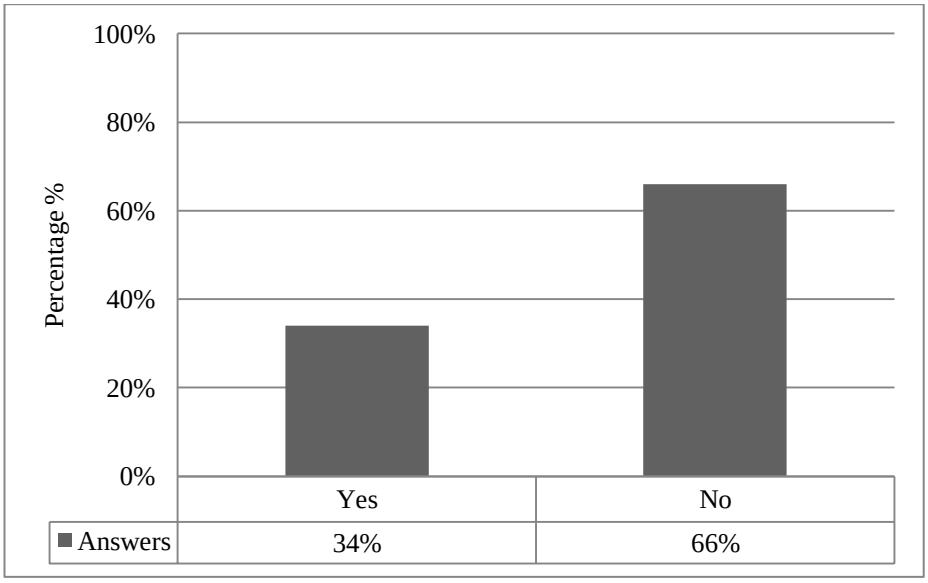


Chart 7 : Percentage need of any adaptability in the apartment in terms of room type for different requirements of children
Source: (By Author, 2010)

Most of the occupants of social housing in Famagusta do not' have the financial possibility of making their dwellings adaptable, because most of them are governmental employees and their income is insufficient for such changes. Fourteen residents stated that they were not in a position to carry out any changes and twelve stated that maybe in the future they could make some changes in their apartments. The remaining twenty-four residents stated that they have are in a financial position to effect changes. The results are shown in the table below,

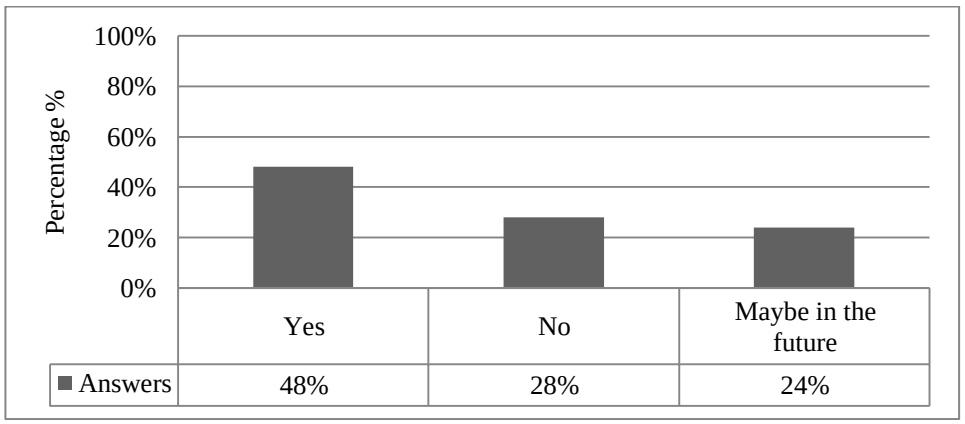


Chart 8 : Possibility for residents to make the unit adaptable according to the budget of the family and their needs and wishes
Source: (By Author, 2010)

According to information regarding earlier changes to the social housing apartments in Famagusta, twenty-one residents changed the unit according to their needs and twenty-nine did not carry out any changes to their apartment. The results are shown in the chart below,

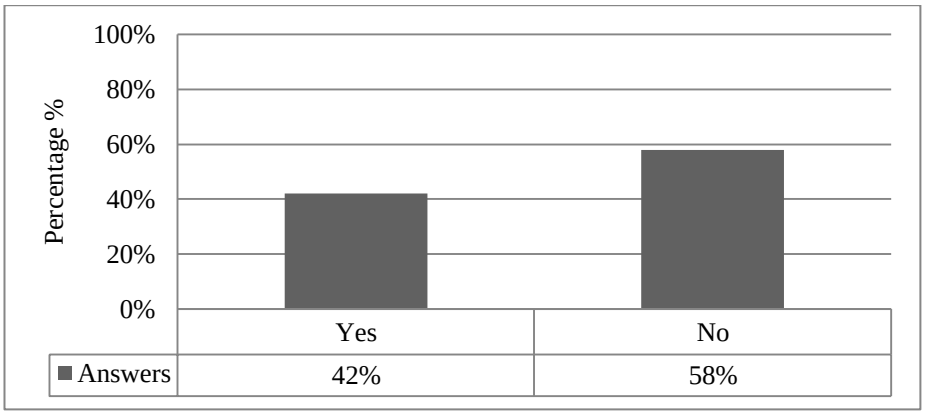


Chart 9 : There have been previous changes made in some parts of the apartment according to the family's needs
Source: (By Author, 2010)

Figure 74 : View of the front facade
Source: (By Author, 2010)

In figure number 48, the residents extended the size of the living –room by adding a balcony to the living room on the first and third floor.

As a result, thirty-three of the respondents in this social housing in Famagusta, agreed that it was possible to update the building using new technology. , For example, most of them mentioned the fact that it was necessary to have an elevator in the building, but seventeen respondents disagreed with this.

The results are shown in the chart below,

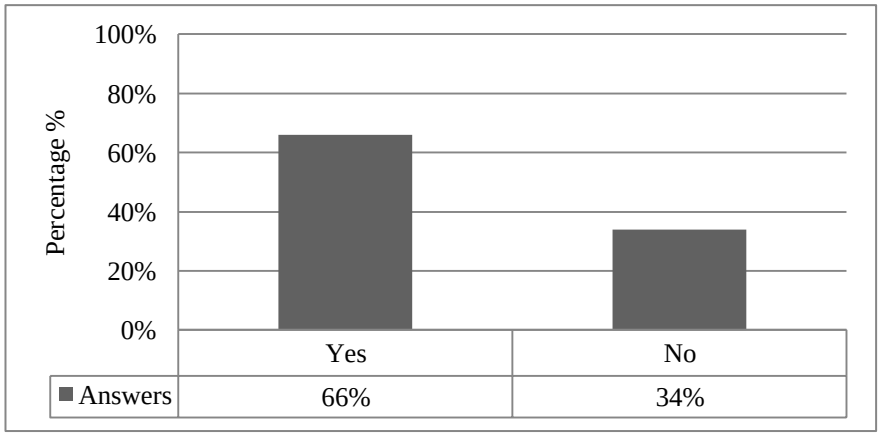


Chart 10 : Updating this building with new technology for example heating systems, kitchen, and bathroom
Source: (By Author, 2010)

Figure 75 : top view of void between two apartments
Source: (By Author, 2010)

According to the majority of the respondents to the questionnaire they were in agreement about the possibility of the prospective users being involved in the design and completion of their apartments before taking up residence. The results are shown in the table below,

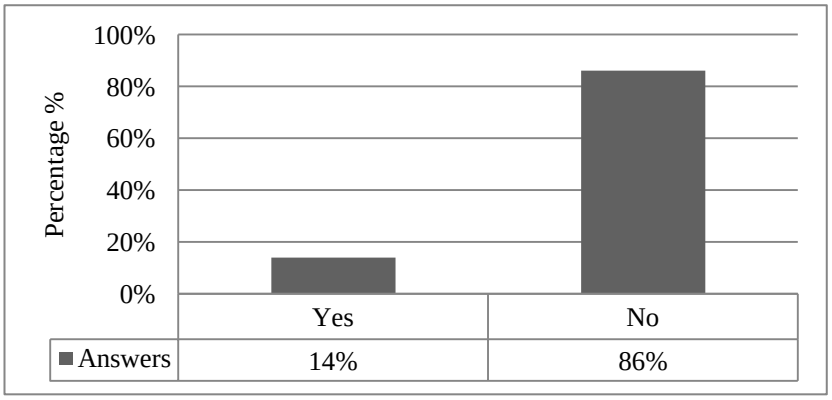


Chart 11 : Possibility for the users to complete their apartments on participation by themselves before they go to live in the apartments
Source: (By Author, 2010)

The residents of the apartments in Famagusta were satisfied with their dwellings and they do not need any changes: approximately thirty-five respondents agreed. The results are shown in the chart below,

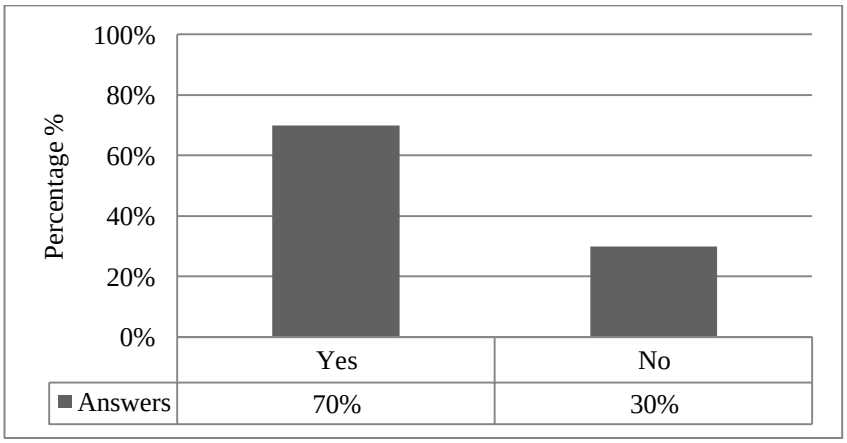


Chart 12 : Satisfaction of respondents with their apartments:
A) Satisfied B) Prefer to change the apartment according to special needs and sizes
Source: (By Author, 2010)

In general twenty-five of the residents of the social housing in the case study in Famagusta claimed that changing the interior of the apartments to meet the families' requirements does not require any permission from the Ministry of Social Housing, but if the residents wanted to change anything outside the units such as facades, court yard, parking permission is required.

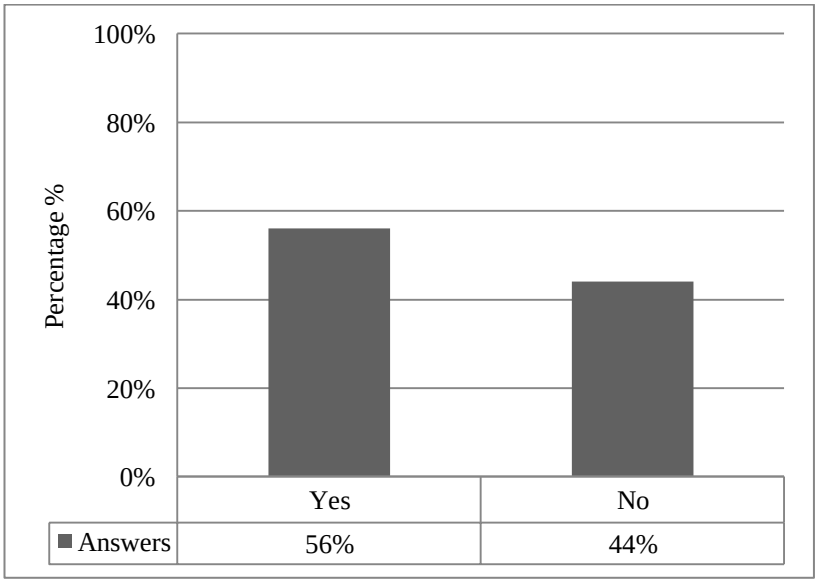
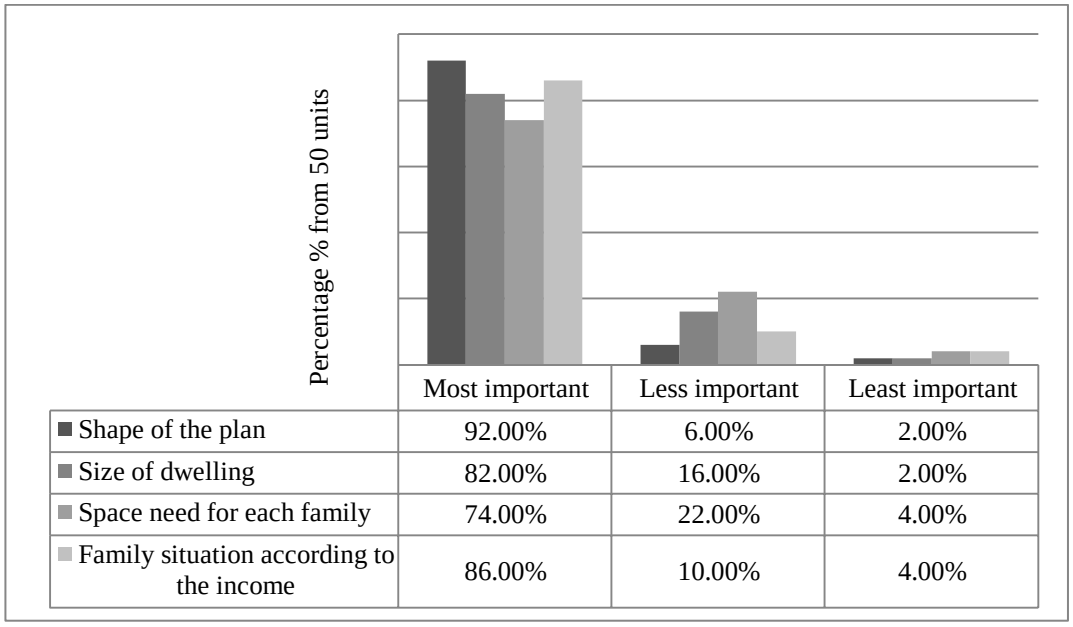


Chart 13 : Possibility for resident to change the apartment according to their requirements by getting permission from the ministry of social housing
Source: (By Author, 2010)

The most important feature form the residents point of view in respect of the issue of adaptability was first and foremost the shape of the plan: 92% of residents agreed with it. Secondly the household situation based on the budget that 86% of the occupants believe. Thirdly was the size of the dwellings: 82.00% has the same opinion and finally 74% the results are shown in the chart below,



	Most important	Less important	Least important
Shape of the plan	92.00%	6.00%	2.00%
Size of dwelling	82.00%	16.00%	2.00%
Space need for each family	74.00%	22.00%	4.00%
Family situation according to the income	86.00%	10.00%	4.00%

Chart 14 : The most important factors in adaptability
Source: (By Author, 2010)

In conclusion, the majority of the respondents of the social housing in Famagusta are not satisfied with the kitchens, living rooms and the bathrooms, and most of them have already changed the arrangement of these three spaces. Almost 90% of the occupants have changed the kitchen and toilet in the house whilst, the rest have changed the bedrooms. In just a few houses the living room has been changed. Most of the respondents agreed with implementation of technology inside of the houses; such as the installation of modern technology in piping systems or installing elevators. This survey reveals the fact that in order to provide more comfortable and necessary spaces, the families have changed the kitchens and the toilets, where they are more in use than the other spaces in the houses, but after the analysis of the plans, the researcher's perception was that based on the type and location of the existing supports in the apartments, the residents will not be able to adaptability. It means that the apartments' supports are not designed in such a way that each individual family could change the design plan based on their personal needs and requirements.

In this section, a couple of comments and proposals are given on the studied houses. These can be used to alter the design plan of the houses and achieve the desired living spaces, which will better meet the personal needs of the individual residents and, therefore, offer or provide better living environments.

Appendix D: Nicosia: "KonutlarMehmet Ahmet Kucuk Caddesi Sosyal Konutlar ,Sht Sonay Beyzade Sk & Hasan Bilgen Sokak"

According to the research survey carried out prepared and carried out by the author, 58%, of the residents who live in social housing in Nicosia are 4 person families, then the most approximate number of the residents are 24% for 3 residents in one unit. The approximate figures are shown in the table below,

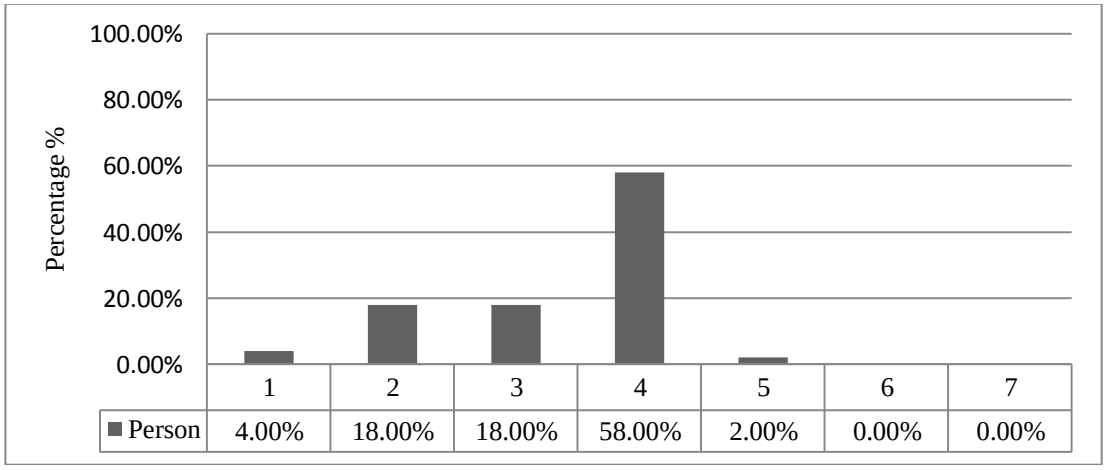


Chart 15 : The percentage of the resident occupancy in units
Source: (By Author, 2010)

Roughly the people who answered the questionnaires in social housing in Nicosia are between the ages of 20 and 30. There were also some residents between the ages of 60 and 70.

Table 10: The analysis of the ages of the 50 residents that live in social housing in Nicosia

Age between 20 and 70	20-30	30-40	40-50	50-60	60-70
Number out of 50 questionnaire	18	3	15	9	5
Percentage	36.00%	6.00%	30.00%	18.00%	10.00%

Source: (By Author, 2010)

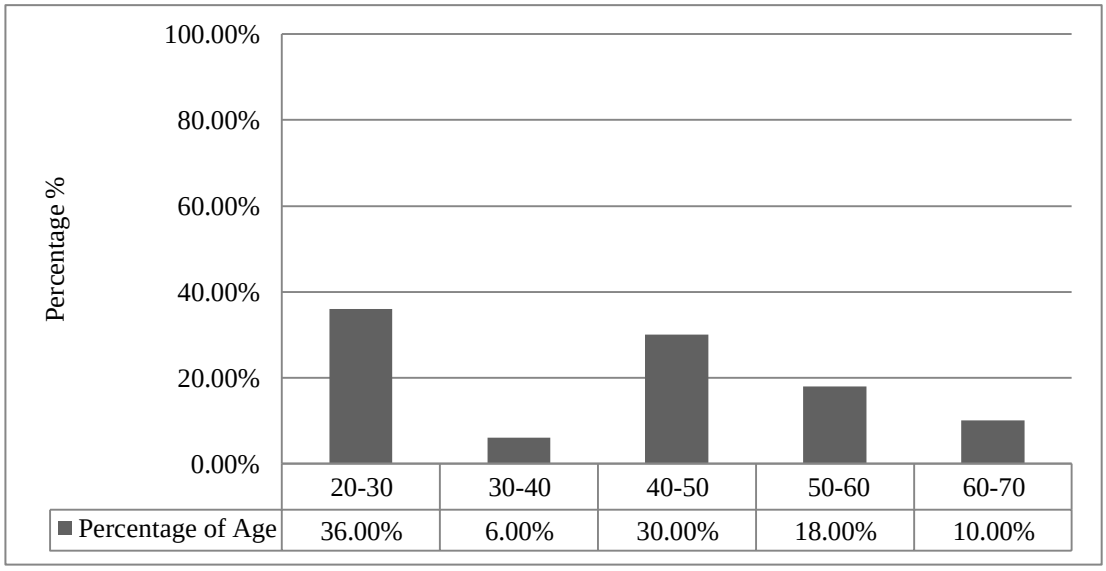


Chart 16 : The percentage of the ages of residents between 20 and 70 years old in 50 units in Nicosia
Source: (By Author, 2010)

Most of the social housing residents in Nicosia were between 20 and 30 years old with 36% and 30% of the people between the ages of 40 and 50. On the other hand, only 6% of the residents were between 30 and 40 years old. Moreover, the majority of the residents in Nicosia social housing were students 31.11%, 30.56% miscellaneous, 25% retired, 22.22% government employees, 13.89% housewife and 8.33 free/ self employment.; The estimated figures are shown in the table below,

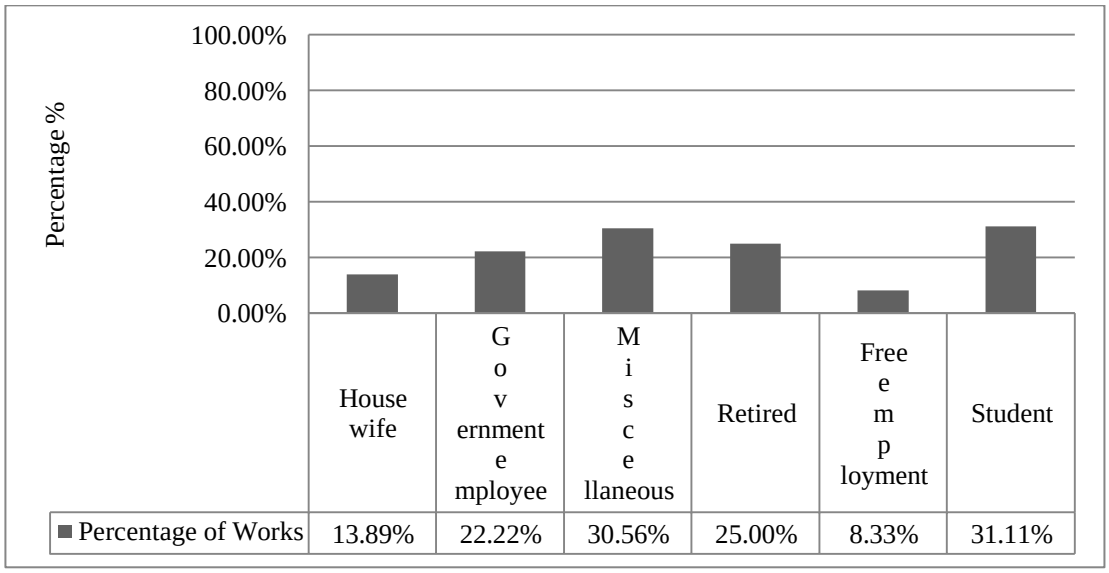


Chart 17 : The chart show the percentage of the respondents to the questionnaires
Source: (By Author, 2010)

Based on the result of the social housing questionnaires distributed in *Nicosia, people chose social housing mainly because of their low income (40%). According to the residents their income meant that they could only afford apartments that belonged to the government. The apartments that are owned by the government are

much cheaper so they are more suitable for those people with a low income. The table below shows the result of the questionnaires:

Table 11 : The table shows the reason for the families selecting social housing apartments in Nicosia

Reason of selecting social housing for live	Budget	Location	Budget & Location	Area of the house
Number out of 50 questionnaire	20	10	3	17
Percentage	40.00%	20.00%	6.00%	34.00%

Source: (By Author, 2010)

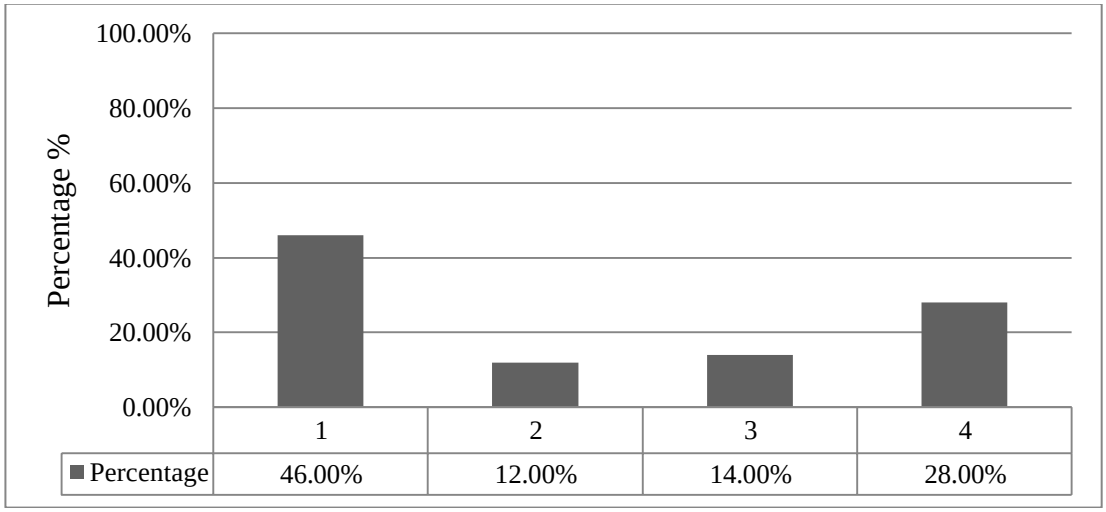


Chart 18: the chart shows the percentage result of selecting social housing in Nicosia
Source: (By Author, 2010)

Analysis of the questionnaires in 50 units of social housing apartments in Nicosia: “KonutlarMehmet Ahmet Kucuk Cadesi Sosyal Konutlar ,Sht Sonay Beyzade Sk & Hasan Bilgen Sokak"

According to the surveys by the author the possibilities for Nicosia social housing to make changes according to the space required and the size of the rooms in the units is as shown in the chart below:

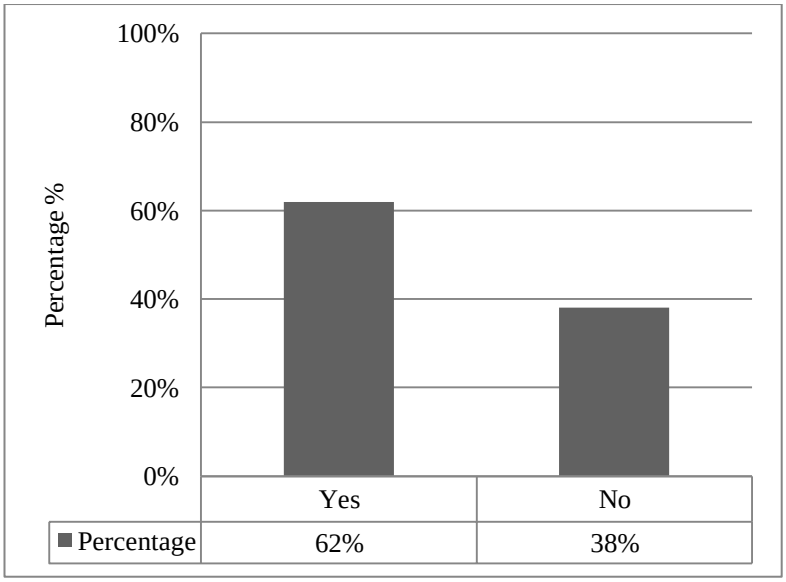


Chart 19 : Percentage of Possibilities to make changes according to the space required and the size of the rooms in the unit
Source: (By Author, 2010)

Table 12 : Percentages of preference of the respondents for changing one space

	Bedroom	Kitchen	Services	Living room	Dining room	No one	Kitchen+Service
Number	14	14	2	6	2	4	8
Percentage	28.00%	28.00%	4.00%	12.00%	4.00%	8.00%	16.00%

Source: (By Author, 2010)

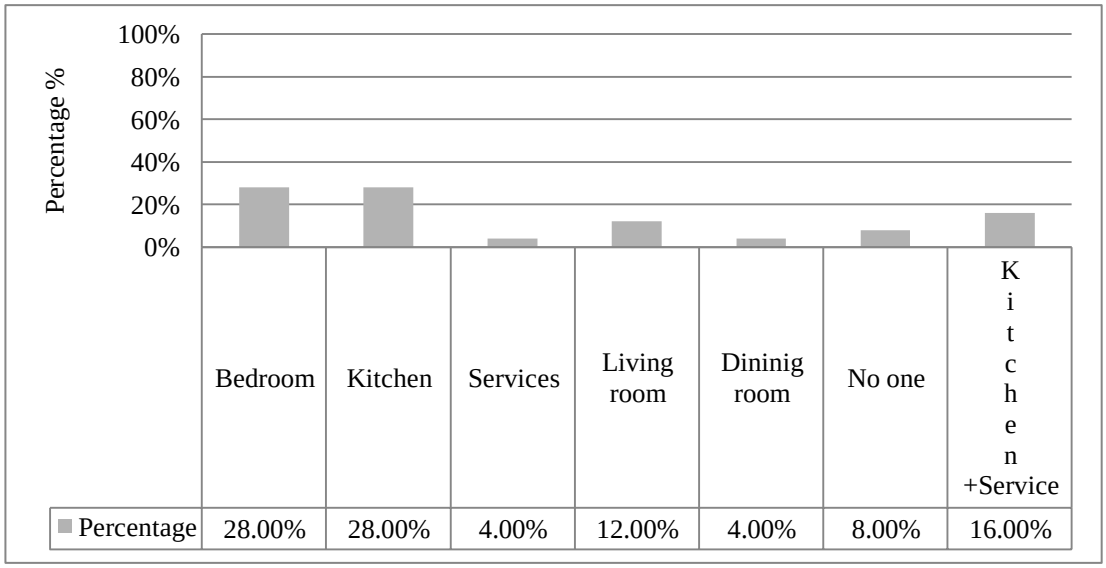


Chart 20 : Percentages of preference of the respondents for changing one space
Source: (By Author, 2010)

The needs and requirements of families are different; families based on their size are in need of different applications, items and spaces. According to the chart below 58% of the occupants did not agree with the concept of adaptability in their apartment in terms of room type and only 42% of the residents agreed with the idea of adaptability in their apartments.

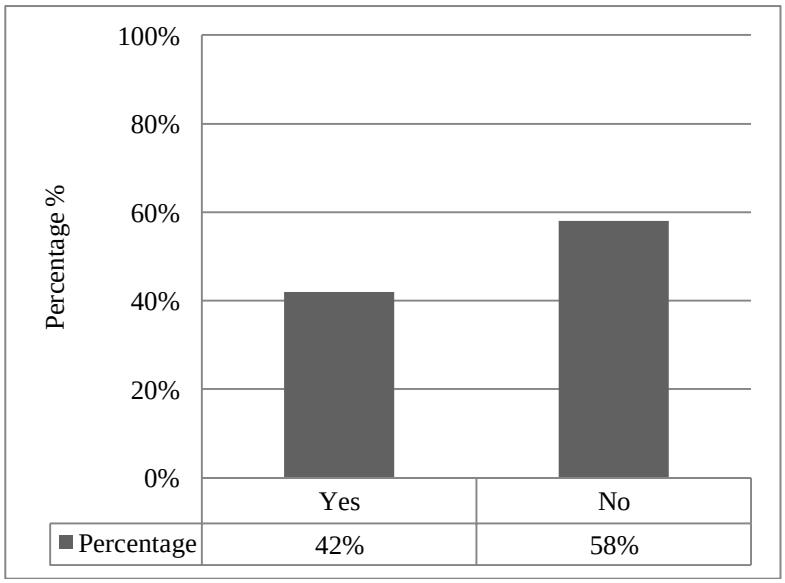


Chart 21 : Percentage need of any adaptability required in the apartment in terms of room type for different childrens' needs.
Source: (By Author, 2010)

Making an apartment adaptable to meet the needs is one of the concerns of the residents of the social housing in Nicosia; 38% of the occupants are willing and able to change their apartments based on their families' needs, but, on the other hand, 34% of the residents are not entitled to change anything in their apartments, since they do not have permission and the remaining residents have in mind the idea of

changing the apartment in the future when they are in a better, more secure, financial situation. The results are shown in the table below:

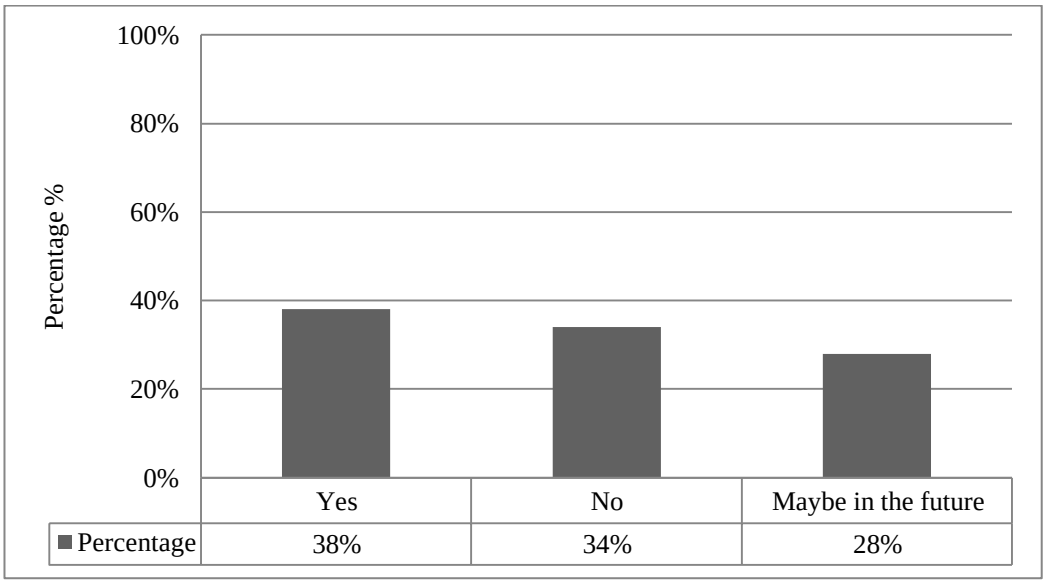


Chart 22 : Possibility for residents to make the unit adaptable according to the budget of the family and their needs/wishes
Source: (By Author, 2010)

According to the questionnaires 46% of the apartments had been altered previously based on the occupants' needs.

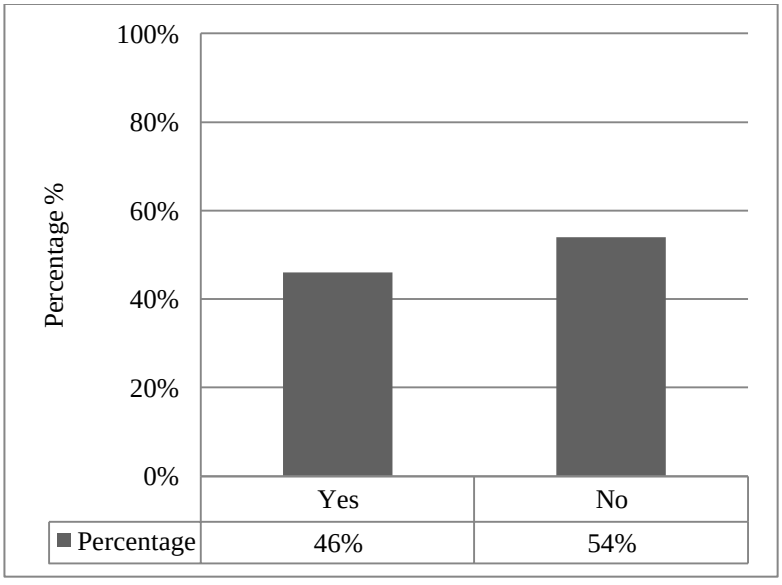


Chart 23 : There have been previous changes in some parts of the apartment according to family needs
Source: (By Author, 2010)

Most of the respondents in social housing in Nicosia agreed with updating the apartments using new technology such as installing elevators and new heating and cooling systems in their apartments, the results are shown in the chart below:

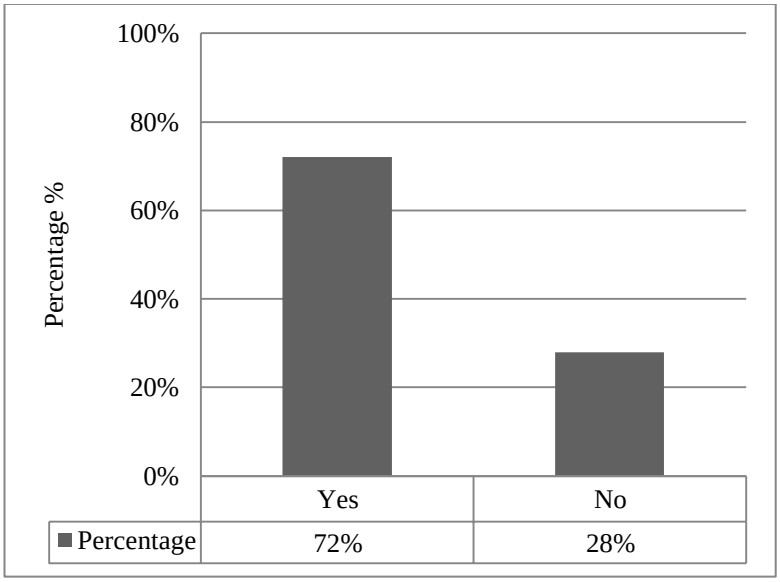


Chart 24 : Updating this building with new technology for example the heating system, kitchen, and bathroom
Source: (By Author, 2010)

As t is shown in the chart below 50% of the residents agreed with the possibility of participating in completing their own apartments by themselves through participation cooperation with the owners / builders of the housing and with the benefit of technical advice and supervision from them, but the other 50% were not happy with the idea of participating in completing their apartments.

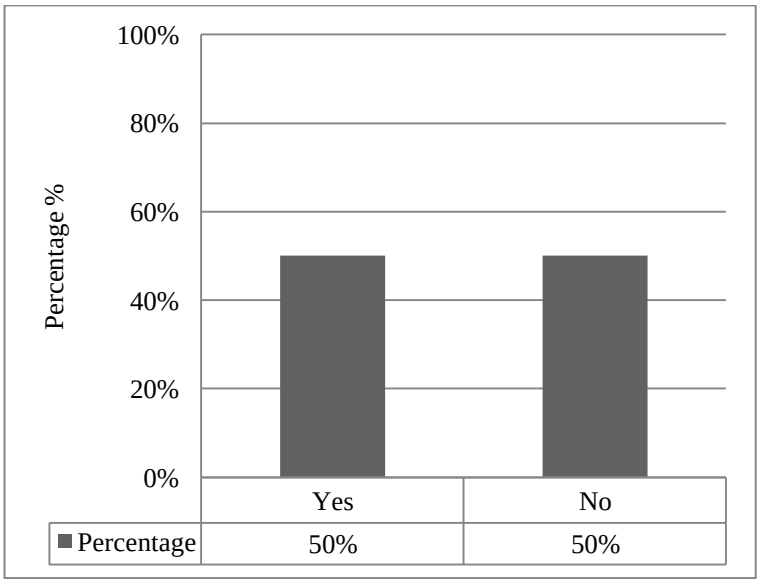


Chart 25 : Possibility for the users to complete their apartments by themselves before taking up residence
Source: (By Author, 2010)

Most of the social housing residents in Nicosia were happy with their apartments and they did not want any change, nearly 72% of the occupants were satisfied with their apartments in the way they were. The result is shown in the chart below:

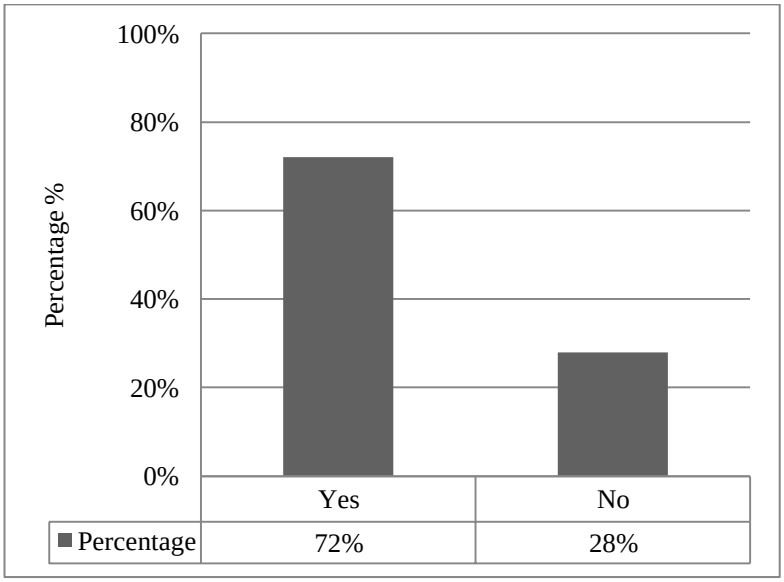


Chart 26 : Satisfaction of the respondents with their apartments:
A) Satisfied B) Prefer to change the apartment according to special needs and sizes
Source: (By Author, 2010)

The majority of the residents claimed that there is the possibility of residents changing the inside of their apartments according to their needs without getting permission from the ministry of social housing, but changing the external part of the apartments such as the facades or external spaces or arrangements is forbidden and the residents must obtain permission from the Ministry of Social Housing.

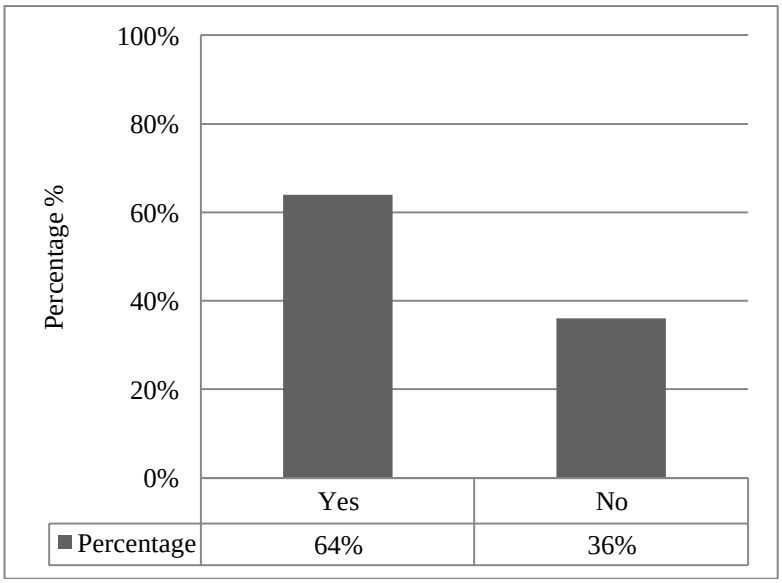
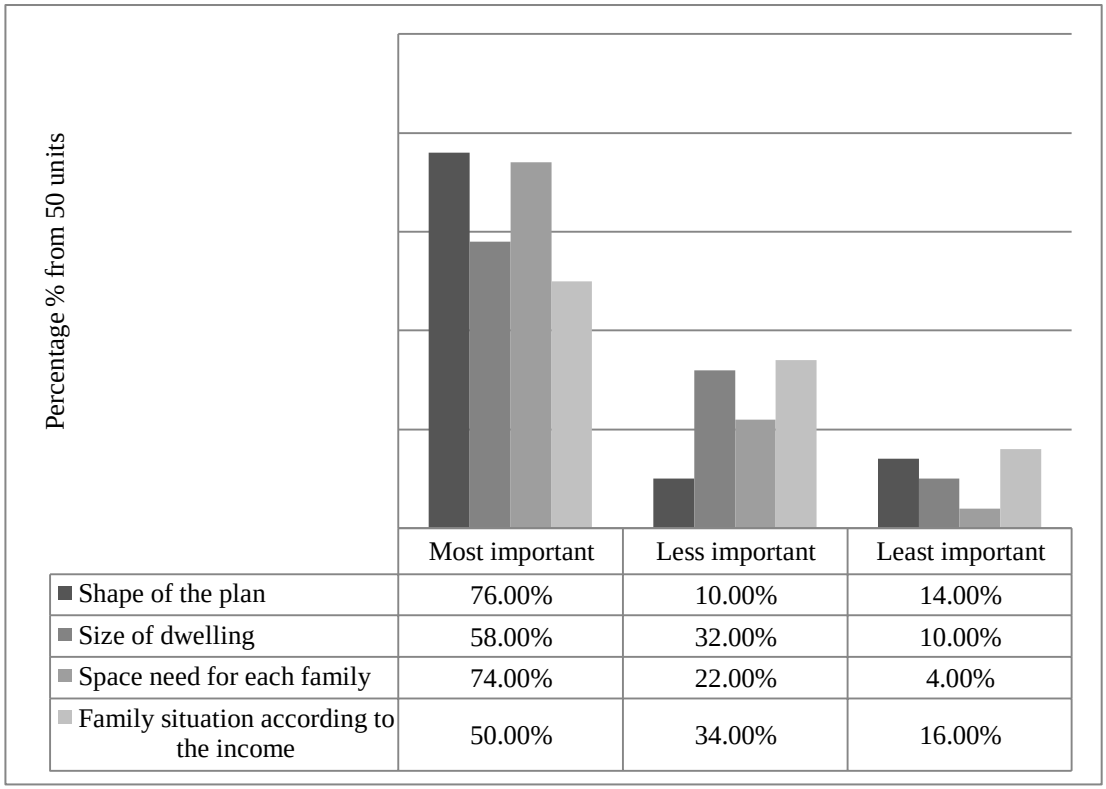


Chart 27 : Possibility for residents to change the apartment according to their requirements by obtaining permission from the Ministry of Social Housing
Source: (By Author, 2010)

The residents of social housing in Nicosia believed that the most important factor in adaptability was firstly the shape of the plan with 76% agreement of residents, secondly was the budget/ income of the families with 74%, thirdly, the size of the dwellings with 58.00% and finally 50.00% of the residents agreed with the space needed for each family. The results are shown in the chart below,



	Most important	Less important	Least important
Shape of the plan	76.00%	10.00%	14.00%
Size of dwelling	58.00%	32.00%	10.00%
Space need for each family	74.00%	22.00%	4.00%
Family situation according to the income	50.00%	34.00%	16.00%

Chart 28 : The most important factors in adaptability
Source: (By Author, 2010)

Appendix E: Caesar Resort: “Karpas peninsula or the Panhandle, the easternmost part of Northern Cyprus on the Mediterranean coast"

According to the analysis researched, presented and delivered by the author, 30%, of the residents who live in the Caesar Resort are 4 person families and 28% are 3 person families. On the other hand, there are some units which house 7 persons. . The rough figures are shown in the table below,

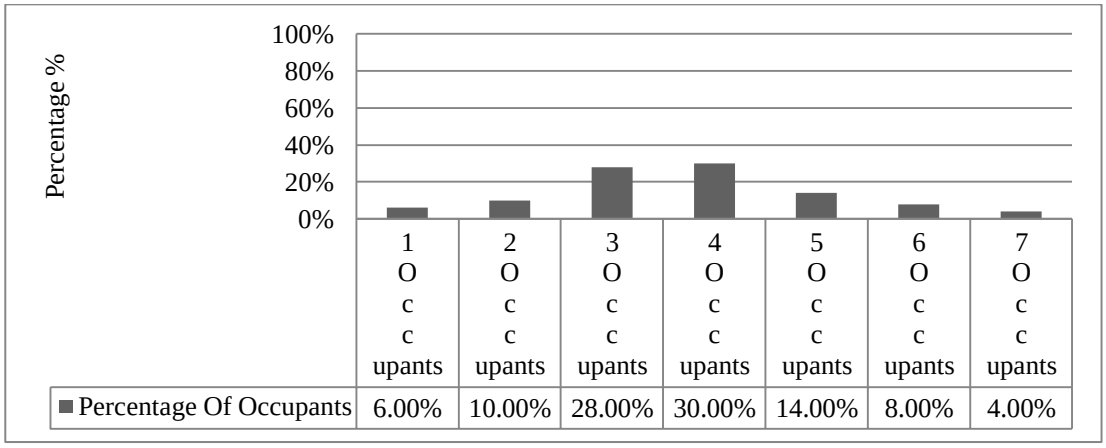


Chart 29 : The percentage of the resident occupancy in units
Source: (By Author, 2010)

Generally the residents who live in the Caesar Resort and who responded to the questionnaires are in their 20s. There were, however, 2% of the respondents between the ages of 60 and 70. . In addition, 22% of the Caesar Resort residents are between 30 and 40 years old.

Table 13: The analysis of the ages of the 50 residents that live in social housing in Iskele

Age between 20 and 70	20-30	30-40	40-50	50-60	60-70
Number out of 50 questionnaire	35	11	0	3	1
Percentage	70.00%	22.00%	0.00%	6.00%	2.00%

Source: (By Author, 2010)

The majority of the Caesar Resort social housing residents were between 20 and 30 years old with 70%, and people between the ages of 30 and 40 numbered 22%. In contrast, only 2% of the residents were between 60 and 70 years old.

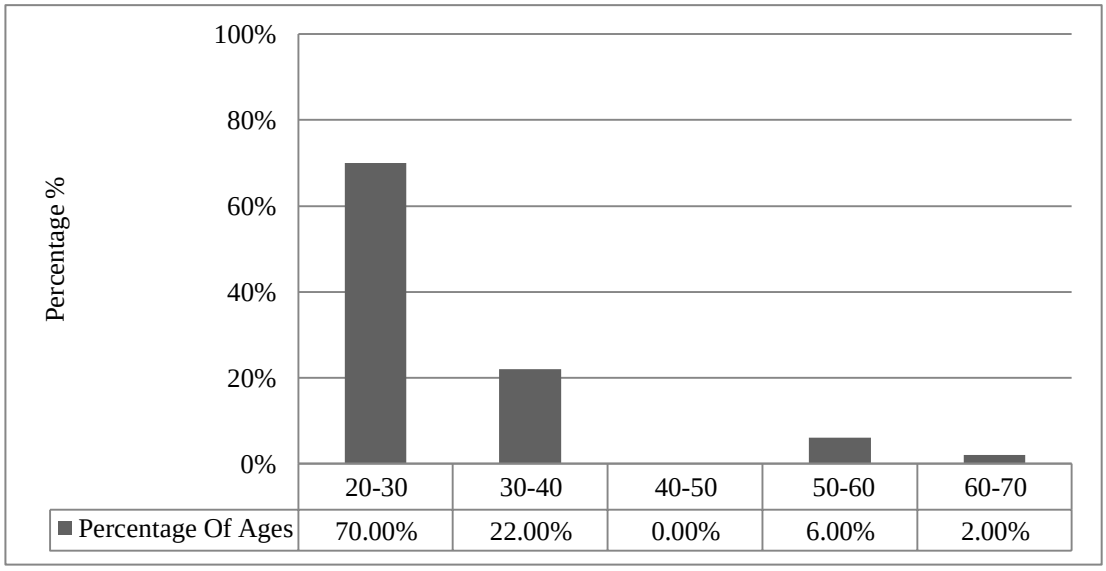


Chart 30 : The percentage of the ages of the residents between 20 and 70 years old in 50 units in Nicosia
Source: (By Author, 2010)

Furthermore, the greater part of the residents in Caesar Resort social housing fell into the miscellaneous employment category, such as: , casino worker, (65.12%), 15.22% student, 9.30% retired, 9.30% government employee, 9.30%housewife and lastly free/self employment which showed the lowest percentage of 6.98%. ; The figures are shown in the table below,

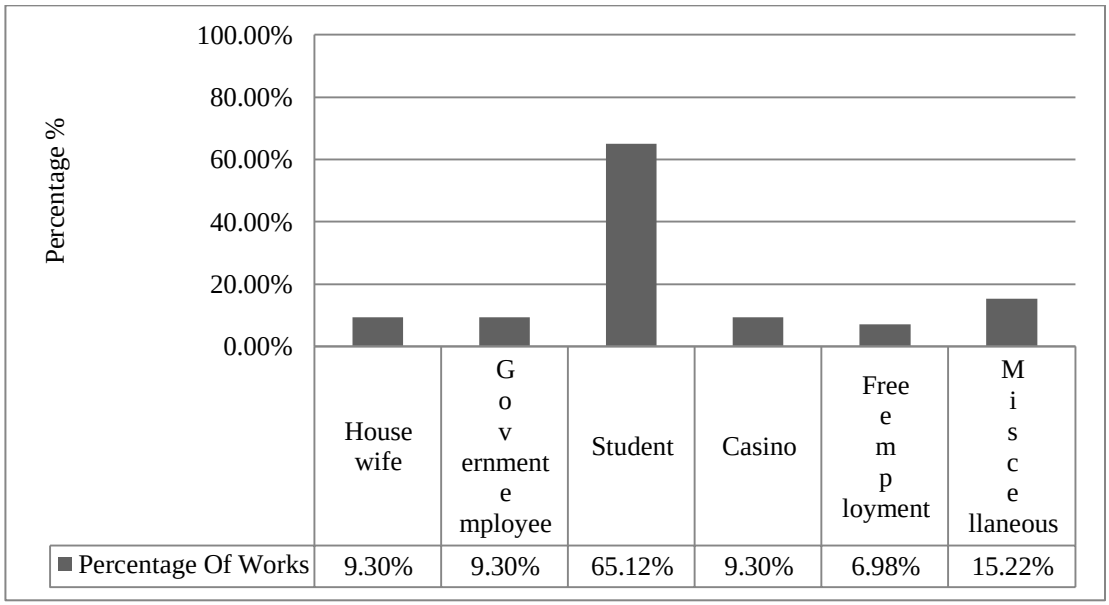


Chart 31 : The chart show the percentage of job –types of the respondents to the questionnaires
Source: (By Author, 2010)

According to the result of the Caesar Resort social housing questionnaires, the main reason for people choosing to live there was the location and their budget based on their income (36%). On the other hand, 22% of the occupants chose to live there

for the area of the house. For the remaining residents of Caesar Resort budget or income was not very important (6%). The table below shows the result of the questionnaires:

Table 14 : The table shows the reason of the households to select social housing apartments in Iskele

Reason of selecting social housing for live	Budget	Location	Budget & Location	Area of the house
Number out of 50 questionnaire	3	18	18	11
Percentage	6.00%	36.00%	36.00%	22.00%

Source: (By Author, 2010)

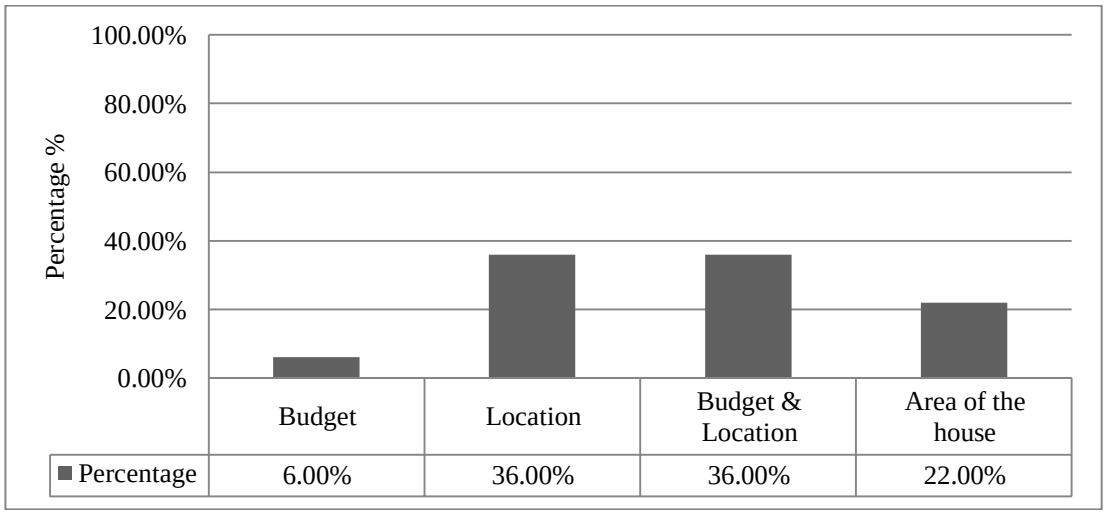


Chart 32: the chart of the percentage shows the result of selecting social housing to live in Iskele
Source: (By Author, 2010)

Analysis of the questionnaires in 50 units of social housing apartments in Caesar Resort: "Karpas peninsula or the Panhandle, the easternmost part of Northern Cyprus on the Mediterranean coast"

The possibilities for Caesar Resort social housing to make changes according to the space need and the size of the rooms in the units based on the author's surveys.

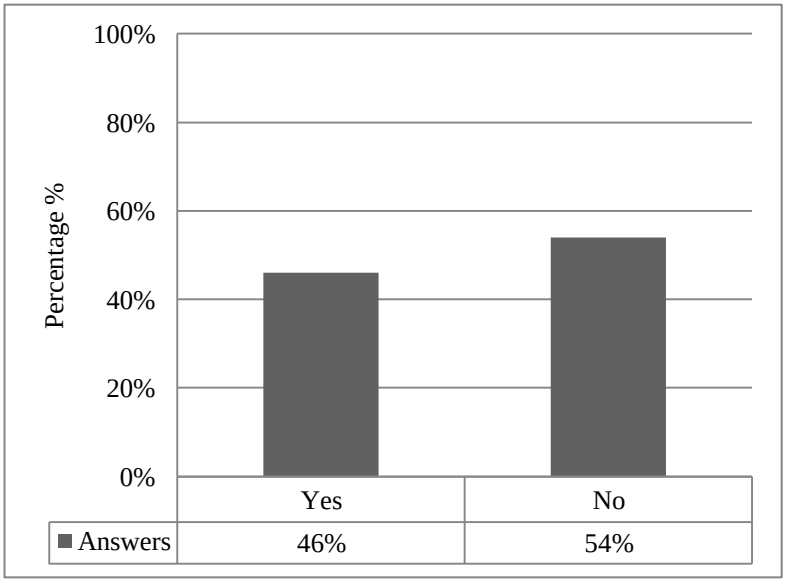


Chart 33 : Percentage of Possibilities for making changes according to the space needs and sizes of the rooms in the units
Source: (By Author, 2010)

Most of the residents of Caesar Resort did not agree to the changes in the units according to the space and sizes needed in the rooms (54 %.) On the other hand, 46% of the residents were happy with the changes effected based on their needs.

Table 15 : Percentages of preference of the respondents to change one space

	Bedroom	Kitchen	Services	Living room	Dining room	No one	Kitchen+ Service	Kitchen+ Living room
Number	8	14	3	15	1	6	1	2
Percentage	16.00%	28.00%	6.00%	30.00%	2.00%	12.00%	2.00%	4.00%

Source: (By Author, 2010)

The needs and requirements of each of the residents of Caesar Resort varied. The majority of residents wanted to change their living room (30.00 %,), 28.00% wanted to change their kitchen, 16.00% their bedroom, 6.00% the services. The rough result is shown in the chart below:

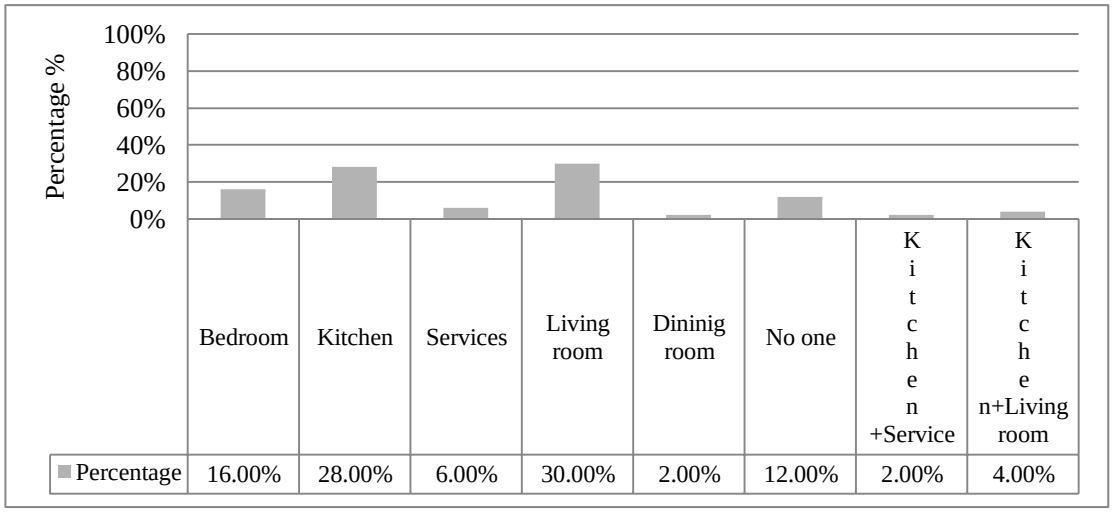


Chart 34 : Percentages of preference of the respondents for changing one space
Source: (By Author, 2010)

The Families who are living in Caesar Resort have different needs as aforementioned each family's requirements are, and the occupants require different spaces. Based on the chart below 68% of the occupants did not agree with the adaptability of their apartment in terms of room type and only 32% of the residents agreed with the adaptability of their apartments.

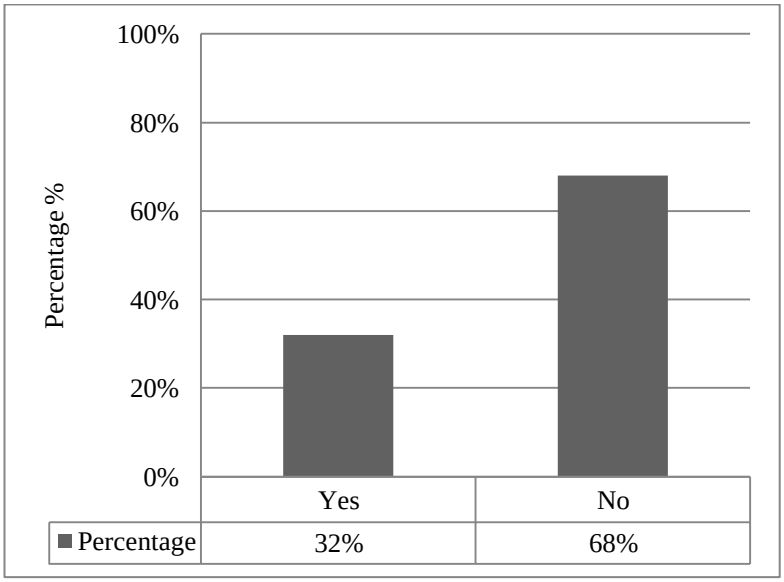


Chart 35 : Percentage need of any adaptability in the apartment in terms of room type for different childrens' requirements
Source: (By Author, 2010)

The adaptability of the apartments according to the needs of the users is very important to the residents of the Caesar Resort; 34% of the inhabitants are eager and able to change their apartments based on their families' needs, but in contrast 32% of the residents are unable, to make any changes in their apartments and the rest maybe make some changes in order to achieve adaptability in the future, The results are shown in the table below,

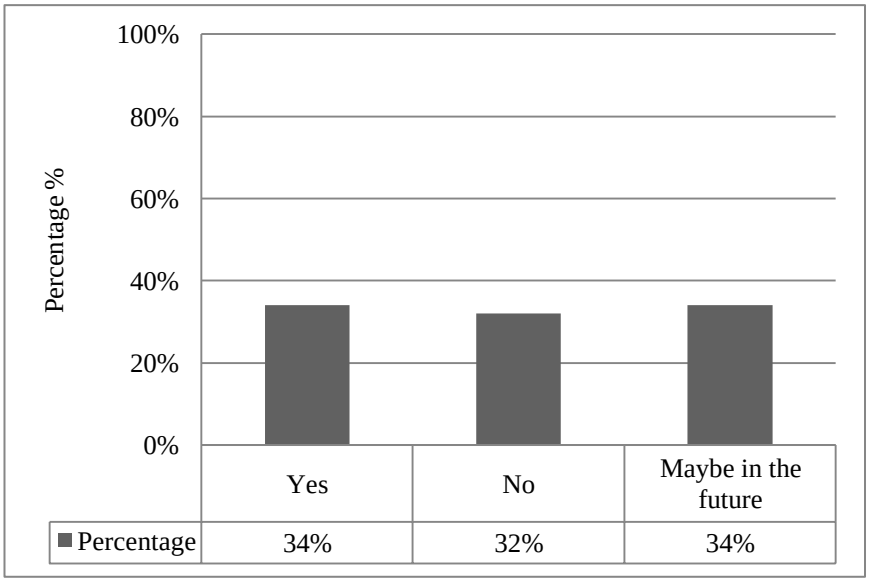


Chart 36 : Possibility for the residents to make the unit adaptable according to the budget of the family and their needs/wishes
Source: (By Author, 2010)

Based on the questionnaire result in Caesar Resort social housing, -22% of the apartments were changed before based on the former occupant's needs, but 78% of them have never been changed before.

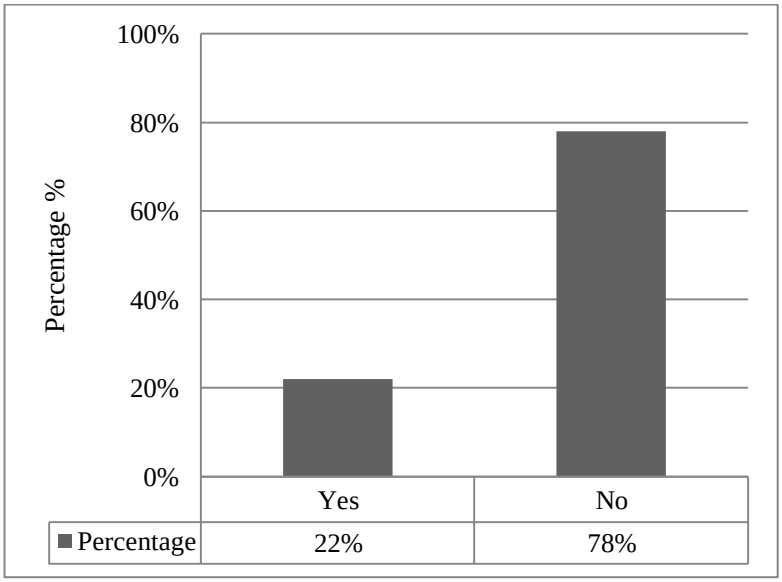


Chart 37 : There have been previous changes in some parts of the apartment to meet the familys' needs
Source: (By Author, 2010)

The majority of the respondents in social housing in Caesar Resort agreed the updating of the apartments with new technologies, in respect of upgrading or renewing the heating and cooling systems of their apartments -64%. On the other hand, 36% of the occupants did not agree with any changes. The results are shown in the chart below,

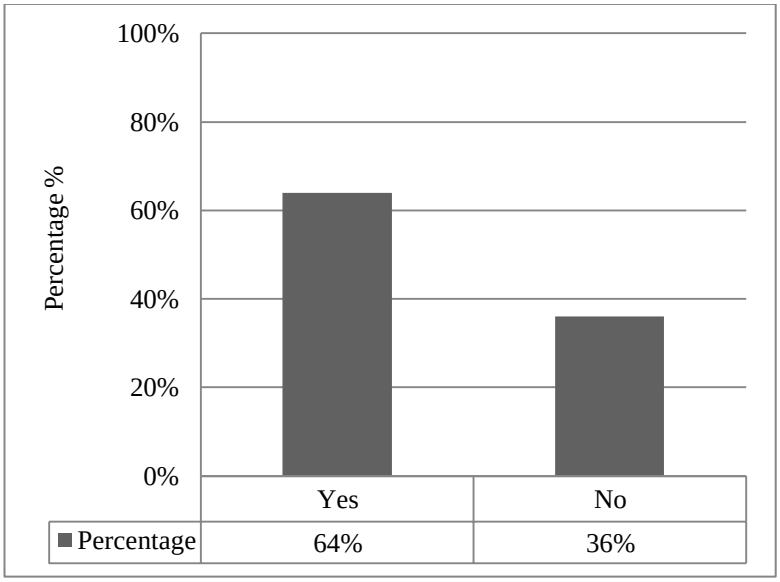


Chart 38 : Updating this building with new technology for example heating systems, kitchen, and bathroom
Source: (By Author, 2010)

Based on the chart below 53% of the residents of Caesar Resort social housing agreed with the possibility of participating in completing their own apartments by themselves and in cooperation. The remaining 48% did not want to participate in this way.

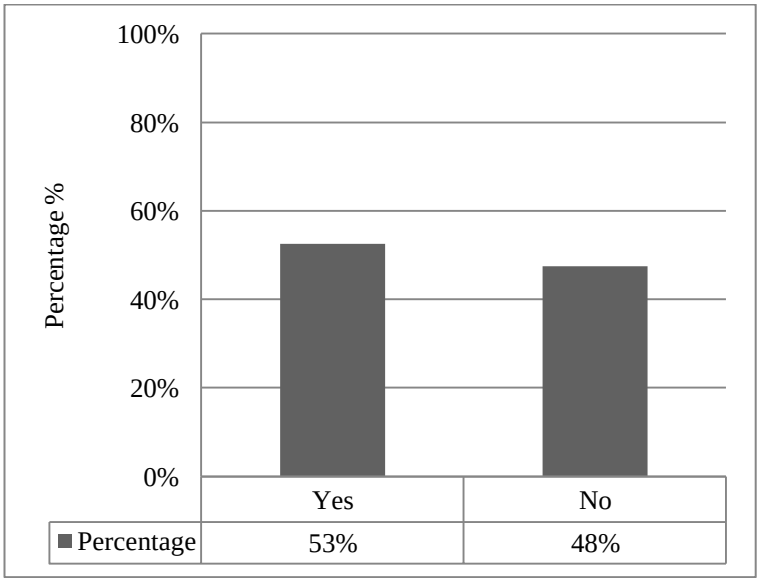


Chart 39 : Possibility for the users to complete their apartments by themselves before taling up residence.
Source: (By Author, 2010)

A good number of residents in Caesar Resort social housing were satisfied with their apartments and they did not want any changes (60 %.) In contrast, 40% of the

occupants were not happy with their apartments. The result is shown in the chart below:

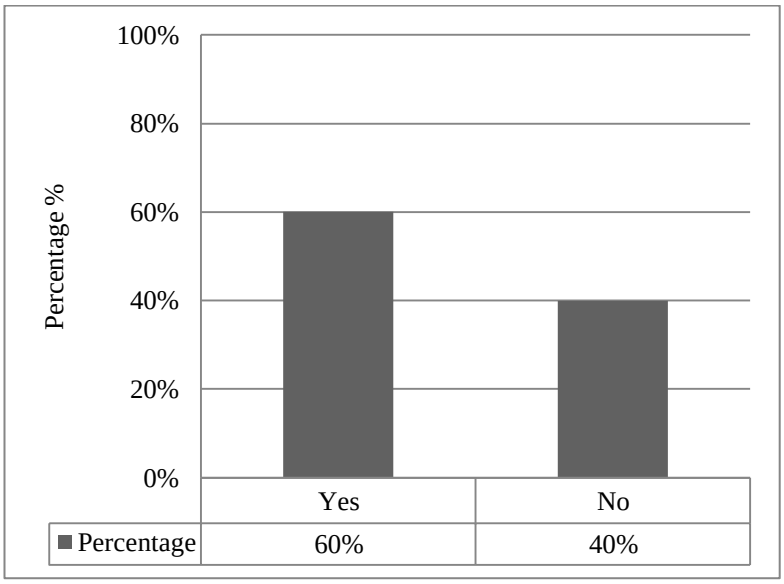


Chart 40 : Satisfaction of the respondents with their apartments:
A) Satisfied B) Prefer to change the apartment according to special needs and sizes
Source: (By Author, 2010)

The majority of the residents of Caesar Resort social housing claimed that there is not a possibility for residents to change the interior of their apartments such as the size of the rooms according to their needs without obtaining permission from the Ministry of Social Housing.

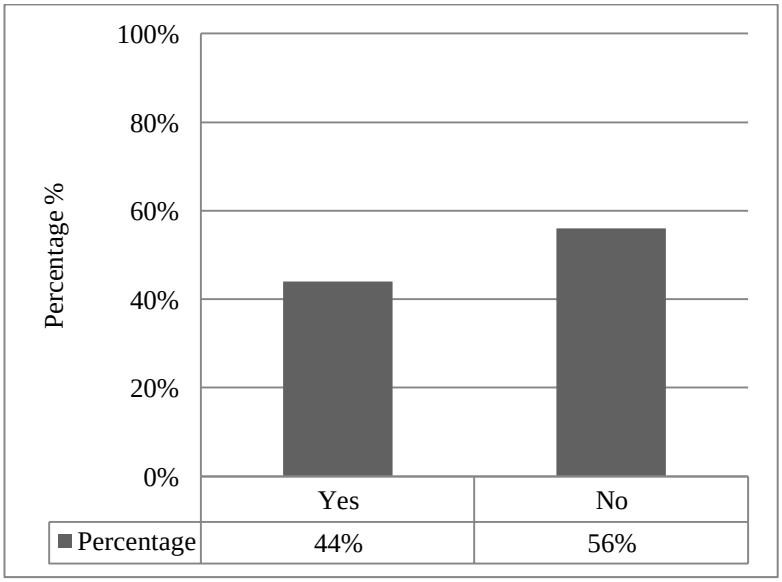
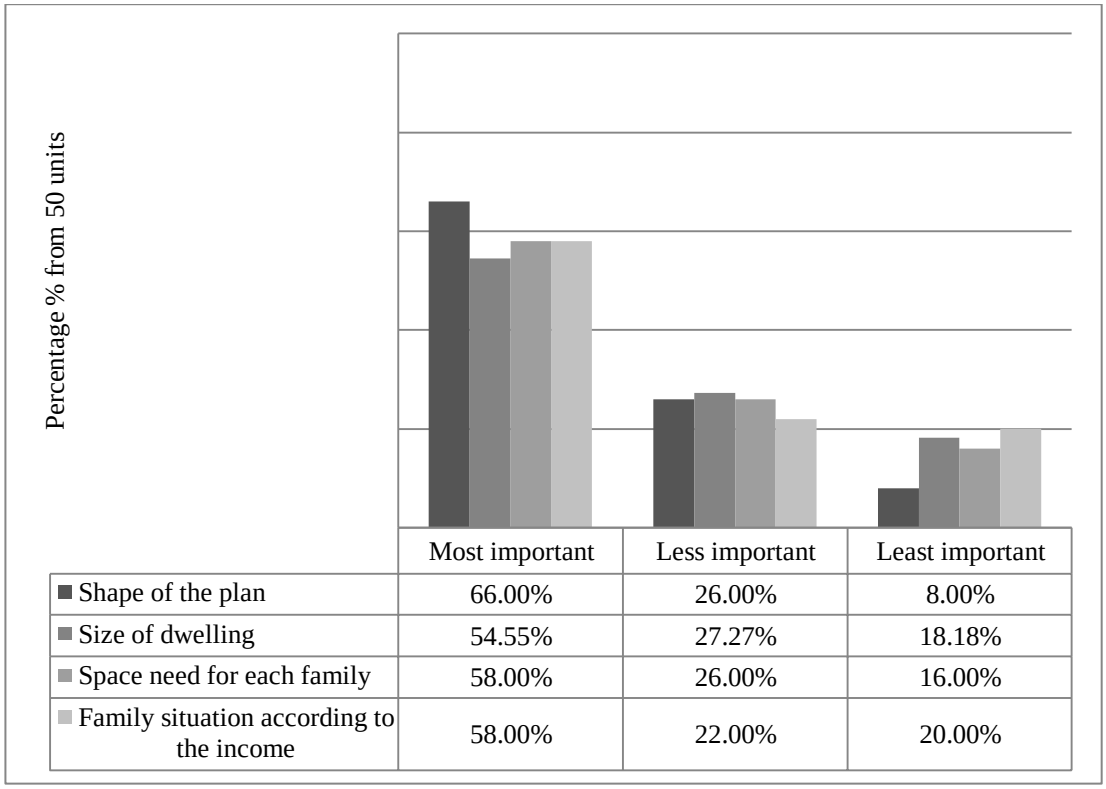


Chart 41 : Possibility for residents to change the apartment according to their requirements by getting permission from the Ministry of Social Housing
Source: (By Author, 2010)

The majority of the inhabitants of Caesar Resort social housing thought that the most important factor in respect of the issue of adaptability was firstly the shape of the plan (66.00%) , secondly, the income or budget and the space need for each family (58.00%), thirdly, the size of the dwellings –(54.55%), The results are shown in the chart below,



	Most important	Less important	Least important
Shape of the plan	66.00%	26.00%	8.00%
Size of dwelling	54.55%	27.27%	18.18%
Space need for each family	58.00%	26.00%	16.00%
Family situation according to the income	58.00%	22.00%	20.00%

Chart 42 : The most important factors in adaptability
Source: (By Author, 2010)