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Occupancy Issues of Apartment Housing in Kathmandu Valley

by

Nagendra Kumar Singh

A THESIS

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ABSTRACT

Nepal is urbanizing at a rapid pace. Kathmandu Valley shares the highest urban population. Growing population has per immense pressure on land and housing situation in Kathmandu Valley. Apartment came into picture to accommodate large no. of people in less horizontal space but all income groups of people could not afford to utilize the facilities of it. Considering the particular features of high rise; it should be managed and constructed in proper way. It saves our land to provide more greenery and open spaces for other infrastructural activities. Apartment plays vital role to optimize high-dense area, expensive and scarcity of land.

The objective of the report is to understand the occupancy level of apartments, causing factors behind the vacancy of apartments, and others related occupancy issues of apartment and its practicality in Kathmandu Valley.

Case study approach has been adopted through selecting some apartments of Kathmandu Valley. It was found that only higher income group (HIG) and middle income group (MIG) are residing in apartment and most of them are businessman. The developers make investments in the construction of apartments as a commercial activity rather than to upgrade housing scenario. Despite, due to the high interest rate, formal collateral in the form of land and house and high income of people to repay loans proffered by commercial banks, economically weaker section and lower income group of people are not able to get excess for loan because they don't have enough collateral for loan. Apartment is far beyond EWS and LIG to afford.

Before earthquake, apartment like Rio, Kuleshwor, Guna…etc had very nice occupancy rate more than 85%; but it decreased highly after earthquake except few apartment.

High-rises should be for all income groups. Cross subsidy schemes as well as encouraging private developers by providing incentives can maximize the EWS and LIG dwelling units. Government with the collaboration of private sectors can play vital role for its flourish through the improvements in policy and incentives by making long term plan to establish actual image of vertical living.

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List of Abbreviations

CBS	Central Bureau of Statistics
HIG	High Income Group
MIG	Middle Income Group
EWS	Economically Weaker Sections
LIG	Lower Income Group
FAR	Floor Area Ratio
ATM	Automatic Transfer Machine
USA	United State of America
CAR	Cost- Recovery Affordability Replicability
SOE	State Owned Enterprises
NHF	National Housing Fund
GHB	Government Housing Bank
GSEs	Government-Sponsored Enterprises
PCA	Portland Cement Association
MDU	Multi Dwelling Unit
IBC	International Building Code
NFPA	National Fire Protection Association
BMC	Mumbai Municipal Corporation
HVAC	Heating, Ventilation and Air Conditioning
NIHT	Northern Ireland Housing Trust
NSW	New South Wales
TED	Technology Entertainment Design
CTBUH	Council on Tall Buildings & Urban Habitat

ULI	Urban Land Institute
CLC	Center for Liveable Cities
SIT	Singapore Improvement Trust
HDB	Housing and Development Board
MUP	Main Upgrading Programme
MRT	Mass Rapid Transit
HUDC	Housing and Urban Development Company
CBD	Central Business District
SGD	Singapore Dollar
SCDF	Singapore Civil Defense Force
IFHP	International Federation for Housing and Planning
MILU	Multiple Intensive Land Use
GIC	Government, Institutional and Community
TKO	Tseng Kwan O
POE	Post Occupancy Evaluation
NHP	National Housing Policy
NUHHP	National Urban Housing & Habitat Policy
HFCs	Housing Finance Companies
SARFAESI	Securitisation and Reconstruction of Financial Assets and Enforcement of Security Interest
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
BSUP	Basic Services for the Urban Poor
IHSDP	Integrated Housing and Slum Development Programme
IAY	Indira Awas Yojana
BPL	Below Poverty Line
ISHUP	Interest Subsidy Scheme for Housing the Urban Poor

RAY	Rajiv Awas Yojna
HUDCO	Housing and Urban Development Corporation
NHB	National Housing Bank
BMC	Brihanmumbai Municipal Corporation
PAP	Project Affected Person
STP	Sewage treatment plants
FSI	Floor Space Index
PMC	Pune Municipal Corporation
PCMC	Pimpri Chinchwad Municipal Corporation
IT	Information Technology
NLSS	Nepal Living Standard Survey
NPHC	National Population and Housing Census
NRB	Nepal Rastriya Bank
IEE	Initial Environment Examination
EIA	Environment Impact Assessment
KVTDC	Kathmandu Valley Town Development Committee
KVTDA	Kathmandu Valley Town Development Act
NLHDA	Nepal Land and Housing Development Association
NHDFC	Nepal Housing Development Financing Company
HMG	His Majesty's Government
DHUD	Department of Housing and Urban Development
DUDBC	Department of Urban Development and Building Construction
CBS	Central Bureau of Statics
EPF	Employee Provident Fund
KSK	Karmachari Sanchaya Kosh

GLD	Guided Land Development
LP	Land Pooling
LSGA	Local Self Governance Act
TDA	Town Development Act
NSP	National Shelter Policy
GoN	Government of Nepal
TDC	Town Development Committee
NBL	Nepal Bank Limited
KMC	Kathmandu Metropolitan City
ADB	Asian Development Bank
NEA	Nepal Electricity Authority
SOE	State Owned Enterprises
GHB	Government Housing Bank

CHAPTER1: INTRODUCTION

1.1 Background

Housing is one of the most prominent basic needs of the human life. Good housing carries certain tremendous characteristics on the basis of which the layout and development of residential units is determined to provide peaceful, pleasant and sustainable healthier environment for living including all the amenities (social, cultural and recreational facilities) in holistic way. "People need a cheap but cozy house affording the maximum utility, safety, comfort and convenience with a background of serenity (Hiraskar, 1993)." The enhancement of house can't be forgotten; since house is the first essential unit of society and considered as the primary and fundamental unit of human habitation; that's why there must be clear and deep study on housing considering its all aspects in proper integrated and holistic manner. Thus, the affordable, adequate and safe housing plays vital role next to food and clothing; to satisfy the human basic needs properly.

To enhance and give the continuation of the ethical standard of the family and the society for its own iconic identity; there is the need of the ownership of a house; not only needed through the provision of the protection against sun, rain, heat and cold.

The history shows that shelter is probably started in the caves at beginning where people sheltered for protection against the natural calamities and wild animals. After long practice; people learned the cultivation and domestication of animals and realized the need of much wider space. The history behind civilization shows that people wandered around from places to places in the search of food and appropriate shelter; which compelled to people to stay at different place as having no permanent shelters. The nature of people is curious. They always try to solve any problem in best sophisticated way as they feel the level of demand and need. As a result; people behaviour and activities got drastic change through the long practice for the improvement of life style and thus on the way of such development, human race

started to stay in a society, which resulted in civilization. Thus, the concept of housing emerged by people after starting to stay at a permanent place and the emergence of trade formed trading centres in highly flourished settlements. The maximum flow of people to these centres resulted to evolution of urbanization.

"Housing really affects all aspects of a person's life – Youth Volunteer Twin Cities Habitat for Humanity".

Figure 1:1.1: Kathmandu Valley View

On the progressive track, the physical appearance of house including its forms, planning, architectural designs have been changing through the ages of times. The changing nature of life style of the inhabitants have demanded more comfort and facilities; accordingly to contextual time frame demand and performance level of people on their own perception about housing. Thus the houses built are also the reflections of the social, cultural, spiritual, economical behaviour of its inhabitants. The population density of the urban cities is increasing in rapid pace. Also day-by-day, people are being busier in earning money so they have less time for the family and self. Likewise, the inadequate knowledge to construct structures compels them to rely on other parties. This results in the need of housings. Through housing process, neighbourhoods and communities are formed which eventually grow in towns, cities and metropolitans. So housing process guide the pattern of urban growth, provide places for socialization and recreation, enhance economic sustainability and represent the socio-cultural identity of the community. It initiates the shaping of future towns. With the increasing pressure of population, commerce and trade, land cost in cities have been very high and it has demanded construction of high rise multi-storied building for residential units and this has been on the increase in the cities.

The capital city Kathmandu is the fastest growing cities in the world. As the availability of better job opportunities; high security; educational quality i.e. well

developed social facilities like international standard colleges and hospitals, people from different parts of the country are found to be migrating in Kathmandu. During the few years, flow of resident inside Kathmandu has drastically increased mainly due the poor security condition of the outsides cities. Thus this city is acting as a common platform for people from different parts outside or inside the country where they wishes to live in. Everyone has a dream to have a shelter in the Kathmandu valley.

The rapidly growth urbanization of Kathmandu but lack of proper city planning, the city has face to the unplanned growth of number of houses by the individuals has created a slum. Since the construction of the individual residential buildings is getting more expensive due to the roaring price of land and there is the provision of high density housing developments with the introduction of Apartment Housing Act 2054, many Real Estate companies are emerged for the development of apartments units in different core areas of the Valley.

Thus, the increased urbanization of Kathmandu Valley along with gradual shift in economic base from agriculture to commerce and service including changing lifestyles of city dwellers has not only created a huge demand of housing, infrastructure provision, social and emergency services but also transformed the form and mode of development of housing in the Kathmandu Valley with numerous consequences. The increased urbanization has led to pressure on the available land and infrastructure. Government is not able to fulfill the huge demand, operation and maintenance of the dwelling units. That's why the private housing companies came into existences.

1.2 Introduction

Occupants are the most essential factor in determining whether the apartment housing solution works. They can play vital role for the flourishment of any type of housing scenario in cities with high fame. They are the people who eventually have to live with the buildings that

Figure 2:1.2: TCH Tower, Sitapaila

planners, architects and developers build. Their lived experience and impressions are issued not to be neglected. Due to its shape, placement and surroundings, high-rise housing plays a key role in the city's built environment. Their damage and dysfunction can have profound effect on the occupants and trigger ripple effect through the city. (Yuen, 2011)

Apartment housing is that type of housing which is developed by certain organized group called developers in sophisticated way may go vertical with many floors as high rise apartment or just some floors with horizontal expansion called low-rise apartment. Housing occupants who occupy houses are broadly categorized into owner, renter, rent-free and others.

The housing is a basic need of human beings among three basic needs i.e. foods, cloths, and shelter. It is a shelter for every human being, so there should be the provision of healthy and eco-friendly environment under which elderly to the child should breathe healthy and happily. Housing is needed due to certain crucial factors which are not fulfilled by individual level for example scarcity of land, higher land value, inconveniency of services like water supply in individual level, inconveniency of construction work in individual level, security and privacy, increase in population, migration to city, trend of parent-child unit eliminating the extended family concept are certain those crucial factors intense to need apartment housing.

Overcrowding, congestion and unhygienic living conditions are widespread, as a result of unplanned, haphazard and substandard development in the metropolitan area and has resulted in the unhygienic condition of living, suffocating and deteriorating urban environment. High class families are moving in the urban fringe and it's always the poor who are trapped in the vulnerable core cities of Kathmandu. A large number of housing companies are making investments in the housing and apartment construction sector with a slogan of affordable and well accessed apartments with services and amenities for middle class family as well as for low class family but this has limited to slogan. So people go to urban fringe where there is less price of land that they can afford. There may occur win-win situation if social investment on housing is improved since it has numerous positive impacts on national development.

The unit cost of housing shall be optimized through combinations of integrating land development and housing unit construction, integrating with service delivery agencies and making long term housing loan available in the market. The improvement of the existing housing stocks and promoting rental housing further adds towards achieving the goal. The emerging private sector though profit motive should work together with the government sector and professional bodies for win-win situation. Last but not the least, it is the duty and responsibility of all Nepalese to contribute from their sides to make better housing conditions (Shrestha, 2012).

The price of houses and apartments varies based on the housing company and its facilities and location. The price of apartment housing ranges between Rs. 1.3 million to Rs 12.5 million. The middle class people have been buying the low cost accommodations while the high class people including businessmen, engineers and doctors buy the high rate apartments. The prospective buyers want a good location site, uniform land, usage of good quality of building materials, affordable cost, playground, school, health centre and public transportation facilities etc.

Figure 3:1.3: Kathmandu Residency

Apartment development in the country in organized way started with Tashi Rijal industries entering into the scene in the eighties. But they were ahead of time as they could not sell the apartments due to the lack of necessary legislation. As a result, it had to be given on rent for a long time. Ansal Chaudhary Company was the first of its kind in rendering the services with the sale of apartments the Kathmandu Residency in Bagdol of Lalitpur.

Community living in an Apartment, with all the necessary amenities, in prime locations inside the valley, soon became the hotcakes. As a result, Apartments inside the valley developed as the mushroom and hence the booming market of Apartments, the ratio of users and investors changed

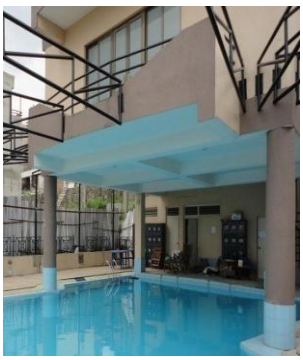


Figure 4:1.4: Swimming Pool

drastically. The affordability of land within the ring road led to the development of high-rise apartments in urban fringe. Not only inside, the apartments are growing outside the Ring-road at fringe of urban area because of availability of chunk of land and allowance of high FAR in the urban fringe.

Civil Homes, Comfort Housing and Sunrise Housing Company constructed separate houses as per the desire of the people in 1999. Civil homes had constructed separate houses in Bhaishepati in the first phase in 1999. Similarly, the Comfort and Sunrise Housing companies constructed separate houses in Sitapaila and Balkumari respectively in the same year. 70 apartments have been registered in Kathmandu Valley, only 55 of them are in operation and people are living in only 31 of them (Republica, 2015).

To study the occupancy issue in apartment's buildings deeply is relevant to formulate best solution to image the better and safe city under the urban planning.

1.3 Rationale of the Study

Figure 5:1.5: TCH Tower-II, Lazimpat

Apartment plays vital role to accommodate many people with high facilities in high density area. Over the years, the rich have been showing increasing affinity to high standard bungalows. High has become increasingly difficult for owner builders to manage the land purchase and the building process. Moreover, access to housing elements and services has become more and more difficult. Load shedding and poor water supply are major problems that people are facing every day. Apartment housing has tried to address such problems. The concept of high-rise buildings in the country can be an efficient solution as many people are housed in a single building (Joshi, 2013). The rich want to live in a safer neighbourhood with good environment.

Apartment scenario in Kathmandu is so narrowed only in living and basic approach of four covered walls ignoring social aspect of housing environment for occupants. Occupancy of apartment is current burning issue is the main rational of study. Many apartments in Kathmandu are not fully occupied.

In holistic approach, it is not good to emerge only physical infrastructure there must be considered of intangible aspects as well as social infrastructure to enhance the occupancy level of housing.

Lack of affordable housing and the virtually non-existent scale of housing assistance programs to the urban poor are the primary causes of homelessness. The growing gap between the number of affordable housing units and the number of people needing them has created a housing crisis for the poor people.

Considering the scarcity of land in Valley, policy should benefit with optimum result for a sustainable urban development. One way could be the going vertical than horizontal. Besides planned infrastructures and services, the policies should be such that the cost of apartments should be feasible to all income groups of people.

High-rise Scenario should be in progress to flourish, but current practice not indicating ***solid & flourish future*** of high-rise. In this regard my study aims to study the trend of vertical growth of apartment buildings in Kathmandu valley and its convenience to general people residing there and examine the level of occupancy. The unplanned growth of housing and high cost of private housing has resulted in inequity and disparity between the people living within same geographical boundary.

Moreover, due to recently occurred terrible Earthquake, Apartments are becoming one of the most relevant and burning issue within the valley. Due to the impact of earthquake on apartment buildings, become hot cake issues for highly urbanized dense area (Kathmandu Valley). That's why Apartments are being considered as very interesting issue to search its right solution in context of Kathmandu Valley.

1.4 Problem Statement

Even though there are number of housing and apartments growing each year, the costs of apartments are so expensive that all sectors of people could not afford for it and also not provision of well social environment makes a people more isolated and individualistic so people become more work oriented and mentally not well satisfied. Paying high cost month wise for Security, physical

Figure 6:1.6: Park View Horizon, Dhapasi

infrastructures and other amenities in extra pressurized the occupant which strike negative impact about occupancy of Apartment.

North oriented unit of Apartment in Kathmandu also not favours in comparison of south oriented force to vacant in some extent. In context of valley, the monthly salary from people job is not enough. The savings are less and for one family it takes earning of whole life to build a house or afford for apartment. So lack of affordable housing.

A sophisticated financial market for housing is not available, whereas loan from commercial bank with high interest rate is not feasible for ordinary people. There should be provision of safer high rise zone in each and every closed settlement. The safety of such units during emergencies such as fire and earthquake is not taken seriously. Due to low affordability, about 70% of units of many apartments are unoccupied. (Shrestha, 2012). The fear of living apartment after earthquake raised a problem for occupants which cause very low occupancy. Such high impact of earthquake to apartment is due to bad construction and improper location.

In present context occupancy of apartment becoming burning issue due to various causes. For example not affordable by all income groups, not well provision of loan with minimum interest rate etc. Earthquake is also one of the key factors to reduce occupancy level.

1.5 Statement of Purpose

1.5.1 Objectives of the Study

- To identify the level of occupancy in high-rise apartment.
- To identify the basic causes about vacancy of apartment (i. e. about low occupancy).
- To understand the socio-economic characteristics of occupants of apartments.

1.5.2 Research Questions

- Why have high-rise apartments low occupancy rate?
- What is the occupancy level after earthquake?
- How to improve low occupancy (or, what policies measures should be followed to overcome low occupancy problems)?

1.6 Expected Output

The expected output of thesis enhances the theoretical and logical background to the necessity and improvement of Apartment standards & occupancy situation in valley.

Factors affecting occupancy to low; have been included. Overview about occupancy of high-rise has been emphasized and understood clearly.

On the comprehensive and integrated study of burning issues and problems of the occupancy of apartment, the provision of certain fixed policies and legitimacy and other boosting factors for better occupancy has been clarified to make concrete recommendation for successful future of apartment in valley.

1.7 Scope of the Study

It is very crucial to explore the role of government and private developers in the development of apartments and their efforts to make the living in apartments affordable, convenient, and secured. The scope of the study involves the existing scenario of Apartment targeting its occupancy issues.

1.8 Limitation of the Study

National case study has been done selecting some apartments of Kathmandu Valley. Study depends on secondary data too available at Internet, books, senior thesis…etc. Candidate has tried to collect relevant information about occupants of apartment in limited months after earthquake. So, there may occur some error depending upon the nature of respondent. Also; candidate has included one case study of apartment which has done in housing module of urban planning just before earthquake. After earthquake, residences of that apartment come in day time then go back to rental house in night until apartment not getting well repair.

CHAPTER 2: RESEARCH METHODOLOGY

The research is primarily done to understand the current scenario of Apartment specifically related to occupants considering the various occupancy issues and socio economic activities.

2.1 Research Approach

The method of research is descriptive in nature. Thus, a statement of purpose is stated in the form of objectives of the study. For the research design of a descriptive study, the first focus is to specify the objective with sufficient precision to ensure that the data collected are relevant and then the technique for collecting the information is devised. Descriptive method is adopted to gain the better understanding of the topic so the research based on this method in order to get the better understanding about the existing facts of Private Housing. Descriptive method is used to identify and obtain the information on the particular issue.

2.2 Research Design

The research paradigm is based on the positivism. The study focuses on occupancy issues in apartments. The process of this research is typically quantitative analysis also including qualitative analysis in some extent, for example psychological impact on occupants, socio- economic status of occupants etc.

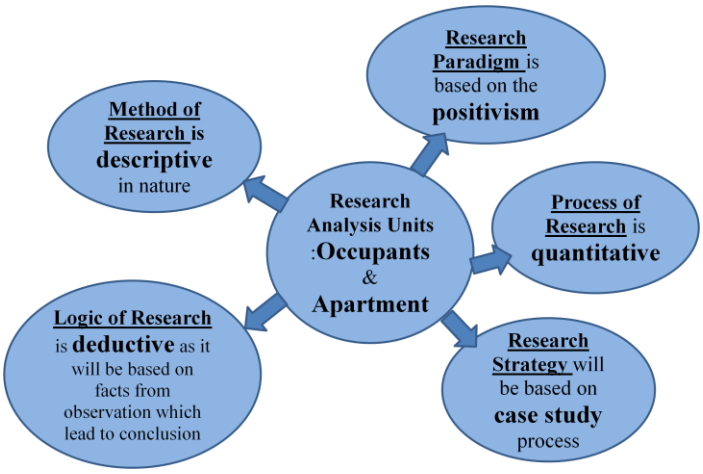


Figure 7: 2.1: Research Design

The logic of this research is deductive. Research analysis units are users of apartments (i.e. occupants) and apartment building.

The research strategy is based on the case study process considering the different parameters and socio-economic condition of the occupants of the apartments and to mitigate its occupancy problem of apartment of Kathmandu valley.

2.3 Research Methods

The method of this study is carried out as shown below (i.e. Step by step Approach):

2.3.1 Topic Selection

Topic is selected considering the base of interested field related to Urban Planning and last gained knowledge and experiences of various modules of subjects.

Problem Identification: The first step is to observe the situation and sensing the problem of occupancy in the private housing in Kathmandu Valley.

Formulation of Objectives: The objectives are formulated addressing the issues of the topic.

2.3.2 Literature Review

The literature review has been done, mostly concerned with the various aspects of apartments specially focused about the Occupancy. The evaluation methodology regarding the occupancy in Group housing was reviewed. The literatures related to thesis topic in various books, published articles, journals and newspapers through internet, library, teacher, lecture notes, magazines, media, etc. were reviewed. Similarly legislation related to Private Housing and Apartment Act 1997, Environment Protection Act 199 etc. was reviewed in order to adopt the appropriate strategies to overcome the problem identified in the case.

2.3.3 Study Area Description

Some familiar apartments are randomly selected for case study. The study areas lie within Kathmandu valley.

2.3.4 Data Collection

Primary Data Collection: The primary data was collected using some special methods as questionnaire, interviews, observation, maps and photographs.

The questionnaire method was used to know situation of specific variables related to physical and socio economic condition of household. Similarly, the interview method was used to know the policies, finance…etc about apartment. Observation was made to know the physical status of case area.

Secondary Data Collection: Secondary data was collected through the concerned agencies working for apartment housing in the form of published data, record, report, etc. such as Private Developers, CBS Census 2011, Nepal Living Standard Survey 2010/11, DUDBC, UNHABITAT… etc. and related materials such as book, magazine, journal, newspapers…etc. from different sources as library, internet, senior thesis etc.

2.3.5 Data Discussion, Analysis & Findings

The collected data was analyzed within the objective framework to arrive at logical conclusion.

Quantitative Analysis: The data are presented in tabular &graphical forms as far possible & the analysis tools to be used are MS excel, SPSS and GIS if needed. Maps and photographs are included to present the visual condition of the study area. The outcome of the data is interpreted and certain generalized inference will be drawn. The graphic presentation which consist various graphs, charts, diagrams, maps etc. were used for data analysis to result clear picture of relations and differences of variables.

Qualitative Analysis: It includes the theoretical aspects that the data collected revealed in the process of post disaster occupancy in private housing. This analysis is based on sampling survey and in-depth interviews with the key informants. The views of people and local authorities were analyzed descriptively. The data were synthesized to arrive at certain conclusion as the main findings of the research. This included finding out the problems and potential of the area in the prospect of development.

2.3.6 Conclusions and Recommendation

Based on the findings of the study the conclusion was drawn out and the recommendation will be given in the form of framework and various options for high occupancy level of apartments.

This is the last part of thesis in which all the parts of research methodology were presented in the systematic way showing all types of data collection, analysis, interpretation, findings, conclusion and recommendation. The whole final report was summarized and breakdown in to the points and now read to present in front of judges.

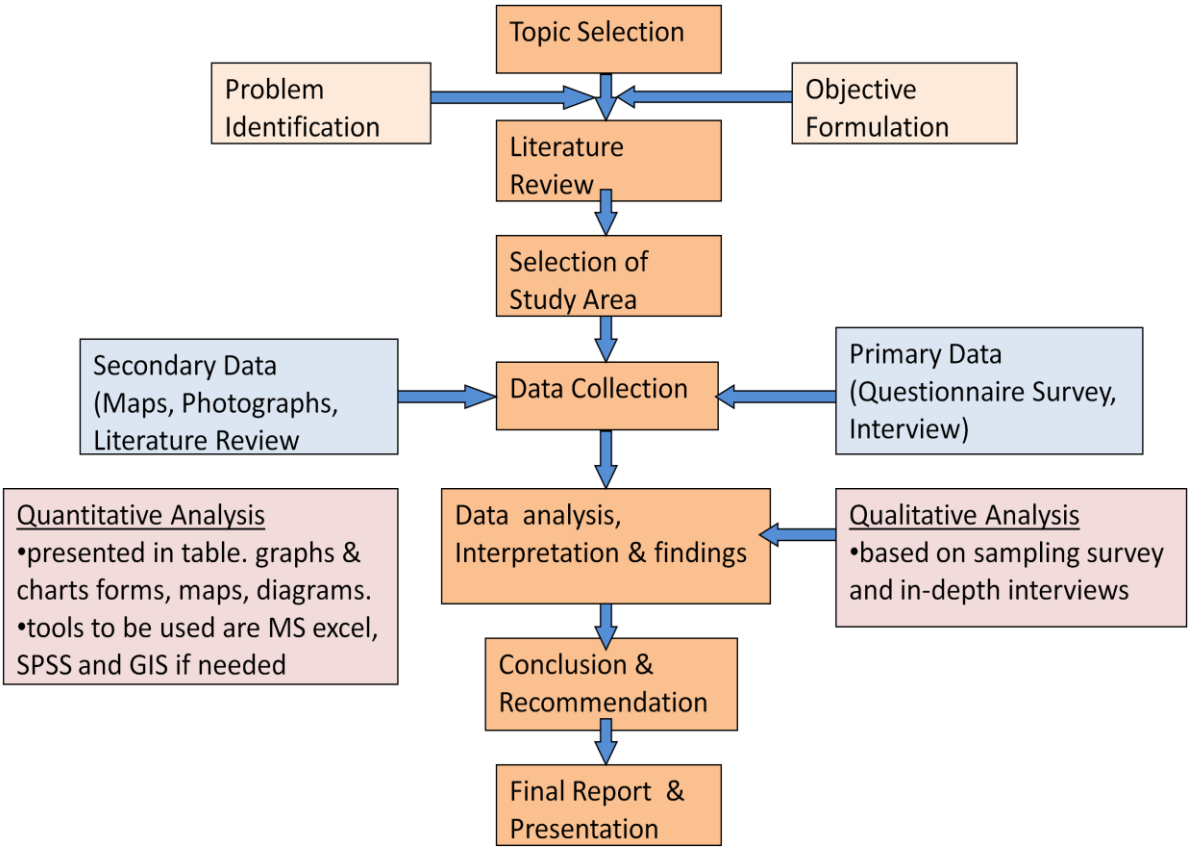


Figure 8: 2.2: Chart Diagram of Methods under Methodology

CHAPTER 3: LITERATURE REVIEW

3.1 Definition of Housing

"Buildings or other shelters in which people live, a place to live; a dwelling, provision of lodging or shelter" -*The free online dictionary.*

"Houses and other buildings where people live, considered collectively" -*Encarta online dictionary.*

"Any shelter, lodging, or dwelling place, houses collectively, the act of one who houses or puts under shelter, the providing of houses for a group or community: the housing of an influx of labourers."-*Dictionary.com.*

"Dwelling houses collectively, the provision of these, Shelter, lodging" -*Illustrated oxford dictionary, oxford university press.*

"Housing is an existentially significant activity, offering various opportunities for its residents, including identity and security, and as a vehicle for personal fulfillment." (Turner)

In integrated form housing can be defined as the art of creating a living area through the acquisition of the land at the top of which the building are constructed with the provision of basic, social and cultural infrastructure. Housing is described as a shelter having reasonably privacy with sufficient space provided for different activities. Physical infrastructure includes roads, water, and electricity and communication facilities. Social infrastructure consists of schools, hospital, playground etc. Cultural infrastructures consist of temples etc. The definition of housing involves security of household assets and tenure for the dwelling units and plot, protection from natural and manmade hazards.

Housing is more popularly described as a shelter having reasonable privacy with sufficient space provided for different activities. It should have proper security, lighting and ventilation. On the top of it should be furnished with the necessary infrastructure that can give access to employment and basic services which should not only be affordable but acceptable as well.

Housing can be basically defined as the starting point of urban development. The government mobilizes the participation in the financing of urban development by enabling people to build their shelter. Demand for infrastructure and services are generated as the people have affordable housing. Housing means creating a comfortable living condition not only within the dwelling or the house but also in the society and the surroundings where people live in.

3.2 History of Housing

Shelter is said to be started from caves in the way of individual living, then after huts are originate in the sense of group living for the protection against animal & tribal invasion which further proceeded in the form of community living for fulfill the purpose of collective haunting & agriculture.

City planning in ancient Greek and Roman empires built urban housing from the perspectives of defense and water supply which were continued throughout the middle Ages.

After that, Industrial Revolution breakthrough in 19th century invited huge number of immigrants to work where industrial workers had to accommodate residential quarters very near to their working places sharing common facilities like open space, parking area, playground, roads to develop new concept of housing.

Individual built houses concept was there no mass housing before World War I. After war, concept of mass housing realized and made considerable growth in urban housing. After World War II; there occurred the severe destruction of houses; unusual population growth and migration from rural to urban areas which appeared in the form of great weakness to balance the shortage of housing in urban areas, the term modern group housing came into existence.

The Jews made the oldest house in the world. It was approximately from 10,000 BC and was made of mammoth bones, found at Mezhirich near Kiev in Ukraine. It was probably covered with mammoth hides. The house was discovered in 1965 by a farmer digging a new basement six feet below the ground.

The concept of housing started from the very old times. At ancient times people started to live in the cave and earn their food by hunting. Later when agriculture

developed they started living together in a group n the dwellings. In those days the dwellings were very simple, just to protect themselves from the forces of nature. As time passed on these dwellings began to expand into a more comfortable and lavish dwelling from the former one. This has been the trend of human nature as they go on seeking more and more comfort as the time becomes more and more advanced. Jew Architect Norbert Schoenauer, in his book 6,000 Years of Housing, identifies three major categories of types of housing: the "Pre-Urban" house, the "Oriental Urban" house and the "Occidental Urban" house.

"Pre-Urban" houses include temporary dwellings such as the Inuit Igloo, semi-permanent dwellings such as the Pueblo, and permanent dwellings such as the New England homestead. "Oriental Urban" houses include houses of the ancient Greeks and Romans, and traditional urban houses in China, India, and Islamic cities. "Occidental Urban" houses include medieval urban houses, the Renaissance town house, and the houses, tenements and apartments of the 19th and 20th centuries.

One of the oldest houses remains in St. Augustine (USA) which was said to have been built in 1564, but it was probably built in 1763. The first housing colonies were not established until the early 1600's Jamestown in 1607 and Plymouth in 1620. The colonists coming to America arrived in different parts of what was then known as the North America Continent. The colonies were established in 1600-1820. The houses were not painted until 1734. (Housing_Introduction, n.d.)

During the 17^{th} and 18^{th} centuries, the emphasis in America had been on colonizing new land and after 1776, on establishing the independence of a new country. Pioneering and colonizing new land were major activities throughout the nineteenth century and this period also marked the beginning of our present day culture and manner of life. In other European countries, too, such housing initiated in the late 16^{th} or early 17^{th} century.

Before the First World War, people lived in individual built houses and there was no concept of mass housing. But after the war there was need of mass housing and it has acquired the present meaning after the Second World War. During the war, there was a severe destruction of houses in the European countries. Also, there was an unusual population growth and migration of huge population from rural to sub-urban and

urban areas due to rapid industrialization, political situations and other reasons. In such a context, the term housing came into existence to balance the shortage of housing in the urban areas. At beginning, row and twin houses were built. But later on, due to land shortage in urban area and advancement in building technology, high rise buildings were built.

3.3 Housing Concept

Shelter is one of the human basic biological needs. In this modern era, shelter comes in a form of house and it is the most important component of the socio-economy of sector. Housing as a social and economic product has a positive impact on the economy of any country. Housing is often defined as a multi-dimensional bundle of services. It is the largest industry in most countries of the world, yet the most backwards in terms of capitalization and amount of serial production; it is the single largest family expenditure, yet many households are insufficiently prepared to cope with the complex operations involved in buying, owning or even renting a housing unit. (Anon., 2013)

One important point in housing should be considered that it is the production, consumption, and saving processes in the wider economy (Pugh, 1990).There are three major words which should be taken in mind in housing concept and can be easily remembered by the word "CAR" stands as cost recovery, affordability and replicability. These three words are remembered as theoretical trinity in housing.

Aldrich & Sandhu (1990) highlights the Views of famous housing expert Turner as called Turner's theory explains two related concepts: standards and dweller's control.

Standards: "Only in an impossible world of limitless resources and perfect justice-where could have their cake and eat it too-could there be a coincidence of material and human value. For the present we must accept that as long as there are unsatisfied desires for material goods and services, people must choose between the cakes they can afford to eat. So long as this fact of life remains, and as long as people's priorities vary, the usefulness of things will vary independently of their material standard or monetary value" (Alddrich & Sandhu, 1990).

In an economy of scarcity, people have to make choices, and since they have different levels of income, they have different needs and priorities and consequently make different choices. What is 'best' varies and cannot be measured by absolute standards; 'best' is what satisfies the particular needs of individual people. This is also true for housing: a house of materially higher standards is not necessarily 'better' for its occupants than a house of lower standards. What is important is that the house satisfies the needs and priorities of the people who occupy it.

Most public and private housing projects fail because this principle is not taken into account. Planners fix a level of standards which usually coincides with the urban-industrial middle-class norms, and they assess the housing need by deducting the number of dwelling units at or above this standard from the total number of households. Subsequently, they try to reduce the apparent housing shortage by constructing dwelling units which meet the standards they have initially set. In Turner's view this is an obvious misinterpretation of the housing crisis, and therefore an adequate approach to its solution.

Three universal basic housing needs can be distinguished: location with access to people, institutions and amenities on which livelihood depends; minimum shelter from hostile elements, whether climatic or social; secure tenure which lasts long enough to make the move worthwhile.

The gap between the growing need and the evolution of an effective demand constitutes a major gap in the housing market. As it is well known fact that shelter is one of the most important ingredients in the urban pattern; it must be carries the characters of cost recovery, affordability and replicability to enhance the safe, adequate and sustainable environment in built form. Effective demand can be defined as the desire for housing plus the ability to pay for it. Affordable housing was intended to imply housing within the economic reach of the lower-middle income group. It begins to appear that new ideas for providing housing for the many thousands of families with modest incomes will emerge only from a greater degree of local participation, if and when local economic conditions permit. (Gallion & Eisner, 2005)

3.4 Affordable Housing

Affordability means one can able to afford i.e. paying easily. Housing affordability means one can easily buy the house from his/her annual income. Generally for house; if one should to afford about 20-30% from total income to buy then it is called affordable housing. If more than 30% from annual income then it has low affordability and only 10-20% then high affordability.

- It is appropriate to the needs of low-income households in terms of design, location and access to services and facilities.
- Rent paid by households in the lowest 40% of income units does not exceed 30% of gross household income.

There are different ways to create affordable housing. The simplest, most direct, and cheapest approach that a city can take is to build or acquire public housing, and actually maintain it well. Public housing not only provides affordable homes, but takes land off the speculative market, contrasting the gentrification processes. (IFHP, 2015)

"There is a need for a more fundamental discussion about the redistribution of the re-sources that cities have." Miguel Robles-Duran

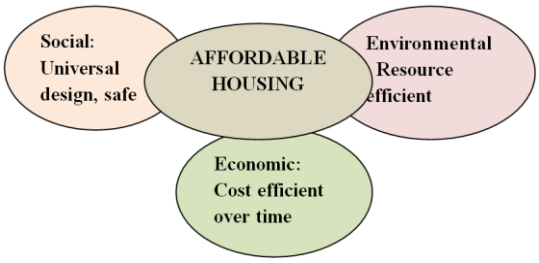


Figure 9: 3.1: Criteria of Affordable Housing

A housing should be more socially, environmentally and economically sustainable.

Affordable housing has some basic criteria. They are- comfortable, pleasant and safe accommodation, accommodation on sites with good access to public services, amenities, facilities and employment centres; should be attractive , fits into its neighbourhood and well-designed for the local climatic conditions.

Affordable housing is located close to, or has easy access to, shops, employment, transport and government and community services. It achieves a balance between long term cost efficiency and good design. It respects any other housing on the site and on adjoining sites. It overlooks any adjacent street or parkland to support public safety.

Affordable housing is a complex and controversy challenge facing by cities all over the world. Public authorities are struggling to alleviate the effects of a global housing crisis that has contributed to mounting urban inequalities and the social exclusion of many low and middle-income citizens from city boroughs.

Complex global housing market dynamics, direct foreign investment portfolios, increasing private development incentives, poor or absent national housing strategies and the stagnation of general income levels are just some of the factors attributing to the increasing disparity between housing development and the habitation needs of the majority of urban dwellers. Affordable housing is one solution to help bridge this disparity, an unfortunate necessity for the continued prosperity of cities and the urban fabric upon which they function. (IFHP, 2015)

For critical example, today New York is facing a critical shortage of affordable housing. Rents continue to increase. Between 2000 and 2012, New York City lost 400,000 units renting for less than $1,000 per month. In a city where almost 70 percent of residents are renters, one-third of tenants pay more than half their income in rent. Between 2000 and 2012, rents rose much faster than wages — 75 percent rent increases compared to 31 percent raises. On the other hand high-end developers, driven by increasing demand, are investing huge sums to rush land for new luxurious developments, bringing upward land prices for all other builders. Today, nearly 50 luxury buildings all over the city have apartments selling for more than $10 million – and with some selling for upwards of $90 million. These elements seem to indicate that the city is in the middle of a luxury housing bubble.

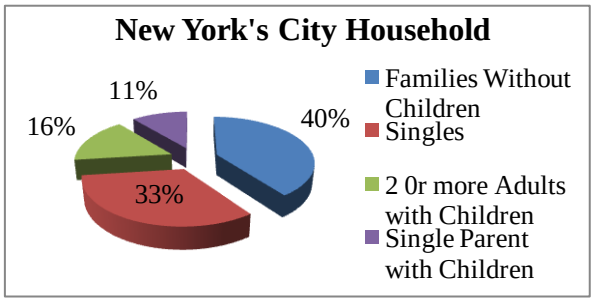


Figure 10:3.2: New York's City Household

New York City households are diverse. One third is singles and 27percent are families with children.

The housing affordability ratio can be defined as the ratio of house price to income ratio which should be such that one can afford it by 20-30% of his/her annual income.

Factors affecting Affordability

Cost of land: If that was excluded from the price, housing would be affordable for many more people.

Demand for up-front payment: If the down payment was quite small, and payment could be in installments, many more would be able to afford the same cost house. The availability of long- term finance is thus critical to expanding affordability.

Incremental Construction: If the house could be built not in one go, but incrementally, over a period of years or decades, expanding and improving in step with the growing income of the family, affordability could be dramatically improved. (PRAJA, 2014)

Normally, in Nepal; it takes about Rs. one million to build a single storey house of about 650 sq. ft. Thus; higher income population own big houses built in large plots and middle-income populations own a minimum of 856 sq. ft. of land and have a tendency to build their houses in an incremental order. About US $ 24,600 is required to build a single storey house of about 650 sq. ft. and the average income of Nepalese people is US$ 270 per year, so for a lower income person to own a house is difficult. (Shrestha, 2012)

3.5 Attributes of Housing

The six relevant attributes of housing are location, land, infrastructure, physical structure, finance, tenureship. Out of those essential attributes of housing; the one important is infrastructure, which can be defined as the basic structures and facilities necessary for the housing to function efficiently. The basic infrastructure includes: Roads, Water supply, Drainage including storm sewer and sanitary sewer, Electricity, Telecommunications, Cable.

Desirable features in housing: parks and playgrounds, elementary school, local shopping, medical facilities, stores or shops. Undesirable features in a housing: industrial uses like warehouses.

3.6 Development of Housing

Housing development can be either horizontal or vertical. Development is said on the behalf of construction. Either the houses are constructed one after another, detached; colony or the houses are constructed one above another.

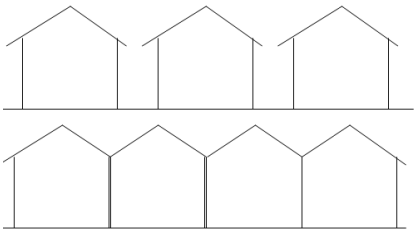


Figure 11: 3.3: Schematic of Horizontal

Horizontal Housing: The skyline looks refreshing in horizontal housing. It gives much more freedom of design than the apartment blocks. Vertical circulation is minimized. FAR is generally less. Traditional Nepalese street elevation provides the concept of horizontal housing. Light and ventilation is much better in horizontal housing.

Figure 12:3.4: Kiefhook Housing estate (1930), Netherlands; Architect – J.J.P. Oud

Vertical Housing: Apartment blocks which vary in size considerably, from two-storey blocks to high-rise towers or skyscrapers. It is ideal in the context of increasing land price and scarcity of land. It became viable after the development of reinforced concrete and effective due to the development of lift.

Figure 13: 3.5: United habitation, Marseilles block, France, 337 apartments with 18 floors, 1800 inhabitants, 23 different layouts.

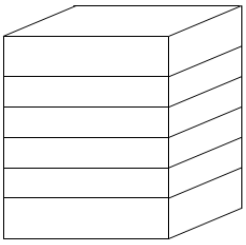


Figure 14:3.6: Schematic

In Nepal, the Horizontal Community Living Concept, were introduced in the outskirts of the valley due to land feasibility. With the constraint and high price of land within the city and to manage high density of core area, "Vertical Living concept" was introduced in Kathmandu valley (i.e. apartment came into picture).

3.7 Housing Deficit in World

The estimated housing shortage across the world according to the internationally recommended standards is 428,700,000 units and it is double than recommended about 1,088,219,000 units according to Dutch standards.

"Seven billion out of up to 10 billion people worldwide would live in cities within 70 years." (Chris Anderson, founder of international talkfest TED; Technology, Entertainment, Design.)

By the year 2030, an additional 3 billion people, about 40 percent of the world's population will need access to housing. This translates into a demand for 96,150 new affordable units every day and 4,000 every hour.

One out of every three city dwellers – nearly a billion people – lives in a slum and that number is expected to double in the next 25 years. (Slum indicators include: lack of water, lack of sanitation, overcrowding, non-durable structures and insecure tenure.)

As much as 70 percent of the urban housing stock in sub-Saharan Africa, 50 percent in South Asia, and 25 percent in Latin America and the Caribbean is of poor quality and not in compliance with local regulations.

Access to land is fundamental to adequate shelter. Having legal title to that land encourages families to invest and improve their homes and allows them to access credit and other public services such as water and electricity. Nearly one sixth of the world's population is living without secure tenure.

The quality of housing stock & amenities directly affect health & quality of life. One's health is directly linked to housing and housing related basics such as water and sanitation. In Mexico, researchers at the World Bank and University of California, Berkeley, found that replacing dirt floors with concrete floors improved the health of children.

2.6 billion People or 39 per cent of the world's population live without access to improved sanitation and 751 million people share their sanitation facilities with other households or only use public facilities.

3.8 Global Trends in Housing and Housing Finance Markets

Housing has traditionally been one of the most important assets for households. The cities of Indus Valley Civilization, Harappa and Mohenjo-Daro, are the exemplary in this context. (Housing_Introduction, n.d.)

China: The practice of providing houses by SOE (State Owned Enterprises) is stopped in 1998 and the government began to encourage workers to buy their own

homes. Since the land is nationalized, home purchasers could hold legal rights to occupy the building for a specific period (typically the tenure for residential property is 70 years; commercial building 30-50 years; and industrial property, 20 years) and could transfer the title to another party. People's Bank of China issued the guidelines to other banks in the country on granting housing loans.

Hong Kong: Hong Kong is considered as one of the most developed mortgage markets in Asia. The government has played a significant role in the housing market from the very beginning. Hong Kong Mortgage Corporation was established by the government in 1999 to promote mortgage loan securitization. There is no government run-housing loan bank in Hong Kong, hence; commercial banks are the predominant source of housing finance.

Indonesia: From the beginning of 1970s housing development policy of the government has focused on providing low-cost housing for low-income householders and this is done by imposing compulsory "1:3:6" rule for developers. Accordingly, for every high cost house, developers must build minimum three middle-class houses and six simple or very simple houses. Through this rule, the government provided subsidized loans for low-cost housing through state owned mortgage banks.

Korea: Prior to 1991, Korea's housing and housing finance system used to be heavily regulated. The price controls on new apartments were abolished and market based-housing finance emerged and later by 1996 commercial banks were allowed to provide long-term mortgages. In the year 1997, Korea Housing Bank, which used to be the major player, subsidized by the State, was privatized. After a decade of rapid growth, housing banks and commercial banks have become the major source of mortgage loans for medium and high-cost houses. For low-income home buyers, National Housing Fund (NHF) still remains the primary funding source.

Singapore: Singapore's home-ownership is segmented into private and public housing markets. The public housing in Singapore can be purchased by upper-or middle income groups. The public housing sector is dominant and it accounts for 84% of the total households and this is being done under the Housing Development Board, which plays a major role in the demand and supply sides of the housing market and housing finance. But from 1990 onwards, the government has taken steps to encourage the

development of private housing and the share of private housing has increased rapidly.

Thailand: In 1986, the government issued guidelines to encourage commercial banks to participate more actively in mortgage lending. Currently, commercial banks and the Government Housing Bank (GHB) are the two dominant mortgage lenders with a combined share of 80–90%.

US: In the US Fannie Mae and Fressie Mae are the principal GSEs (Government-Sponsored Enterprises) that are instrumental in the high percentage of the home ownership (above 70%). These two enterprises enjoy implicit government guarantee and consequently raise long term funds globally at low interest rates.

Europe: Europe, known for strong and traditional banking, has a very advance mortgages market as well.

3.9 Types of Housing

The housing types are grouped under three different heads on the basis of height namely, high rise, mid rise and low rise. There is no generally accepted definition of these categories.

Generally, low rise is 1 to 3 storied for single or two families; mid rise is limited in height 4 to 7 or 4-10 storied uses hydraulic elevators and high rise uses electric elevators and maximum number of floors more than 5 storey according to international concept. The building having storey from 4-5 is also known as walkways without elevators. The height of high-rise is limited only by the application of available materials and current technology.

Emporis, the real estate data mining company with headquarters in Hamburg, Germany; defines high-rise buildings and skyscrapers, which it defines as buildings "between 35 and 100 meters" tall and "at least 100 meters tall". The city of Toronto defines a mid-rise as a building between 4 and 12 stories. In Canada somewhere 4-9 storied is also considered for mid-rise apartment. According to Portland Cement Association (PCA); apartments are divided into three categories: i) low-rise apartment having 3 –storey(39 ft) , ii)mid-rise apartment(4-7 storey) having maximum height 7 storey i.e. 87 ft and iii) high-rise apartment(8-12 storey) having maximum height 12

storey i.e. 147 ft. In India, due to huge cost & many formalities needed to construct, storey is limited from 6-12 in middle level cities. Bhartiya Vastushastra (Indian Architecture) recommends construction of hi-rise buildings upto 12 stories.

In context of Nepal, low rise in Nepal refers to the single-family house or a unit of 2 to 3 storied dwelt by a single family or shared by two families. Whereas high rise in Nepal refers to the apartments which are just about 6 to 7 storied or more than it. Such housing types use electric elevators for vertical circulation.

High-Rise	Mid Rise(Low-high rise)	Low-Rise
International Concept 6 -30 stories or more upto 100 stories with lift.(>5 storey, all) 11-30 storied(35-100 meters) tall buildings (Emporis) Typically, an excess of 10 floors ***Portland Cement Association*** (PCA) : 8-12 storey ***Indian Concept:*** 6-12 storey (recommended by Vaastu Sastra) ***In Nepal:*** more than 5 storey ***In overall:*** Above 10 storied.  **Figure 15: 3.7: High-Rise Apartment**	4-12storey (City of Toronto) 4-8storey(American heritage) 4-10 storey (Wiktionary) 5-10 storey (Merriam-Webster dictionary) 5-10 storied buildings equipped with elevators. (http://dictionary.reference.com/) 4-5 storey(also called walkways) 4-7 storey (PCA) ***In overall*** 4-10 storied  **Figure 16: 3.8: Mid-Rise Apartment**	A low-rise is a building that is only a few stories tall or any building that is shorter than a high-rise Emporis defines a low-rise as "an enclosed structure below 35 meters [115 feet] Not higher than 5 storey 1-3 storey (PCA) ***In overall*** 1-3 storied  **Figure 17: 3.9: Low-Rise Apartment**

Table 1: 3.1: Comparative Study between Types of Apartment

3.10 High-Rise Apartment Housing

Housing consists as a group of houses sharing a common infrastructure developing in two ways either horizontal or vertical. High rise means the vertical development of a building also called apartment if its main target for residence-living not for working purpose (i.e. office). A high-rise building, named with various names as apartment tower, office tower, apartment block, or block of flats, is tall building or structure used as a residential and or office use or other commercial purpose or academic purpose up to any height depending upon the available technology. In some areas they may be referred to as MDU "Multi Dwelling Unit" or "Vertical cities". In some country condominium or shortly condos is also famous for high rise buildings. They have the potential to decongest the urban sprawl on the ground level, and increase the urban density, housing higher number of families in lesser space with high efficient and sustainability providing all kinds of amenities for better life style with high safety and security.

Figure 18: 3.10: Ocean Vistas Condominium in Daytona Beach Shores

Some Special Definitions

The International Conference on Fire Safety in High-Rise Buildings defined a high-rise as "any structure where the height can have a serious impact on evacuation"

The Oxford English Dictionary defines a high-rise as "a tall building having many stories with flats on each floor."

Massachusetts General Laws define a high-rise as being higher than 70 feet (21 m).

Most building engineers, inspectors, architects and similar professions define a high-rise as a building that is at least 75 feet (23 m) tall.

The average height of a level is around 13 feet (4 m) high, thus a 79 foot (24 m) tall building would comprise 6 floors.

The International Building Code (IBC 2000) and the Building Construction and Safety Code, NFPA 5000TM-2002,Paragraph 3.3.28.7 of the *Life Safety Code*®, 2006 edition, define high-rise buildings as buildings 75 feet or greater in height measured

from the lowest level of fire department vehicle access to the floor of the highest occupiable story.

Considered to be one that extends higher than the maximum reach available to fire fighters. When this happens fire is fought by personnel inside the building rather than from outside.

The term "high-rise building" means any building having an occupied floor(s) located more than 75 feet above the lowest level of Fire Department vehicle access.

The Mumbai Municipal Corporation (BMC) proposed that any building with a height of 30m (nine floors) be categorized as a high rise. This is an increase of 6m from the existing definition (24m or seven floors).

But from the structural point of view it can be defined as the a building that its height will be affected by lateral forces resulting from earthquakes and wind forces to extent that such forces will play a major role in the process of design. Based on the distribution of the components of the primary lateral load-resisting system over the building, the structural system of high-rise buildings can be broadly classified as : Interior Structures Exterior Structures

Figure 19: 3.11: Lake Shore drive apartment, Chicago 26 storied block

In interior structural system, the major part of the lateral load-resisting system is located within the interior of the building. Whereas in exterior structural system, the lateral loads resisting system, is located along the building perimeter.

Condominium: A building or complex in which units of property, such as apartments, are individually owned, each owner receiving a recordable deed to the individual unit purchased, including right to sell, mortgage, etc., that unit and common parts of the property, such as the grounds and building structure, passageways etc are owned jointly by the unit owners i.e. sharing in joint ownership.

British Dictionary defines that condominium is an apartment building in which each apartment is individually wholly owned and the common areas are jointly owned.

High-rise buildings became possible with the invention of the elevator (lift) and new possibilities of cheaper, more abundant building materials. Apartments may be owned by an owner/occupier or rented by tenants (two types of housing tenure).

Thus, high rise apartment can be defined as a vertical positioning of one or more than one residential unit or section, having a lot of floor consisting of basement parking along with the facility of at least one elevator, either by regulation or by common practice. The number of floor is determined by the construction techniques, elevator manufacture and local zoning ordinances.

The law makes it mandatory to have a lift for any building above four floors, two lifts and fire fighting system for any building above seven floors, and a earthquake-resistance structural design if a high-rise is situated in a seismically active region, or if the underlying soils have geo-technical risk factors such as high 'compressibility's.

The factors which potentialize the marketing point of view of apartments are: type of occupancy (Rental, Cooperative, Condominium), price (rent, maintenance, etc.), Amenities, Apartment size (area and number of rooms), building types, Vacancy rates, public facilities (transportation, schools, shopping, recreation). (Time_Saver_Standards, n.d.). In an apartment building; the spaces themselves must be simple and universal enough to adapt a variety of life styles. A well planned apartment provides maximum privacy for various activities and movement to any room is possible without crossing another.

Housing with two dwellings per floor around a central core provides a good balance between living quality and economy. Two, three or four- roomed dwellings can be considered. But housing with four dwellings per floor and a shared staircase requires appropriate planning to provide a satisfactory relationship between economy and living quality. One of the iconic features of apartment housing is that different type of flat on each floor is possible. (Neufert & Neufert, 2000)

3.10.1 Advantages-Disadvantages of High Rise Apartment

There are many benefits living in a high-rise building which includes location, convenience, and on-site amenities. To make life easier, high-rise offers so many on-site amenities i.e. on-site gym, dryer cleaner, laundry room, controlled entry, on-site maintenance, and more. Doormen and security systems can be of great value to those who live alone or travel frequently. There are also business centres where one can take care of all his/her copying, faxing, and other business needs. The provision of underground parking in heavily populated area is another feature of high rise for maintaining the car and parking a lot easier.

In foreign context, if somebody is looking to meet new people, living in a high rise can provide a real sense of community. There is opportunity to meet new people since many high-rises offer community events that are designed to help residents meet and get to know each other. Getting to know a few people or families that live in same building will hopefully help to feel more comfortable and right at home.

The saving of the cost of utilities is another advantage of high-rise. Oftentimes the cable, heating, and internet costs are already packaged into the monthly rent. While there are some high-rises that do not bundle these utilities, they will still allow to negotiate a lower rate. The free Wi-Fi system is also available in some apartment.

High-rise apartment buildings are often located in desirable, central locations. One will be within a few minutes walking distance to shopping centres, restaurants, public transportation, and more. If someone is looking to save money and time, then living in a high-rise building may be a great choice for his/her. One will be saving a lot on time and transportation by living in a high-rise.

Living style of apartment also depends on people's personal adoptability and feelings since some say that people living in high rise apartments are lonely and unhappy, while others say that it's advantageous to stay in high-rise apartments.

Alerting about decreased availability of space, it is the increased demand of high rises in highly populated cities but there must be safer environment in all aspects physical, social and cultural. Earthquake like disaster impact forces to provide structurally safe buildings.

High rises are excellent places for short stay too since they satisfy the drastic demand of rentals in cities to an extent. It costs less to buy the flat in comparison of individual house in the cities. These places are blessings for people who are supposed to live and work away from their home. Urban life amenities and high living standards are sophisticated in these places such as good hospitals, recreational facilities and so on. In the sense of enabling to accommodate their family; it is good enough place to relieve the stress of living away from their family members. For example , flats provides people to stay with their children and trim down the time of journey, fuel consumption, traffic block and all other related issues.

On the other hand, if flats are not constricted and maintained in a good manner, then they become place of congestion and insecurity. It is difficult to demolish or arrange according to personal needs since the design of all the houses are similar pattern. Almost for all services provision occupants have to depend on others and pay for it. For example, the payment for water, removing garbage and transporting heavy things to and from the rooms; payment is mandatory. The neighbourhood relations may vanish. People may feel isolated due to high building as away from the nature. Life of occupants may be stressful due to loans, lack of proper parking and relaxation facilities. There may occur lack of solitude and distraction in studies due to disturbance from neighbouring people. For example, all family members may be disturbed by the neighbors' fond of playing T.V. louder.

Advantages	Disadvantages
Location: As the adage goes, "Location, location, location". High rise apartment buildings are typically built in desirable, urban locations to meet demand. These locations yield a variety of lifestyle features, including the proximity of shopping, nightlife, restaurants; public transportation, working place and more. ***Amenities:*** Amenities are another huge advantage of high-rise. Doormen, fitness centres, controlled entry, security systems, on-site maintenance, guest housing,	***Neighbours:*** In a high-rise one commonly has a neighbour above, below and to both sides of him/her. Obviously this can be a positive, but it has the more potential for trouble than when their neighbours are close, but a short distance away, as in a single family

and morning coffee are all commonly included amenities in a high rise apartment building. Additionally, if somebody live in a densely populated area, many high rise buildings will offer underground parking, either included in the rent or as a separate fee. This parking space can make maintaining a car easier and parking more efficient.

High-rises often have gyms, pools and public meeting rooms. They may also have some retail, such as a restaurant or dry cleaner at their ground floor. An elevator can make the unit more accessible for the disabled or elderly.

Door Guard: Doormen and security systems are a great value in terms of safety for singles and travelers.

Most high-rises will have a professional 24hr door person, which is good security as well as ensuring one get packages that are delivered to his/her.

Views: One can get a great view living in a high-rise.

Utilities*:* Some apartments will include utilities in the total rent; others will require someone to pay his/her own utilities. However, high rise apartments typically result in lower utility costs overall, due to construction standards and practices. Additionally, many high rises will bulk-negotiate lower rates, even when residents pay their bills individually. This results in cost savings for residents. If someone don't use internet very often, many resident lounges provide free Wi-Fi, which means he/she won't have to worry about signing up for internet ownself.

Maintenance*:* One of the biggest benefits to living in a apartment is that other people do the maintenance for

or walk up building. Their neighbours could be loud and partying all the time, or perhaps worse, they could complain every time he/she has to friends over for a couple drinks and aren't dead silent. In a lower rise, one typically has more control over the amount of interaction with his/her neighbours.

Pets: High-rises often have restrictions on pets. Having a dog in a high-rise has the added complexity of having to make a fairly lengthy trip each time the animal needs to do its business.

Outdoor space: Low-rise buildings will often have more functional outdoor space, whether it is a patio, yard or deck. High rise units sometimes have balconies, but these are often not very functional, because of the limited size, high winds and limited views and access. High-rises are also typically located in "concrete jungle" areas with fewer public

someone flat. They cut the grass and maintain the grounds, fix the roof…etc. If someone is a first time homeowner, in poor health, busy with work, like to travel, or he/she just don't want to deal with all that work, this is a major benefit to living in a condo. Affordability. Apartments are often priced lower than single-family homes. If someone wants to dive into home ownership, an apartment can be a great first step. ***Community*:** While it may seem counter-intuitive, living in the right high rise can provide a real sense of community. Many large buildings host regular resident events or fitness classes that let one get to know his/her neighbours. Once he/she has met a few people or families that live in their building, he/she will start feeling right at home. In order to be certain somebody is choosing the right apartment, they should always try to tour the building and a similar unit before they make up their mind. They might also want to walk around the building, to make sure they are in touch with the neighbourhood as well.	green spaces in the vicinity, so this can be a concern. ***Building restrictions:*** High rises often have restrictions on which utility suppliers (including television and internet) one can use within their building. This can be frustrating if he/she works for a telecom or have some relationship with a different vendor and would prefer his/her own service. ***Lift Problem:*** Occupants have to walk up several flights of stairs when the elevator is out. In our Nepalese context back up problem. (Source: Google.com)

Table 2: 3.2: Shows the Advantages and Disadvantages of High-rise Apartment

3.10.2 History of High- Rise Apartment

Rome: The insulae were large apartment buildings in ancient Rome, where the lower and middle classes of Romans dwelled. The lower floors were typically occupied by either shops or wealthy families, while the upper stories were rented out to the lower classes for living purpose. Ancient Roman insulae in Rome and other imperial cities reached up to 10 and more stories, some with more than 200 stairs. Several emperors, beginning with Augustus (r. 30 BC-14 AD), attempted to establish limits of 20–25 m

for multi-storey buildings, but met with only limited success. Surviving Oxyrhynchus Papyri indicate that seven-story buildings even existed in provincial towns, such as in 3rd century Hermopolis in Roman Egypt.

Egypt: The initial capital city of Arabic-Islamic medieval period was Fustat. It housed many high-rise residential buildings, some seven stories tall that could reportedly accommodate hundreds of people. In the 10th century, Al-Muqaddasi described them as resembling minarets, and stated that the majority of Fustat's population lived in these multi-storey apartment buildings, each one housing over 200 people. In the 11th century, Nasir Khusraw described some of these apartment buildings rising up to fourteen stories, with roof gardens on the top storey complete with ox-drawn water wheels for irrigating them.

By the 16th century, the current Cairo also had high-rise apartment buildings, where the two lower floors were for commercial and storage purposes and the multiple stories above them were rented out to tenants.

The skyline of many important medieval cities was dominated by large numbers of high-rising urban towers, which fulfilled defensive but also representative purposes. The residential Towers of Bologna numbered between 80 to 100 at a time, the largest of which still rise to 97.2 m. In Florence, a law of 1251 decreed that all urban buildings should be reduced to a height of less than 26 m, the regulation immediately put into effect. Even medium-sized towns such as San Gimignano are known to have featured 72 towers up to 51 m in height.

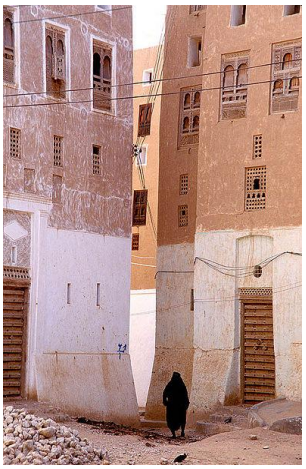


Figure 20:3.12: These tower blocks were built in Shibam, Yemen in the 16th century, and are the tallest mudbrick.

Yemen: High-rise apartment buildings were built in the Yemeni city of Shibam in the 16th century. They remained the tallest mud brick buildings in the world. The houses of Shibam are all made out of mud bricks, but about 500 of them are tower houses, which rise 5 to 11 stories high, with each floor having one or two apartments. This technique of building was implemented in order to protect residents from Bedouin attacks. While Shibam has existed for around 2,000 years, most of the city's houses come mainly from the 16th century. Shibam has been called

"the oldest skyscraper-city in the world" or "Manhattan of the desert". Some of them were over 100 feet (30 m) high, thus being the tallest mudbrick apartment buildings in the world to this day. Shibam has been called "one of the oldest and best examples of urban planning based on the principle of vertical construction" or "Manhattan of the desert".

China: The Hakka people in southern China have adopted communal living structures designed to be easily defensible in the forms of Weilongwu and Tulou, the latter are large, enclosed and fortified earth building, between three and five stories high and housing up to 80 families.

England: The concept of the flat was slow to catch-on amongst the English middle-classes in the late 19th and early 20th century. Those who lived in these flats were assumed to be adaptable and "different". In London, everyone who could afford it occupied an entire house – even if a small one.

Figure 21: 3.13: A red brick block of flats in Lime house, on the north bank of the Thames, London, England

During the last quarter of the 19th century, ideas began to change. Both urban growth and the increase in population meant that more imaginative housing concepts were going to be needed if the middle and upper classes were to maintain a pied-à-terre in the capital. The traditional London town house was becoming increasingly expensive to maintain. Especially for bachelors and unmarried women, the idea of renting a modern mansion flat came increasingly into vogue.

The first mansion flats in England were Albert Mansions, which were developed by Philip Flower and designed by James Knowles. These flats were constructed between 1867 and 1870, and were one of the earliest blocks of flats to fill the vacant spaces of the newly-laid out Victoria Street at the end of the 1860s. Today, only a sliver of the building remains, next to the Victoria Palace Theatre. Albert Mansions were really 19 separate "houses", each with a staircase serving one flat per floor. Its tenants included Lord Alfred Tennyson, whose connections with the developer's family were long-

standing. Philip Flower's son 1st Baron Cyril Flower Battersea, developed most of the mansion blocks on Prince of Wales Drive, London.

Albert Hall Mansions, designed by Richard Norman Shaw in 1876. Because this was of a new type, risks were reduced as much as possible; each block was planned as a separate project with the building of each separate part contingent on the successful occupation of every flat in the previous block. The gamble paid off and the scheme was a success.

In London, by the time of the 2011 census, 52% of all homes were flats.

Scotland: In Scotland, the term "tenement" lacks the pejorative connotations it carries elsewhere, and refers simply to any block of flats sharing a common central staircase and lacking an elevator, particularly those constructed before 1919. Tenements were, and continue to be, inhabited by a wide range of social classes and income groups.

Figure 22: 3.14: Tenement in Edinburgh, Scotland (1893)

During the 19th century tenements became the predominant type of new housing in Scotland's industrial cities; although they were very common in the Old Town in Edinburgh from the 15th century where they reached ten or eleven storey high and in one case fourteen storey.

Built of sandstone or granite, Scottish tenements are usually three to five storeys in height, with two to four flats on each floor. (In contrast, industrial cities in England tended to favour "back-to-back" terraces of brick.) Scottish tenements are constructed in terraces of tenements, and each entrance within a block is referred to as a close or stair — both referring to the shared passageway to the individual flats.

Figure 23: 3.15: Tenement in Marchmont, Edinburgh, built in 1882

Flights of stairs and landings are generally designated common areas, and residents traditionally took turns to sweep clean the floors, and in Aberdeen in particular, took turns to make use of shared laundry facilities in the "back green" (garden or yard). It

is now more common for cleaning of the common ways to be contracted out through a managing agent or "factor".

Tenements today are bought by a wide range of social types, including young professionals, older retiring people, and by absentee landlords, often for rental to students after they leave halls of residence managed by their institution.

Many multi-storey tower blocks were built in the UK after the Second World War.

Post Second World War, more ambitious plans, known as the Bruce Plan, were made for the complete evacuation of slums to modern mid-rise housing developments on the outskirts of the city. High rise living too started off with bright ambition — the Moss Heights are still desirable - (1950–1954) but fell prey to later economic pressure. Many of the later tower blocks were poorly designed and cheaply built and their anonymity caused some social problems.

The Glasgow Housing Association took ownership of the public housing stock from the city council on 7 March 2003, and has begun a £96 million clearance and demolition programme to clear and demolish many of the high-rise flats.

North America: In the 10th century, the Chacoan people constructed large, multi-room dwellings, some comprising more than 900 rooms, in the Chaco Canyon area of what is now northwest New Mexico.

Figure 24: 3.16: Tenement buildings in Manhattan's Lower East Side.

In 1839, the first New York City tenement was built, housing mainly poor immigrants. In the United States, "tenement" is a label usually applied to the less expensive, more basic rental apartment buildings in older sections of large cities. Many of these apartment buildings are "walk-ups" without an elevator, and some have shared bathing facilities, though this is becoming less common. The slang term "dingbat" is used to describe cheap urban apartment buildings from the 1950s and 1960s with unique and often wacky façades to differentiate themselves within a full block of apartments. They are often built on stilts, and with parking underneath.

The Dakota (1884) was one of the first luxury apartment buildings in New York City. The majority, however, remained tenements.

3.10.3 Some Important Factors for Apartment

High-rise apartment should be constructed in right place for providing all amenities, safety and security in all manners. It should not be constructed in vulnerable site.

Land topography: High- rise apartment couldn't be constructed in the sloppy land. If the bearing capacity of the land is very low, the number of floor to be raised will be restricted to a certain value.

Available materials: Materials also bind the number of floor to be erected. High-rise apartment is the result of development of steel structure. But, if the steel is not available in sufficient amount, it is not good enough to construct high- rise apartments since no chance of feasibility and economic.

Available technology: Technology determines the height of the building. Whether the land is in seismic zone or slope land, if the technology is up to date then one can easily construct high- rise apartment. Japan is a country that lies in a seismic zone but, there are many tall building. This is because of the developed technology. Base isolation is one of the latest earthquake safe building technologies which are well applied in Japan.

Skilled manpower: Whatever be the technology, if the skilled manpower is not available couldn't construct the building like high- rise. If we import skilled manpower then obviously, it will be uneconomical which is not good in the country like Nepal.

Market situation: High- rise apartment have no any importance if it couldn't get market. If the groups of people are not ready to afford that then why to construct the high- rise. But the present scenario of the Kathmandu valley shows that there is a good market for high- rise apartment due to the high price and scarcity of land. The question arises, how it can be affordable for all income group.

Achievement of loss Knowledge: It is said that our ancestors are highly experienced in terms of strong building technology and materials but we lost their knowledge due to lack of transferring media. If it becomes possible to regain about such traditional materials & knowledge properly, then it may helpful for high rise buildings too. Thus, we can make such high-rises with such traditional material to enhance and flourish the cultural identity.

3.10.4 Provision of Services in Apartment

High- rise apartment consists of a number of floors. It will be difficulties for the circulation without elevator and the use of elevator for every purpose like disposal of waste, fire escape etc is not possible. So, there should be such kind of system which provides all kinds of services.

Solid Waste Disposal: "Most popular method of waste disposal in high- rise apartment is a chute system. Similarly Trash bin and the Dumpster are also used for the collection of solid waste in the high- rise apartments.

Fire Escape: High-rise structures pose serious challenges to fire-fighters during emergencies. Building systems like the building standpipe system, HVAC systems (Heating, Ventilation and Air conditioning), fire sprinkler system and other things like stairwell and elevator evacuations are provided in the high- rise apartment for the fire escape. Also the emergency alarm system is provided in the building so that everybody could know the danger situation and make easier to escape from the building immediately.

Elevator: Elevator is the major component of the high- rise apartment. It should be provided centrally so that access is easier to every family or units.

3.10.5 Occupancy Rate of Apartment

It is a numerical value expressed in percentage about occupied units of apartments. The antonym of occupancy rate is 'vacancy rate' which is a percentage unoccupied units of apartment.

For the evaluation or rental property like apartment; the occupancy rate is a useful metric. Low occupancy rate determines that the apartment is not renting well; high occupancy rates indicate to strong sales. Both vacancy and occupancy rate should add up to 100%.

In other words, occupancy rate is defined as the ratio of occupied unit to the total no. of units in the building, city, state etc.

Occupancy rate = Units rented i.e. occupied/ Total units

For instance, let's consider that Company ABC owns an apartment building that has 500 units out of which 48 units are not occupied. Then the occupancy rate of ABC Company becomes as:

Occupancy rate = (500-48)/500= 452/500 = 90.4%

Thus; Vacancy rate = 1- Occupancy rate.

Here, (1-0.904) = 0.096 = 9.6%

3.10.6 Post Occupancy Evaluation

Housing occupancy can be tested on different levels. Post Occupancy Evaluation (POE) is the test for performance of apartment and satisfaction level of its occupants. Its better performance plays essence role for occupancy of apartment.

Husina, et al., 2015 emphasizes about the concept of Post Occupancy Evaluation as safety performance tool. Housing is a foremost universal concern as the wellbeing of a country reflects in its people enjoying a particular standard of living. Residential and neighbourhood satisfactions are important indicators of housing quality and condition which affect individuals' quality of life. The factors, which determine their satisfaction levels, are essential inputs in monitoring the success of housing policies. (Husina, et al., 2015).

There are considered 24 attributes of safety performance level to test the performance of apartments. Those attributes are categorized into a) 12 attributes from buildings performance and b) 12 attributes from quality performance. The first one describes about the safety performance level and second one about the level of occupants' satisfaction towards the safety attributes.

Performance	Quality
***Structural**:* Column, Beam, Roof, Slabs ***Services**:* Electrical, Plumbing, Fire system ***Space**:* Corridor, Staircase, Balcony ***Amenities**:* Playground, Vehicle Parking, Lift	***Fittings:*** Door/Window, Security bar/grille, Sanitary Fittings ***Materials:*** Floor Finishes, Wall Finishes, Ceiling finishes ***Environment*:** Internal Ventilation, Indoor Temperature, Visual Obstruction ***Workmanship:*** Plastering Works, Tiling Works, Painting Works

Table 3: 3.3: Twenty-four Attributes of Safety Performance Level, Source: (Husina, et al., 2015).

To achieve the best quality in building services and occupancy, such test integrates the occupants' behaviour, perception and opinion as the building user. The level of occupants' satisfaction which depends upon the level of safety performance in their housing unit helps to state the occupancy level of buildings.

3.10.7 Occupants Indoor Environment (Thermal Comfort)

The essence of thermal comfort can't be forgotten; since it provides comfortable indoor environment for any building and so, also for apartment. Thus better indoor environment through the provision of thermal comfort also enhances the rise in occupancy level of apartment. As we know most of the time of occupants are being spent inside the building. So apartment should be facilitated with air conditioning and thermally comfort to please and satisfy the occupant's living. It should be constructed by those types of materials which enhance the thermal comfort. Such building has feature to provide warmth in cold and vice-versa.

Idris; et al.; 2011 explains about occupancy related factors in the article that the occupants deserve to obtain a comfortable condition to generate wellbeing and valuable quality in their life. Almost 90 percent of the occupants spent their time in an indoor environment. Therefore the indoor environment should be highly benefitted for occupants to achieve better performance and so to increase the occupancy level of housing. Thus, the comfort living can be expressed as the main indicator for occupants to live in peaceful, healthy and harmony condition. On the first priority base; the comfort and hazard free should be taken in mind to cultivate occupant's social needs and enhancement of the level of productivity. Thermal comfort plays vital role to provide better indoor environment then after visual and acoustic comfort. (Idris, et al., 2011)

3.11 Concept and Features of a Vertical City

The concept of modern apartment housing started from America. The ever growing population of New York for which there was not enough land to build individual residence in plenty of lands. Due to heavy urbanization in cities like New York, the price of residence sky-rocketed and due to this it was not possible for middle income families to purchase a house. Due to the high inflation rate in post-war era,

development of new construction technology and the availability of plenty investors during the economic bustling period the concept of modern apartment developed.

One of the earliest concepts of a vertical city was developed in 1922 by, who proposed a plan where three million people would be housed in a specially designed 'contemporary city'. This notion of a vertical city was Le Corbusier's first systematic attempt to design an environment in which man, nature and machines could be reconciled. The main features of Le Corbusier's 1922 vertical city consist of very high-rise high-density skyscrapers, which leave at least 85% of the ground free for open space and other recreational facilities; an elaborate but well-coordinated system of vertical transportation comprising elevators that serve as superhighways, subways, access roads and pedestrian walks; as well as a very large population of people who work and live within the skyscrapers. (Wong, 2004)

Frank Lloyd Wright designed another version of a vertical city known as the 'Illinois'. The 'Illinois', which is a mile-high skyscraper with 528 storeys, could accommodate up to 100 000 people, 15 000 car parking lots, and even enough office space to house the entire United States state government.

Expanding on Wright's ideas, Soleri developed the concept of 'arcology', which means a harmonious combination of architecture with ecology. Soleri's first vertical city plan was 'Babels'. 'Babels', which is intended for a population of 520 000, comprises an underground industrial and commercial area, with the city centre, neighborhoods, parks, community areas and housing located at the very top of the structure. In the design of 'Babels', horizontal transportation networks are minimized to prevent urban sprawl as well as damage to the environment by smog and pollution.

Another vertical city design developed by Soleri was 'Arcosanti'. As the buildings in 'Arcosanti' are of mixed-use, with residential, retail, office, recreation and services all located within the same structure, each building is self-sufficient. The 'Arcosanti' concept is envisioned to be a prototype vertical city that promotes energy conservation, human interaction, and a creative environment while minimizing automobile transportation. Efforts to construct 'Arcosanti' have resulted in completing only 3% of the project since its inception in the 1970s' Upon completion,

'Arcosanti' is likely to occupy about 60 700m^2 of land with buildings up to 25-storeys high, and accommodating approximately 7000 people.

Vertical City Concept in Japan: Expecting the population of Tokyo at 2010 about 29 million, the famous vertical planner Soleri was commissioned by Japan in 1996 to design the self-contained contained 1 km^3 'Hyper Building' which aim to accommodate the increasing urban population and to prevent the manifestation of inner city congestion, slums, degeneration of the social structure, commuting problems as well as a weakening economy due to exorbitant land prices.

Figure 25: 3.17: View of Tokyo City

This alternative form of vertical urbanism could be as tall as 1000 m, with a working life of 1000 years, providing accommodation for 100 000 people. (Wong, 2004)

Tokyo has 13.2 million metropolis area and 38.6 million metro populations at 2011.

3.11.1 World's Tallest Cities

New York City has highest no. of high-rises i.e. 5849, then after Toronto has 1924 and similarly Shanghai (1187), Tokyo (1167), Mumbai (278).

(Mirza, 2012)

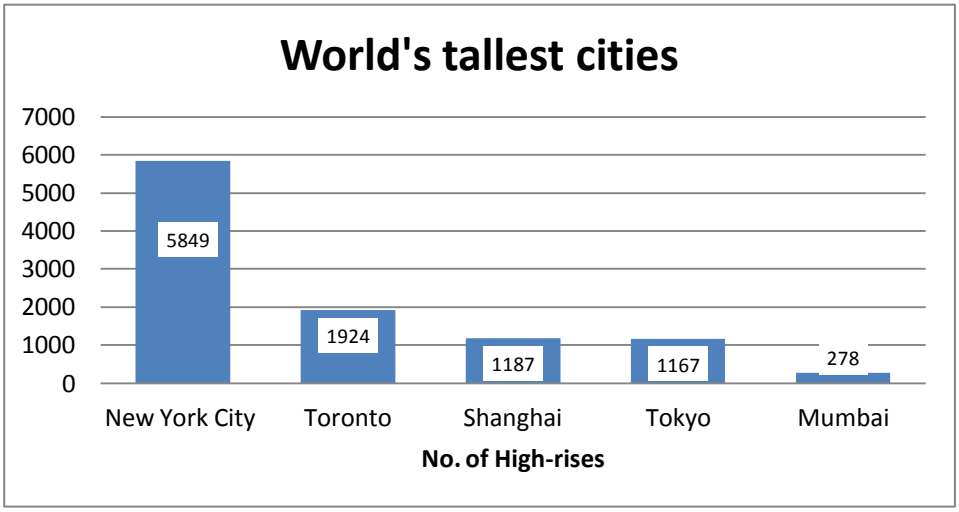


Figure 26: 3.18: World's Tallest Cities

3.11.2 High-rise Satisfaction in Different Countries

Almost 90% of the Glasgow residents of tall buildings have high satisfaction; similarly more than 75% of Singapore high rise residents are satisfied. In Singapore, the percentage of residents willing to live on the 10th floor and above had gradually increased from 27.9% in 1973 to 35.7% in 1977 and to 47.3% in 1981.

In Israel, above 84% of high rise residents are satisfied. The 84% of the high rise residents are agreed that view is the main advantage of living in a high rise building in Hong Kong. Apart from view enjoyed from the high residences, the next perceived advantage of high rise living was the enjoyment of quietness (47%), and fresh air (44%). (Chatterjee, 2009). In Accra, the city of Ghana above 90% occupants are satisfied with high-rise scenario and the feeling of living in a prestigious environment, on top of the world and the breeze they enjoy including clean air makes occupants very satisfied. (Ama, 2012). Similarly, majority of people are pleased with the amount paying for their service charge as receiving a good management and maintenance services for their properties in Shah Alam; city of Malaysia (Aziz, et al., 2014). In Seoul, the capital of South Korea approximately 80% of its residents lives in apartment complexes.

3.12 Apartment Housing Scenario in Asia

The vertical living is one of the essential scenarios of urban high density area due to the migration of the people to the urban areas, high land price, and scarcity of land in urban areas as well as life style. One other factor also plays vital role for the living in high rise building i.e. it is the solution to the massive housing shortages, especially in major cities in the world like Japan, South Korea, Mumbai, Kathmandu…etc.

Figure 27: 3.19: Map of Asia

"Many urban planners and policymakers from developing countries visit the city-states and come away with the conviction that they have seen the future and it works." (Yuen, 2011)

Residential tower complexes are common in Asian countries such as China, Singapore, Japan, and Korea as urban densities are very high. In Singapore and urban Hong Kong, land prices are so high that almost the entire population lives in high-rise apartments. In fact, over 60% of Hong Kong residents live in apartments, many of them condominiums. These all are affordable housing.

It is the subject of curiosity to know about the benefits or cost in vertical living and also about issues and challenges faced by the households living in such high rise buildings.

"One million people a week, every week, are moving into cities. That will go on for the next 70 years. There will be seven billion, out of nine or 10 billion people living in cities and to provide all settle, vertical living is right solution" Mr. Anderson (founder of international talkfest TED, Technology, Entertainment, Design) (Homes, 2014)

Linked Hybrid: It is the example of; one of the best high-rise housing complex project situated in Beijing near the old city wall. Its area is 220000 sq. meters (2.4 million sq.ft.). It is designed by Steven Holl Architect, and opened in 2009 won prestigious awards including the Best Tall Buildings Overall Award by the CTBUH in 2009. It consists of eight 60m (197 ft) tall asymmetrical towers and a 35 m (115 ft) tall hotel interconnected at their upper levels by a serried of bridges. It contains a large number of apartments, commercial spaces, hotel, cinema, a kindergarten, and underground parking. (Ali & Kodmany, 2012)

Figure 28: 3.20: Linked Hybrid.

High-rise buildings should be economically viable which can be illustrated following Japanese high-rise building strengthening technique. The *Tokyo Metropolitan Government plans* to spend about $50.4 million yen ($ 630 million) to equip the buildings with about 150 oil dampers i.e. giant hydraulic shock absorbers. So that the buildings can withstand strong ground shaking even better and the swaying is reduced. Similarly, Mori Tower situated in Tokyo spent 10 billion yen ($126 million) on an underground gas power plant to provide backup electricity in emergencies, and to stock 100,000 emergency meals. (Hays, 2011)

Asian cities are no exception to the need for affordable housing. They are the sites of rapid urbanization and great housing pressure. Many of the world's largest cities are in Asia. Amid the unsatisfactory housing conditions, several cities (for example, Hong Kong and Singapore) have perpetually provided housing for the masses and, in the process, generated much economic growth. The strong housing performance in these cities has been a source of inspiration for other policymakers. (Yuen, 2011)

3.12.1 Case Study: Singapore

Figure 29: 3.21: Map of Singapore.

Singapore is one of the most densely populated cities in the world with population 5.5 million and land area 719.1 km2 (277.6 sq. mi). It has population density above 6000 people per sq.km. and urban built-up area density more than 9500 persons per sq.km. The median age of Singaporean residents is 39.3. (Wikipedia). It is officially called the Republic of Singapore, and is often known as the Lion City, the Garden City, and the Red Dot. It consists of 63 islands, including the main island, widely known as Singapore Island or Pulau Ujong in Malay. Majority of population is located on the main island of Singapore. Many others island are being used for industry and recreation, for e.g. Jurong Island and Sentosa respectively. The highest natural point is Bukit Timah Hill at 163.63 m (537 ft).

Singapore is a multiracial and multicultural country with a majority population of Chinese (75.9% of the resident population), with substantial Malay (12.1%) and Indian minorities (17%). There are also Eurasians in Singapore. Mahayana Buddhism is most widely adhered to in Singapore then after Islam, Christianity, Hinduism, Sikhism or no religion at all. Malay is the national language. The other three official languages are English, Mandarin and Tamil. English is the main working language and is the mandatory first language in all schools in Singapore.

The Urban Land Institute (ULI) and the Center for Liveable Cities (CLC) are showing how Singapore has turned the challenges of rapid urbanization into opportunities, creating an appealing living and working environment Through 10 Principles for Liveable, High-Density Cities. Those ten principles are: Principle One: Plan for Long-

Term Growth and Renewal, Principle Two: Embrace Diversity, Foster Inclusiveness, Principle Three: Draw Nature Closer to People, Principle Four: Develop Affordable Mixed-Use Neighbourhoods, Principle Five: Make Public Spaces Work Harder, Principle Six: Prioritize Green Transport and Building Options, Principle Seven: Relieve Density with Variety and Add Green Boundaries , Principle Eight: Activate Spaces for Greater Safety , Principle Nine: Promote Innovative and Nonconventional Solutions , Principle Ten: Forge 3P (people, private, and public) Partnerships.

These ten principles provide an insight into Singapore's integrated model of planning and development, which weaves together the physical, economic, social, and environmental aspects of urban living. Many of the impacts of high-density city living can be mitigated or managed better through such an approach. For Singapore this is an important factor as the country continues to grow and high-rise buildings increasingly dominate the urban landscape. (Urban_Land_Institute, 2013)

Housing in Singapore

Almost 90.3% of resident households (i.e. households headed by a Singapore citizen or permanent resident) own the homes they live in, and the average household size is 3.43 persons (which include dependants who are neither citizens nor permanent residents). However, due to scarcity of land, 80.4% of resident households live in subsidized, high-rise, public housing apartments known as "HDB flats" because of the government board (Housing and Development Board) responsible for public housing in the country. (Wikipedia)

Chinese and Japanese Garden, Mandai Orchid Gardens, Bukit Timah Nature Reserve, Fort Canning Park and Singapore Botanic Gardens are some of the major attractions and tourist destinations in Singapore. Most (90 percent) of its 5.5 million residents live in high-rise apartment buildings. Although a high-rise building is not the traditional form of housing, in recent decades it has become the common norm. High-rise housing is a key strategy for providing high-quality living to Singapore's growing population, which is anticipated to grow by 1.5 million or more over the next 40 to 50 years. The construction of high-rise structures deliberately limits the footprint of

residential development to free up land for developing facilities that support a high-quality living environment. The good example of the principles, directions, and outcomes in the "planning for more with less" scenario is seen in Singapore. (Yuen, 2011)

In Singapore's hot and humid tropical climate, and as all newly constructed public housing are not equipped with air-conditioners, a windy environment is an added attraction as it helps to create air movement to keep the dwellings cool.

Although high-rises can greatly affect the scale and context of the urban environment due to their height, high-rise structures would yield land for other buildings and retain open spaces to serve societal needs and aspirations. This use of standards has produced a new pattern of facility provision in which amenities such as open spaces, car parks, schools, and shops are being developed within easy access (a 5-minute walk) of the residents. The premise for this pattern of development is observed that one's standard of living is very much determined by access to basic social services, which provides the means to expand capabilities and functionalities. (Yuen, 2011)

Singapore's long-term development plan has pronounced a development strategy of constructing more high-rises as Singapore aims to become a dynamic, distinctive, and delightful global city-state.

High-Rises in Singapore as a Public Housing

The public housing development in Singapore first began in the 1920s. Singapore country has a unique housing system, which runs like a well-oiled machine providing homes, benefits and livability to the broad population. The Housing & Development Board (HDB) is the public housing authority in Singapore. It was formed in 1960. At that time, most people lived in overcrowded, insanitary conditions in low-standard housing, and could not afford to be home owners. HDB rose to the challenge, acquiring land and putting comprehensive plans into action, designing and building affordable, quality homes. (Moller, 2014)

Figure 30: 3.22: A block of HDB flats, Bukit Batok.

Restructuring the city to facilitate the statement "a more efficient locational arrangement for urban activities, with a massive relocation of population into public housing estates and new towns to reflect the preferred spatial pattern" is the major achievement of building high-rise housing. (Yuen, 2011)

Public Housing in Singapore is so popular that almost 85% of Singapore's population residing in high-rise public housing that is constructed by the Housing and Development Board since 1960. The public housing programmes in Singapore are basically government-initiated with minimal input and feedback from residents. Due to the capability of good governance to solve the issues of apartment scenario, currently vertical living is well established and flourished in Singapore through the public affordable housing schemes.

Besides providing quality housing with good natural lighting, ventilation, orientation and views, the development additionally offers a quality living environment, which incorporates a variety of recreational, institutional, retail and communal uses.

By the end of its first 5-year building program (1961 through 1965), the state had constructed 70,000 flats in high-rise apartment blocks (averaging 10 to 12 stories high) to house about 25 percent of its population. By 2005, some 900,000 dwelling units had been built, including 25-, 30-, and 40-story apartment blocks; the units provided housing for 84 percent of the resident population. These new apartment buildings were built within new towns. Initially located within an 8-kilometer radius of the city, the new towns have gradually spread to all parts of Singapore with the expansion of the public transportation network. The aim is to improve the existing residential space, especially in terms of occupancy, accessibility, and facilities. The development of high-rise public housing for the masses is primarily rooted in the policy to provide good, affordable housing for everyone who lacks shelter. (Yuen, 2011)

Figure 31: 3.23: Overview of Bukit Batok, satellite town developed by the HDB, 1970s.

Public housing in Singapore is managed by the Housing and Development Board (HDB). The vast majority (more than 80%) of Singaporeans live in public housing.

These flats are located in housing estates, which are self-contained satellite towns having developed neighbourhoods with schools, supermarkets, clinics, food centres ,hawker centres, and facilities. Popular neighbourhood estates include names like Ang Mo Kio Town, Toa Payoh, Clementi, Yishun, Bishan, Hougang, Simei, Woodlands, Punggol, Bukit Batok, Tampines and others to the name (Wikipedia).

Most (95 percent) public flats are owner occupied. Housing access and affordability are not limited to some households; instead, various financial assistance schemes have been initiated to specifically help low-income families become homeowners. The slogan announced by Government "If you leave the slum, you will get flat" became popular and appropriate for Singapore slum-dwellers. Many of the Singapore public flats are large and comfortable by international standards. (Yuen, 2011). There are three-room, four-room, five-room and executive flats. A three-room flat has two bedrooms, which is about 1,000 sq. ft. or 90 square meters. A four-room flat has three bedrooms which is about 1,200 sq ft of space. A five-room flat is about 1,400 sq ft. An Executive mansionette has three and they are relatively larger than any other HDB units- some even have double storey, with the rooms on the second level.

The rest of the population live in private housing, such as private apartments, condominiums and landed properties.

HDB flats were built primarily to provide affordable housing for the poor and their purchase can be financially aided by the Central Provident Fund. The first public housings built were in SIT Estates, usually located just outside the fringe of Uptown Singapore, such as Tiong Bahru in the Bukit Merah area. SIT stands as Singapore Improvement Trust was a government organization set up in 1927 by the British colonial government.

Figure 32: 3.24: Multi-storey carpark can be found at newer HDB estates in Singapore.

Toa Payoh is the first town to be built entirely from the ground up by the HDB. There are now officially 23 "HDB Towns" and three "Other Estates". Each HDB town is designed to be self-sustainable. Employment can be found in industrial estates located within several towns. Educational, health care,

and recreational needs are also taken care of with the provision of schools, hospitals, parks, sports complexes, and so on.

HDB towns are typically sub-divided into neighbourhoods, with most neighbourhoods served by a neighbourhood commercial centre and facilitated as communal and common space such as multi-storey carpark.

Ownership and rental

More than 80% of Singapore's population live in HDB flats, with 95% of them owning their HDB flat. HDB Flats in Singapore are sold on a 99-year lease agreement. The remainders are rental flats reserved for those who are unable to afford to purchase the cheapest forms of public housing despite financial support.

Maintenance and renewal

Maintenance of the HDB's approximately 900,000 units largely falls under the Town Councils, which are not part of the HDB but which are formed under the Town Councils Act primarily with the purpose of maintaining the common areas of HDB flats and estates. Common areas would include the common corridors, void decks, lifts, water tanks, external lighting and the open spaces surrounding the estates, which are managed, maintained and improved on by the respective Town Councils. These Town Councils are formed by the respective political constituencies and do not necessarily follow HDB Town boundaries; hence a single HDB Town may be managed by multiple Town Councils.

Rental flats, on the other hand, are maintained directly by the HDB to ensure serviceability for the next occupant. The HDB is also the direct authority overseeing home renovation works, whereby while home owners engage third-party contractors, the HDB imposes strict renovation rules to ensure no structural damage and adherence to noise control during renovation works. The HDB also approves renovation contractor registrations to enforce quality control.

Large-scale improvement works to existing public housing developments were carried out in the form of various programmes under the Estate Renewal Strategy, beginning with the Main Upgrading Programme (MUP) since 1990. These help to bring

common facilities up to standards with newer developments, and in some cases, to offer some improvements to individual units, such as the addition of reinforced bomb shelters which can double-up as an additional room during non-emergency periods (Wikipedia).

Cost of Apartment Housing in Singapore

Most Singaporeans prefer to buy their real estate than rent. The cost of housing in Singapore depends on factors such as the property's proximity to the city i.e. location. It has high price if located in City Centre and comparatively low if outside the city centre. The popular residential areas in Singapore are postal districts 09, 10 and 11, in areas such as Orchard, Bukit Timah and Thomson. Areas close to MRT stations and the new waterfront near the Singapore River are quickly gaining in popularity – and rental rates.

It also depends on size and condition of the place i.e. relative age of the property, availability of recreational facilities (such as pool, gym, etc.). Condominiums with full facilities may command a higher price.

Similarly, other important factor is quality of furnishings that come with the accommodation. It means rent also depends on whether the place is furnished, partially furnished or unfurnished.

Renting a flat usually excludes utility bills but includes maintenance fees.

The cost of different types of housing in Singapore can be illustrated as:-

HDB Flats: Housing Development Board (HDB) flats continue to offer the best value by far. Most of the local Singaporeans about 80% live in government housing flat i.e. HDB flats. It is very reasonable option to live in HDB flats, if somebody is on a tight budget. (Lembo, n.d.) They are abundantly located across the island and sited in convenient, self-contained estates In other words, HDB flats are within close proximity to basic amenities such as banks, local schools, supermarkets, food centres, polyclinics, libraries, shopping malls and usually an MRT station and bus stations. However, these apartments do not come with luxury amenities like swimming pools or gyms.

Pricing of public housing flats are meant to be affordable, and are typically substantially cheaper than privately built developments. For example, an HDB 4-room flat depending on age, environment and surrounding amenities can have a sale value of between S$200,000 to above S$300,000 and an HUDC Executive maisonette above S$500,000. However, in contrast privately developed condominium type housing can cost as much as S$1,000,000 and above. (Wikipedia)

Rental costs for HDB units depend on the location and size of the unit. HDB apartment close to the CBD rents higher than sub-urban locations. The biggest advantage of HDB accommodation is that they typically offer very reasonable rental rates, from SGD 400 a month for a room upwards to about SGD 3,000 for a double-storey maisonette. The size of flats available range from one-room to five-room and larger executive units.

Property	Estimated cost (SGD) per month
HDB flat (5-room/executive/maisonette)	1,500 - 3,000
HDB flat (3-room to 5-room)	1,000 - 1,500

Table 4: 3.4: Approximate Rental Cost of HDB flats, Singapore, (CONTACTS_SINGAPORE, n.d.).

Condominiums: Most expats in Singapore live in private condominiums due to the availability of recreational facilities such as swimming pools and gym to round-the-clock security and scenic surroundings, provide for a comfortable lifestyle, especially for families. Such condos have more and more amenities as tennis courts, playgrounds for children, secured access; opportunity to socialize with other expats; and affordability as compared to renting landed property.

The rental prices for private condos can vary greatly depending on the location and age of the building. The rental cost of a 3-bedroom condo in prime areas close to the city-center including areas such as Orchard, Bukit Timah, Tanglin, and River Valley starts at around S$7,000 per month and can go up-to S$15,000 depending upon how luxurious the apartment is and its proximity to the CBD. The rents for high-end luxury apartments such as waterfront housing at Sentosa and Keppel Bay can range anywhere between S$8,300-S$13,000 per month. 3-bedroom condos located in the city fringe areas start from around S$4,500 and can go upto S$7000. Condos that are

located outside the city-center in neighbourhoods such as Bedok, Changi, Pasir Ris, Tampines, Ang Mo Kio, Woodlands, Yishun, Clementi, Jurong, and Punggol are less expensive with a monthly rental of around S$3,300-S$5,000. (Lembo, n.d.)

Private Apartments: Private apartments in Singapore are similar to condos but normally lack most of the facilities that are found in condominiums such as large sized pools, BBQ pits, tennis courts etc. They also tend to be older buildings since most of the new private construction is done in the form of condominiums.

Rent for a room in a private apartment in prime districts such as East Coast, River Valley and Chinatown costs approximately S$800 – S$1,800. Renting a 3-bedroom private apartment in the CBD area will bear a tag of S$5,000-S$7,000 while those in the outskirts can be rented around S$4,000 per month. (Lembo, n.d.)

Serviced Apartments: Some expats prefer to rent serviced apartments as they offer personalized services and hotel-style facilities or because they intend to stay in Singapore for a short-term period and are looking for a flexible lease. Serviced apartments in Singapore are fully furnished and house a pool and gymnasium. Most serviced apartments house 1-2 bedroom units as well as larger 3-4 bedroom units. Lease terms are flexible and can be negotiated for a per-day basis, per-week basis or on a per-month basis. A large number of serviced apartments are located in the Orchard area while some are located in the River Valley, East Coast and West Coast areas. The monthly rental of a one-bedroom unit can range from S$7,000-S$14,000 depending upon the location and how luxurious the apartment is. (Lembo, n.d.)

Landed property: Although high-rise is the more common form of living in Singapore, one will find that there is still a good variety of landed property. This includes bungalows, semi-detached houses, detached houses, terrace houses, cluster houses and townhouses.

Due to Singapore's relatively small land size and large population, landed property is no longer very common and is consequently quite expensive to rent. The average rent for detached bungalows in prime locations is close S$18,000 per month. A high-end luxurious bungalow (i.e.4-bedrooms, land area of 1,400 sq meters, and a large garden) can cost as high as S$35,000 per month. Terraced houses and semi-detached houses

are less expensive and can be rented for approximately S$8,000-S$13,000 per month. (Lembo, n.d.)

Household Income and Expenditure in Singapore:-

S.N.	Type of Dwelling	Average Monthly Household Income (S$)	Average Monthly Household Expenditure (S$)
1	HDB Flats	7,900	4,724
2	Condominiums and Other Apartments	20,536	3,831
3	Landed Properties	26,058	8,000
4	Other Flats (non-HDB shophouses ,etc)	10,503	10,409

Table 5: 3.5: Household Income and Expenditure in Singapore, Source: (Anon., 2013).

The median monthly household income in overall is now $7,870.

Case study: Pinnacle@Duxton Public Housing Estate

It is the award winning biggest and most prestigious public housing, stands as a spectacular landmark next to the low and dense china town and is unique amongst HDB developments in Singapore. It has seven apartment tower-blocks. Each tower has 50 floors above the ground.

Figure 33: 3.25: Duxton Housing Area, Singapore.

The 50-storeys public housing development, which comprises about 2000 dwellings, was initiated first at 2001 by Housing and Development board considering the high demand of homes almost 8 lakhs to cater the projected population 5.5 million at that time and competed at 2009. The main attractions of such high-rise housing developments are the scenic view and windy environment in contrast to major concerns such as pricing, safety of the building structure, insufficient provision of facilities as well as traffic congestion. (Wong, 2004)

This housing has special designed units having altogether 35 different unit variations for buyers to choose from – with dissimilar combinations of features such as extended bays, balconies, bay windows and planter areas. (Moller, 2014)

It also features the world's two longest sky parks of 500 meters each, on both the 26th and 50th i.e. roof floors. All seven towers are the world's tallest public housing buildings. The 26th storey sky bridge is reserved for residents' use, as it serves as a refuge floor. Facilities on the 26th storey sky bridge include a RC centre, 800 meters jugging(running) track, senior citizen fitness corner, outdoor gym, children playground, communal hall, community plaza, fitness corner and 2 view decks (Moller, 2014).The 26th storey sky bridge (refuge floor) serves to evacuate residents during a fire emergency. As the sky bridge links all 7 blocks, residents from an affected block may evacuate through the sky bridge (refuge floor) to the unaffected blocks. SCDF (Singapore Civil Defense Force) fire-fighters can mount search, rescue and fire-fighting operations from this refuge floor, which is open and naturally ventilated, for efficient smoke dispersal.

Figure 34: 3.26: Sky Park at 50th roof floor.

The 50th storey rooftop sky bridge is open to both residents and the public. To access the 50th storey sky bridge, members of the public have to pay $5 per person per entry. Residents and the public will be able to enjoy scenic views of the city from the 50th storey sky bridge of this public housing project.

Figure 35: 3.27: China Town near Duxton.

The Duxton Plain site is historically significant as the site of the first two ten-storey HDB blocks in the area and amongst the oldest built by the HDB in the country.

Home Ownership Concept

The home ownership is the foundation of the public housing programme and provides every person a tangible stake in the nation. Also, the government provides mortgage financing loan for buyers of HDB flats, ensuring the homes are affordable to Singaporean. On average, most people pay about 20 % of their monthly income to service their loan. Residents owning apartments for more than five years are free to sell it at the open market.

Throughout HDB's towns, six different flat types are provided to choose from. The types of flats are displayed in 1:1 scale at HDB's headquarter, where one will find models of the towns as well. That means people don't have to go and see the actual apartment. They pick it from the model and hope the view is good. The types of flats are similar, and the most common type is four-room apartments about 90 square meters in size. Though the flats are similar, they have the possibility to customize the interior by choosing different features or materials.

The article published by IFHP (International Federation for Housing and Planning) at 2014 tells that low income families get extra help. On top of the existing housing subsidies, they also receive an Additional Housing Grant to buy their first flat. Some low-income families which cannot afford to own homes are offered rental flats, at heavily subsidized rates. A result of the housing system is that 9 out of 10 HDB dwellers own their home. The eligible conditions to become a HDB home owner are, roughly, that one has to have a Singaporean citizenship, be a least 21 years old, form a family nucleus, have a monthly household income of less than 10.000 SGD (1 Singapore Dollar = 74.692 Nepalese Rupee), and not having own any private residential property in the last 30 month. (Moller, 2014)

Residents' perspective of high-rise living

The population in Singapore has gradually accepted the high-rise lifestyle. The percentage of residents willing to live on the 10th floor and above has gradually increased from 27.9% in 1973 to 35.7% in 1977 and to 47.3% in 1981.

In terms of the psychological and social aspects of living in high-rise housing, it is suggested that high-rise living could be detrimental to the creativity and physical development of young children due to the constraints of play activities and facilities.

It is also noted that health problems such as respiratory infection have been more prevalent among women and children living in high-rise buildings. Although there is no clear correlation between the incidence of mental disorder and high-density urbanization, higher-density developments have tended to reduce social contact and community interaction between high-rise. (Wong, 2004)

With regards to environmental factors such as ventilation, noise and thermal comfort, it is found that these are generally acceptable in Singapore's high-rise public housing. As high-rise buildings tend to be tall and narrow, they should be designed such that when subjected to strong winds, the vibrations should not become unacceptable in terms of serviceability and safety.

Figure 36: 3.28: Singapore Vertical Living with Romantic View

A view offered by a high-rise dwelling has been found to command a price premium such that the view is in fact regarded as an amenity within the housing unit. Dwellings on the top two floor levels of the pioneer batch of 40-storeys public housing blocks in Toa Payoh are priced between 12 and 15% higher than those units located on the first 20 storeys within the same building. This price differential translates to an average of S$31 000–$41 000 more.

Occupant's decision whether to live in a high-rise high-density housing development is strongly influenced by their household size. The larger the household size, the less willing is that household to live in a super high-rise building. Younger respondents, males and those who are currently living at higher levels tend to be more in favour of such high-rise high-density housing than older people, females and residents of lower-level dwellings. To a lesser extent, respondents currently living in larger dwellings as well as having higher monthly incomes and higher education tend to be more inclined towards super high-rise living. As those households who are less willing to live in such high-rise housing development tend to have families with younger children, elderly parents, and probably females who do grocery shopping, it could be inferred that access and escape by vertical transportation is a very real concern, in addition to their fear of unfamiliar experiences and resistance to change. The practical

significance of these findings is therefore to design spacious, efficient and reliable vertical transportation systems that are suitable for all ages, including the handicapped. (Wong, 2004)

The main attractions of super high-rise living are the scenic view and windy environment. As the view together with a windy environment are highly valued occupants are also willing to pay high prices for these factors. Developers of high-rise buildings are more alert for the provision of physical orientation and design of their developments so as to optimize the available scenery and wind directions. There is the attraction of higher floor of high-rises for fresher air too.

Figure 37: 3.29: Plan of a typical public housing unit showing location of household shelter.

Traffic flow has been found to be the main component of noise in public housing estates, especially during the evening peak hours.

Since early 1990s, every unit of new public housing constructed by the Housing and Development Board has been installed with a specially reinforced 'household shelter' that operates as a disaster shelter in the event of an emergency or catastrophe. In addition, the time needed for vertical travel within the super high-rise building does not appear to be a major concern to the respondents essentially because of the availability of modern technology, as well as more efficient and speedier elevator systems.

Preferred floor level and height of building

The most popular floor levels amongst the residents are between 16 and 20 storeys.

Preferred floor lvl.	5 & lower	6–10	11–15	16–20	21–25	26–30	31–35	36–40	41–45	46–50	51 & above	Total
%	5.4	15.0	13.2	18.3	11.7	15.4	6.7	4.3	3.7	4.2	2.1	100

Table 6: 3.6: Respondents' preferred floor level, (Wong, 2004).

Majority of the respondents (51.9%) prefer to live on the first 20 storeys and only 10% are willing to live above 40 storeys. This result infers that their previous dwellings are upto 20 storey and most residents are generally resistant to change after long practice on same floor if there occurs unexpected happenings.

It takes some times to make familiar about any new things. Currently super high-rise buildings (i.e. vertical cities) having height more than 30 or 40 storeys are also well flourished in Singapore.

The Outcome and Realities of High-rise Living

Almost 82 percent of residents expressed a keen sense of belonging to their new town. Their main reasons for this perception included length of stay in the town (an average of 12 years), good neighbours, pleasant surroundings and environment, and regarding the flat as home. Dwelling is an activity that develops out of residents' lives, habits, and practices. It enhances familiarity and engagement with the particular environment. (Yuen, 2011)

High-rise public housing offers more living space and amenity convenience to the residents than low-rises. Comparative statistics reveal that public housing residents enjoy more floor area and open space per person after moving to high-rise public housing: living space per person doubled from just under 3 square meters to 6 square meters per person ; open space increased from 2 square meters to 20 square meters per person .

Figure 38: 3.30: Woodlands New Town built near the Johor-Singapore Causeway.

Aspect	Very Unsatisfied (%)	Unsatisfied (%)	Fairly Satisfied (%)	Satisfied (%)	Very Satisfied (%)
Floor level	3.2	5.5	36.2	34.8	20.4
Location	0.3	2.6	26.7	45.4	25
View	3.2	15.8	33	31.6	16.4
Breeze	0.6	12.1	21.1	40.8	26.4
Privacy	1.4	6.6	25.3	41.7	25

Noise from traffic	3.7	17.6	28.5	30	20.2
Noise from neighbors	0.9	3.5	27.5	36.1	32.1
Space between buildings	3.2	19	34.5	29.3	14.1
Convenience to facilities	2.0	9.8	23	40.2	25

Table 7: 3.7: Respondent Satisfaction with Present Living Arrangement, Source: (Yuen, 2011).

Most (more than 85 percent) public housing residents perceived the elevator to be reliable, the noise level to be tolerable, and the level of privacy from neighbours and passers-by to be sufficient.

On the summary of findings, it was found that occupants spent the bulk of their time on personal maintenance. Television watching at home was a favourite pastime. The main activity was sleeping. Occupants spent about 25 percent of all available time (the largest block of social time) with their immediate family and spent less than 10 percent of their time with friends. Comparision with American findings, the emerging picture seems to indicate that the Singapore resident spend more time on passive leisure, in particular on watching television, than the television-addicted American does. The Singapore respondent also appears to engage in fewer collective social activities in other people's homes, such as visiting, and in activities outside their own homes, such as visiting museums, than does the typical respondent American. Determining to what extent these differences are influenced by culture, the living environment, or other considerations is a matter for further investigation.

The increasing numbers of Singapore residents are opting for high-rise living. Most (82.5 percent) households in public housing have expressed contentment about the idea of always living in public housing apartment buildings. Attracted by unblocked city views and natural ventilation, many households have expressed a willingness to live on high floors, even in the 50-story public housing buildings.

The main attractions of high-rise living appear to pivot around good views, breeziness, and air quality. Among younger residents and higher income households, living in taller buildings is perceived as a desirable choice—a prestigious lifestyle.

Findings of residents' living experiences indicate much ambivalence about high-rise living concerns because experiences vary from individual to individual.

Over the past four decades, Singapore has turned the modern high-rise apartment building into the city-state's most prevalent form of housing. High-rises are built in large concentrations and at increasing heights throughout Singapore. More and more people choose to live in high-rises. Unlike residents' experiences elsewhere, high-rise public housing in Singapore offers many people a satisfying living environment (Yuen, 2011).

Concern	Respondent is concerned… (%)				
	Not at All	A Little	Fairly	Much	Very Much
Travelling time in elevator	42.2	9.2	24.1	14.9	9.5
Crime in elevator	32.2	13.2	20.1	17.5	17
Elevator breakdown	30.7	14.9	14.7	18.7	21
Who you have as your neighbors	34.3	10.7	18.7	19.3	17
Accidental falling of family members from the high-rise flat	33.8	18.2	23.1	12.4	12.4
Height of the building	40.5	17.5	26.4	12.1	3.4
Fire risk	31	17.2	21.3	20.4	10.1
Power failure	34.2	19	17.8	19.8	9.2
Collapse of the building	40.3	21.3	14.4	11.5	12.4
Walking along common corridor to reach your flat	45.7	20.4	21.8	8.6	3.4
Lack of neighbourhood facilities	25.6	8.4	19.6	27.1	19.3
Other worries (for example, killer litter ,dumping arrangement, problems with insects, electrical	35.7	14.3	7.1	21.4	21.4

Table 8: 3.8: Respondents' Concerns about Living in High-rise Housing, Source: (Yuen, 2011).

Note: High-rise littering, from televisions to bicycles to coffee mugs, can pose a danger to life and property and can maim or kill people; thus, it has earned the name killer litter.

Singapore high-rise public housing system, if anything, converges toward providing affordable housing of high quality, the good life, and asset enhancement. The analysis indicates that, at a broad level, the Singapore case strengthens the argument of positive discourse that celebrates high-rise living. More specifically, high-rise housing can also contribute to and uplift the standard of living for the masses. Several factors have been reasserted as critical to this outcome: a housing delivery system that seeks a high-quality total living environment, emphasizes a sense of belonging, and, most importantly, puts residents at its center. These factors are key pillars in producing sustainable housing (Yuen, 2011).

Policy implications and Summary

As the time of 2001, the concept of super high-rise buildings and vertical cities was new to the population in Singapore and so only half of the potential residents are in favour to such tall buildings. The first of such a housing development was completed in 2009. The policy implications about the level of public awareness and acceptability about such buildings were increased through public education, feedback and participation. Such public education efforts were carried out to emphasize the older and larger households too; considering the fact as the new housing form appears to be more popular among the younger and smaller households. As the Singapore government authorities are making their decision-making processes more transparent in recent years by informing and educating the population on new policies and explaining how these new initiatives may directly or indirectly affect them, a larger number of households are likely to adopt a more responsible attitude towards the development and feedback on policies.

With the scenic view and windy environment being highlighted as the two major attractions of high-rise living, planners, developers, and policy decision-makers should ensure that these important 'pull' factors are incorporated into the designs of their developments so as to attract more households to reside at higher floor levels, and at the same time demand a price premium for these features. A balance must therefore be achieved by the policy decision-makers to ensure that pricing of such high-rise high-density developments remains affordable to the target households, and at the same time new financing packages and instruments are introduced to facilitate home-ownership of these new housing forms (Wong, 2004).

To solve the dual problem of noise and safety at higher floor levels as it is aggravated by the larger number of households and heavier traffic flow as a result of higher density and more intensive usage. The policy implication has been applied that newer and more resilient building materials, modern technology as well as more innovative acoustic and construction methods were to be explored to try and alleviate some aspects of these issues so as to make high-rise high-density living more acceptable and sustainable in the long term. In fact, many of the modern vertical city designs have proposed and also have constructed the use of flexible and durable building materials that could be recycled when demand changes.

Housing and Development Board transformed unsanitary, slum-condition housing into high-rise dwellings in less than 10 years and only about four decades to super high-rise high-density vertical city developments. Past scenario shows that the Singapore population has been very adaptable to new housing forms. Such exact and high remarkable suitability of vertical trend of housing is enhanced and inferred by the planners and policy decision-makers who have to be constantly experimenting with innovative housing forms to alleviate Singapore's land scarcity.

Although land scarcity in major cities may be the fundamental motivation to develop high-rise high-density vertical cities, in recent times, cities around the world are also trying to create its own identity with skyscraper landmarks. In fact, the race is on to construct the tallest building in the world. With one of the proposed designs for the rebuilding of the World Trade Centre in New York standing at 541 m tall, New York's World Trade Centre may once again be the tallest building in the world in close competition with Shanghai World Financial Centre at 460 m and Taipei Financial Centre at 508 m. (Wong, 2004)

Drawbacks: People not so keen on high-rise living, seem to be most worried about a lack of neighbourhood facilities, personal fears (such as fear of height), potential difficulty of escaping in case of emergency, elevator breakdowns, who their neighbours are; and high density that would result from more people living in taller blocks. Presenting the realities of high-rise living, these concerns ground the sensibility of attending closely to residents' living experiences. If not addressed, these concerns might detract from the high-rise living experience.

3.12.2 Case Study: Hong Kong

Hong Kong is one of the world's densely populated cities. It has an area of 1104 km^2 with around 7.2 million populations of various nationalities with the median age 43.2 years at 2014. The median monthly household income is HK$23,500 (Anon., 2014).

Figure 39: 3.31: Map of Hong Kong.

Shortage of land and increasing population has been a major cause for a high-rise and high density in Hong Kong. Over 50% of its 7.2 million populations live and work in urban centres, Hong Kong Island and Kowloon, for convenience and efficiency that proliferates the intensification of human activities within urban centres. Almost about three million people live in self-owned private homes in high-rise apartment blocks.

Hong Kong has an average density of 6,310-person per square kilometer and a peak urban density of 44,210 people per square kilometer that is among the top in the World.

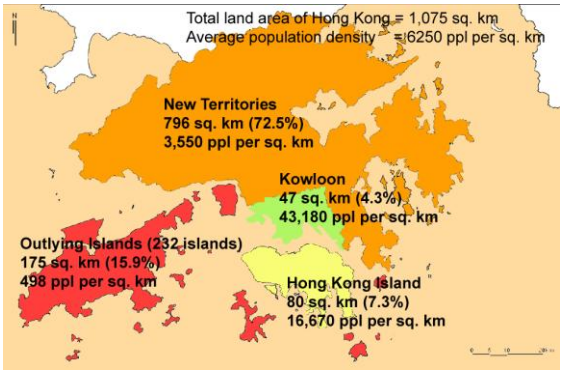


Figure 40: 3.32: Hong Kong's four major areas.

Hong Kong is one of the Asian cities that have evolved a compact urban form. Situated in the south-eastern tip of China, Hong Kong is ideally positioned at the centre of rapidly developing East Asia. It covers Hong Kong Island (80.41 sq. km.), the Kowloon peninsula just opposite (46.93 sq. km.), and the more rural section of Hong Kong New Territories and New Kowloon, 262 outlying islands (976.38 sq. km.). The central part of both Hong Kong Island and Kowloon are hilly rising to a height of 3050 m. Only 21.8% of Hong Kong land is built up, concentrating on the triangular tip of Kowloon and the coastal strip of northern Hong Kong Island (Yuen, 2011).

For Hong Kong, the average travel time between home and work ranges from 30 minutes to 45 minutes per journey.

Over 75% of Hong Kong's land consisted of hill slopes.

A Compact City: Hong Kong is one of the Asian cities that have evolved a compact urban form. MILU (A multiple intensive land use) is mix used use (multi functional) and high-density (intensive) development. The concept of MILU was formulated to tackle the problems of urban sprawl and the development of dysfunctions of urban, suburban and rural areas. Plot ratios, also known as Floor Area Rations, of up to 15 for commercial uses and up to 10 for residential uses have led to buildings of up to 80 storey built above 3-4 level podiums. The podium levels incorporate the secondary supporting functions such as commercial, recreational, government, institutional and community (GIC) land uses while the primary residential, office or hotel/serviced apartments are located above.

In Hong Kong, public housing development has been continually used as in Singapore. In terms of land policy, the government owns land in Hong Kong. Land is sub-divided before leasing to the private developers through auction and tender. The government has full control over the timing, location and amount of land to be leased. The sale of land leases is one of the major sources of revenue of the government. During the property boom periods, revenue from land sales can be as high as 30% of the total revenue of the government (Yuen, 2011).

Challenges: High-rise buildings of Hong Kong are explored to discuss the pressing challenges about physical environment of poor air quality, daylight, lack of open space and noise pollution.

Figure 41: 3.33: Hong Kong Vertical Living Scenario.

Concept of Verticality: The vertical city image of Hong Kong is portrayed by thousands of two hundred meters tall towers of residential apartments, or offices of similar heights. Recently, the projection of extending the Vertical City to 100 stories or 450 meters tall is no longer a dream but rather an imminent reality for urban practitioners. (Xu & Siu, n.d.)

In Hong Kong, activities do not happen on ground alone, always, they happen above ground. Double-decker bus, double-decker ferry and double-decker tram, double level pedestrian system, double-decker footbridges, and even double-decker elevators all are exemplifiers of the concept of sky city.

Mei Fu Shan Chuen Development

The Mei Fu Shan Chuen is the first conceptualization of high-density and high-rise urban design by way of modularized housing for Hong Kong.

Mei Fu Shan Chuen started developed in 1969, and now has 117 towers of 15 stories tall apartment buildings crowding on four adjoining sites constituting a self-contained township for its 46,245 residents or 13,068 households living on a small but compacted urban site close to business and finance centers on both sides of the Harbor. (Xu & Siu, n.d.)

Figure 42: 3.34: Mei Fu Shan Chuen.

Figure 43: 3.35: Shops on ground and residence on floors above.

The development is a blown-up version of the shop on ground and residence on floors above, made practical by a coalition of land use functions on the ground and upper levels such as bus terminus, food markets, gardens, sports ground, cinema and shops, thus, making it a self-sufficient city.

Metro City Tseng Kwan O

Tseng Kwan O (TKO) is one of the 10 satellite towns of Hong Kong. It is separated from most parts of Hong Kong by an hour over journey (i.e. most people's commuting time from home to work in the Central District is 30 to 60 minutes, facilitated by an ultra-efficient public transportation

Figure 44: 3.36: Tseng Kwan O

system). (Xu & Siu, n.d.)

The podium is served as an artificial ground, on which sitting the recreational facilities and green spaces for the residents. In this metro city, one can see forests of bamboos shots-like apartment buildings popping up under the barking sun and monsoon breezes of the South Pacific seasons. The towers are as tall as 40 stories and more recently reaching 60 stories, making the town of TKO a showcase of extreme high-rise high-density liveable urbanity.

It has been developed under three phases. Phase one contains 2,048 households or 6,700 residents in 6 towers of 43 stories tall. Phase two consists houses with 11 towers of 38 stories tall, has 3,344 households or 13,376 residents. Phase three comprised of 4 towers of 43 stories tall buildings that have about 1,376 households or 5,600 residents.

Here, one finds a unique Hong Kong fixation of a MILU (Multiple and Intensive Land Use) application on a relatively small land parcel that afforded a floor area ratio of 10 times the land area, realized by 21 towers of over forty stories tall which houses a total of 6,768 families or 9,600 population.

The unique feature of such MILU development is the fact that all of the residential super-high-rise towers sit on top of a 100% built over podium of 15 meters or 4 stories tall. In this case, the three phased developments are developed from three land parcels connected by 24 hours accessible covered walkways, and conveniently connected to the Mass Transit Railway. (Xu & Siu, n.d.). On the bottom floor is a terminal for both long haul and local commuter buses, maxi-cabs and taxis. Next to the transport terminal are post office and food market and supermarket. Within the podium situates a two level car park for residents and shoppers. There is also a shopping mall, which improvises retail, food, entertainment and all kinds of supplies and goods outlets. On the roof is yet a different land use, comprised of landscaped park, playground, indoor and outdoor swimming pool, club house, tennis courts and jogging paths, all for the exclusive use by residents living in the towers above the podium.

The Metro-City case exhibits the art of connectivity as discussed in the concept of connectivity. The Metro-city podiums, like hundreds of other similar MILU podiums

in the area, are connected with each other by covered walkways, making it in effect a connectable town of multiple layers.

It is interesting to note that the three developments have in fact their own podiums of shopping malls, shared clubhouses, car parks, and other recreational facilities.

Hong Kong vertical living environments summarized as:

- Two-thirds (68%) of the specimen lives in different urban areas on Hong Kong Island and the Kowloon Peninsula, while one-third (32%) live in the new towns in the rural areas of mostly the hinterland to the north of Kowloon known as the New Territories.
- 99% of the families live on different floors of existing high-rise residential buildings, with an exception of one who live in a two stories village type house.
- 36% of the families live on 25th floor and above, with the remaining on different floors on high-rise buildings ranging from 15 stories to 43 stories overall.
- Majority families belong to the mid-income group. The randomly distribution of interviewed families gives the following breakdown – there is a small proportion of mid-income families with monthly family income ranging HK$30,000-50,000 (17 out of 100 families); a large proportion of well-off middle families receiving $50,000 and above (77 out of 100 families); and an insignificant proportion of the surveyed families (6 out of 100 families) that have a low income of around HK$20,000 per family. [HK$7.78=U.S. $1.00]
- Almost 60% of the families have children of varying age (from age 7 months to 15). Children are defined for the purpose of the survey to be age 15 or under.

Main advantage of Apartment Buildings in Hong Kong

Scenic View: It was found that 84% of the residents surveyed perceive that View is a main advantage or benefit of living in a high-rise tower.

For example from Chiang's apartment, one is stunned by the superb view of Hong Kong Island, with the beautiful Victoria Peak as backdrop, and vibrant Victoria

Harbor in the foreground. The stunning view of Hong Kong, seen from every space in the apartment is an ultimate joy for residents and their visitors.

As in most other residential developments in Hong Kong, access to recreation facilities for residents and access to public transport network -subway and commuter buses (that offers connection to work within 30 minutes door-to-door travel time), and connection with neighbouring retails and entertainment complexes is the secret to the wide-spread acceptance to high-density and high-rise living in Hong Kong. (Xu & Siu, n.d.)

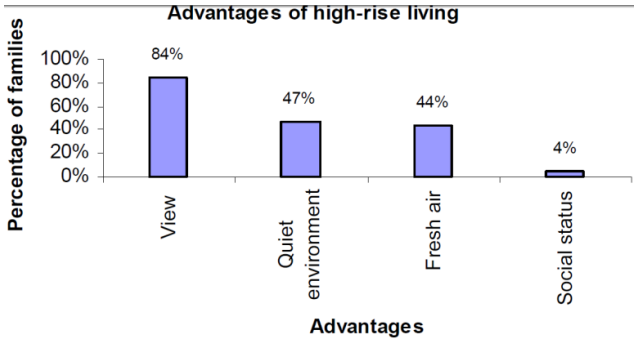


Figure 45: 3.37 Advantages of high-rise living in Hong Kong

Quietness and fresh air: Apart from view enjoyed from the high-rise residences, the next perceived advantage of high-rise living is the enjoyment of quietness (47%), and fresh air (44%). This advantage is carried out by Metro City apartment. The 80 Sq. M. area apartment is a big sized home for two persons. Occupants of this apartment spend most of their working and leisure activities within the community where they live.

Effects on young children: 98% of the families surveyed do not see any bad influence on the growing up of their children due to high-rise living. The few families who had bad experience or worries over undesirable impact on child growth caused by high-rise living are connected with their children's social interactions with other young ones. For these families, they would take more initiatives to compensate such disaffects or worries by taking their children to community centres or child centres for social contacts on a more regular basis.

Mr. and Mrs. Ho one of the family lives in an apartment of about 65 Sq. M. on the 41st floor of one of 34 towers of the Southern Horizon Development, home to 5,000 families.

During the Seventies, high-rise residential buildings ranged from 15 to 20 stories high, as compared with 30 to 40 stories in the Nineties.

It is noted however, most mothers are satisfied with the provisions of recreational facilities available at their housing complex to counteract the worries over spatial need and social need to facilitate children's growing needs, the commonly found facilities are: Green space ,Trail and paths in landscaped surrounding , Outdoor playground for young children, Residential club facilities to include indoor games play rooms for children, indoor or outdoor swimming pool, reading and socializing space for children and mothers.

South Horizon Apartment is well known for its environmental and landscaping design. With three sides bound by the Aberdeen Sea, the towers enjoy good breezes, ventilation, attractive sea views, excessive planting and outdoor/indoor recreational facilities for residents.

Future preference for house type: It is interesting to note that there is majority 77% who still prefer high-rise living, followed by 16% who prefer shift over to houses, and 7% who prefer to live in low-rise buildings. (Xu & Siu, n.d.)

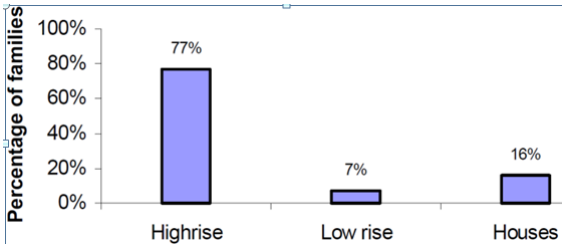


Figure 46: 3.38: Types of House, Hong Kong

"The three contributing factors for a high-density and high-rise city – Changes (population), Compact (living), and Connectivity. The success to high-rise and high-density living depends on three pre-requisites: Comfort, Convenience and Connectivity. Failure to meet any of the three would topple the acceptance for high-rise and high-density living." Tony Wilson, a government Chief Architect in Hong Kong.

This is clearly echoed by the residents' response that they enjoy Comfort, Convenience, and Connectivity in high-rise living, and for the same reason, they would continue like living in high-rise towers.

Comfort and Convenience: From the survey, it is clear that comfort and convenience are two related important factors for measuring the standard and quality of life. Here, comfort also meant security, safety and Comfort.

Connectivity and homework travel time: *Famous author James Trefi has written in his book, A Scientist in the City (1997), about an interesting discussion of "45-minutes" as a universal threshold to determine the acceptable maximum distance between homes to work.*

As expected, the "45-minutes" law has its stronghold in Hong Kong. In many of the surveyed cases, the travel time between homes to work fall within 30 to 45 minutes.

For good connectivity it is seen that 90 numbers of office buildings in the Central Business District, which are all connected in an efficient and elegant manner. The same concept of connectivity is also found in other land-uses such as residential areas.

Preferring a high-density, high-rise urban form: For Hong Kong, the occurrence of a high-density and high-rise urban form was probably due to extreme pressure from a shortage of land supply versus the demand for housing and other human activities.

If population-increase was the initial cause for the high-density urban form model, it is undeniable that economic consideration was a secondary but equally significant cause responsible for the high-density urban model. For decades that followed, land sales revenue account towards as big as 20% of the Government's annual budget, which facilitates Hong Kong to be one of the world's lowest taxation economy and a free capital market that draws in huge amount of international investment funds?

At the same time, economic achievements of Hong Kong in the area of textile, garments and toys industry have contributed towards the economic strengths of its people, which in turn led to an improvements in the standard of living and life quality.

In Hong Kong, high-density, high-rise is integrated with a high floor-to- area ratio (plot ratio) way of urban planning which continues to offer urban dwellers an exciting and comfortable lifestyle that prospers, and more significantly, influences the present and future prospects of the 600 or so expanding cities in China (Xu & Siu, n.d.).

3.13 Apartment Housing Scenario of India (Regional Perspective)

Housing is seen as a complex process involving phases of public health, planning, architecture, engineering, economics and finance, culture and social traditions, government and behavioural sciences so intertwined with one another that it is difficult to isolate a single element for study, analysis and discussion. There are three major causes around which the whole housing problem rotates are: population, low incomes and inadequacy of present housing programmes and inappropriate policies. (Jain, 1990)

Figure 47: 3.39: Map of India

India is the world's second largest country in population over 1.2 billion people and seventh-largest country by area with 3.28 million sq. km. Population of India is rapidly increasing at the rate about 1.25% having more than 900 million people. There is the need of housing, jobs and other infrastructures for such population. To settle the increased population; there is the chances of vanishing the agriculture land near the big and middle level cities resulting in the reversal of green revolution. So to minimize such impact, there arises the scarcity of land for settlement which emphasizes the vertical expansion of buildings i.e. mid rise and high rise.

Housing varies from palaces of erstwhile maharajas in Rajasthan to modern apartment buildings in big cities to tiny huts in far-flung villages. There has been tremendous growth in India's housing sector as incomes have risen.

Presently, urban India is home to 377 million people. Urban India is expected to house 600 million people by 2031, an increase of 59% from 2011. India's urban housing shortage is around 19 million. India ranks 134th among 137 countries; has the world's most unclean air. In India, slum population in 2011 was 66 million; projected

to be 105 million by 2017. Indian cities are deficient in basic amenities such clean drinking water, sanitation and lighting facilities (Cushman & Walkfield, 2014).

High rise apartment in Indian Cities

High-rise structures are also called "vertical cities", having the potential to decongest urban sprawl. Indian cities are witnessing immense demographic expansion due to migration from surrounding villages, leading to urban sprawl, housing demand, rise in cost of land. Many citizens all over India migrate to the cities for better jobs and education. Industries, trade and commerce activities and number of educational centres in cities attract floating population from all their surrounding villages and districts. This has expanded the cities in all directions and all aspects of development. With an urban sprawl of kilometers, these face the problem of congestion, pollution, everyday commuting to work place, competition, deforestation etc. The development of housing can be categorized in four categories considering different philosophy: High Rise with High Density; High Rise with Low Density; Low Rise with High Density; and Low Rise with Low Density. (Kavilkar & Patil, n.d.)

Development and growth of science, technology, trade and commerce are making enormous explosion in population. Peoples are becoming city oriented in Indian modern society too and extremely large no. of people creating tremendous and unmanageable space which should be managed and planned. Dwelling space getting scarcer day by day and there is little possibility of horizontal expansion in the Indian cities to facilitate accommodation of such perennial flow of population. There is high chance to go in vertical expansion of available spaces by constructing high rises to provide maximum accommodation to increasing population. In other developed countries like USA, UK, Canada, Japan; High rise started in early 20th century while in developing country like India it started in later half of the 20th century. (Chatterjee, 2009)

High rise buildings can be praised not only for providing accommodation to a large number of firms and families but also for saving precious land which can be utilized for agricultural and industrial purposes and for lowering the cost of facilities like

water supply, transport, electrification, drainage etc but by the seventies some adverse opinions were being raised criticizing high rise living in many contexts.

In India, a building greater than 75ft (23 m), generally 7 to 10 stories, is considered as high-rise. According to the building code of India, a tall building is one with four floors or more or a high-rise building is one 15 meters or more in height . Most of the tall buildings in India are in the commercial capital Mumbai. More than 2500 high-rise buildings are already constructed. In addition more than thousand mid-rises exist already in the city. Mumbai is undergoing a massive construction boom, with thousands of tall buildings and about fifteen high-rise structures are under construction. Delhi and its surrounding regions are witnessing huge construction activities with 1500 already constructed high-rises.

Today's Indian megacities like Bombay, Delhi, Calcutta, and Madras have large no. of multi-storied building for both residential and commercial purposes. Also, middle level cities like Kanpur, Allahabad, Nagpur, Patna, Indore, and Varanasi…etc. has needed large no. of multi-storied buildings due to high urbanization. It is recommended that buildings having 8-12 stories should be constructed in these cities with enough ground area left around them to grow plants and trees and still save more than 50% land area with respect to single storey buildings. (Gupta, 1995).

Mumbai: Mumbai is facing urbanization challenges as other fast growing cities in developing countries to provide better healthy environment by accommodating all with nice housing. It has wide disparities in housing between the affluent, middle-income and low-income segments of the population.

Highly desirable neighbourhoods such as Colaba, Malabar Hill, Marine Drive, Bandra and Juhu house professionals, industrialists, Bollywood movie stars and expatriates. Up-scale flats have 3 or more bedrooms, ocean views, tasteful interior decoration, parking for luxury cars and sleeping quarters for maids and cooks. Only a tiny fraction of people in Mumbai live in these luxury high-rises. Mumbai condominiums were the priciest in the developing world at around US$9,000 to US$10,200 per square metre at 2007. Mumbai has more than 1,500 high rise buildings, many of

which are just planned, but some already constructed or under construction. Over 9 million people, over 60% of the population of Mumbai, live in informal housing or slums. (Wikipedia)

Delhi: Delhi the capital of India has rapid suburban growth over the past decade. South Delhi, Gurgaon and Noida have added thousands of apartment buildings, houses, shopping centres and highways. Roughly 18.7% of Delhi's population lives in slums.

***Bangalore*:** In the 1990s the information technology boom hit Bangalore. Bangalore has transformed into the Silicon Valley of India as over 500,000 well-paying jobs for young college graduates were created. The demographics of the city changed, new high-rise residential buildings were built, campus-style office parks sprouted, vast shopping centres started to thrive, streets became crowded with new cars and gated expatriate housing estates emerged. Roughly 3% of Bangalore's population lives in slums.

Kolkata: A modern scenario of building boom has converted sprawling British-era bungalows into high-rise residential buildings with modern amenities in Calcutta. The famous neighbourhood central areas in Calcutta are Park Street, Camac Street, Lower Circular Road, Sarat Bose Road, Salt Lake, Ballygunge, Anwar Shah Road, Chowringhee and Golf Green. Kolkata currently has the second most number of high-rises and tall buildings in the country after Mumbai. The highest of them is at 50 floors. New suburbs are constantly being developed in Rajarhat and along the Eastern Metropolitan Bypass. The South City Towers are the tallest condominiums in this city.

Chennai: Houses are generally quite modernized. A basic single, or sometimes double, occupation flat in Chennai consists of Single bedroom with hall, kitchen and attached washroom. This ranges from 1BH to 5BH even 8BH. Chennai is the second largest city which has very low slum population, preceded by Bangalore.

Economics of Indian Hi-Rise Buildings

Large amount of land can be saved for agriculture production through the growth of properly planned cities in terms of mid rise. Here, the example which is worked out

for 2 lakhs dwellings units shows that large area of land can be saved by 8 storied buildings in comparison to scattered single storey dwelling units. (Gupta, 1995)

Single Storey Units:

Land required for 200000 units @ 60 sq. m. per unit for a house = 1200 hectare

Land required for other infrastructure facilities like road, park,

drains etc. @ 50% of above = 600 hectare

Total = 1800 hectare

Eight storey medium height buildings:

Land required for $1/8^{th}$ of 2 lakhs units = 150 hectare

Land required for Ventilation, Environment requirement etc. @ 200%

of above = 300 hectare

Sub-Total= 450 hectare

Land required for parks, drains, roads etc. @ 100% of above area =450 hectare

Total =900 hectare

iii) Thus savings in land: (1800-900) =900 hectare

(i.e. 50% of item i)

iv) Effect on agricultural produce:

On an average agriculture production in India for two crops per year is about 12 Tons per hectare per year and a maximum of 20 Tons per hectare per year. Thus agricultural produce per year in the saved land at an average of 15 Tons/hectare

= 15x900

= 13,500 Tons

By calculation, it is known that 13,500 Tons of Agriculture produce can be saved in a single Indian city. So, construction of medium height buildings has high importance

in Indian context having more other advantage like more green open space, clean air and environment, scenic view, proximity to urban facilities…etc.

Medium rise buildings are suitable scenario of city planning in Indian cities. Easier availability of community facilities, closer network of services and transport, scenic view, locational feasibility, availability of more open space (can be utilized for growing food item like vegetables, cereal etc.) and cleaner air and environment higher up than at ground level…etc. are the special advantages of medium high-rise apartment.

Healthier Environment: City has various negative impacts due to unplanned and scattered growth since it occupies large ground area and also there is the deterioration of environment and living condition of people since chances of mass diseases are high. While in planned growth there is the positive healthier environment since enough space between the buildings can be left so that fresh air is always possible and trees can be planted in open space around the buildings for better look and respiring in fresh air environment by the residents all around. There is easily applicable of the water and solids left after treatment of wastes of these buildings for water supply and manure for these plants and trees. (Gupta, 1995)

Drawbacks of high-rise in India: Lacking open space or play area affect the physical and mental health of occupant's young children. High rise occupants have perceived their housing environments to be unhygienic, substantially warm and uncomfortable, sometimes quite suffocating and thereby making somewhat an inappropriate place for living, fear, dissatisfaction, stress, behaviour problems, suicide, poor social relations, reduced helpfulness, and hindered child development. (Chatterjee, 2009)

3.13.1 Housing Finance in India

The Housing finance sector in India has no doubt, experienced unprecedented change in its structure from its formulation stage. Indian Housing Finance has far moved from the stage of being a solely government undertaking provided service during the 1970's to a very competitive sector with more than 45 housing finance entities providing housing loans worth 7,81,000 million to home buyers across India.

3.13.1.1 Government Policies for Affordable Housing

First National Housing Policy in India was enunciated in 1988, followed by a new National Housing Policy in August 1994. The National Urban Housing & Habitat Policy, 2007 is the first urban areas specific housing policy has sought to earmark land for EWS/LIG groups in new housing projects for provision of affordable housing.

To prevent frauds in loan cases involving multiple lending from different banks/HFCs on the same immovable property, the Government has facilitated setting up of Central Electronic Registry under the SARFAESI Act, 2002. This Registry has become operational with effect from March 31, 2011.

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM), was launched in December 2005 with aim to cover construction of 1.5 m houses for urban poor during the Mission period (2005- 2012).

It has two Sub-Missions:

• Basic Services for the Urban Poor (BSUP).

• The Integrated Housing and Slum Development Programme (IHSDP).

The Indira Awas Yojana (IAY) has been focused on the provision of cash subsidy scheme to rural BPL (Below poverty line) families for construction of dwelling units using their own design and technology.

Interest Subsidy Scheme for Housing the Urban Poor (ISHUP) has sought to enhance affordability of the urban poor through the provision of an interest subsidy of five per cent per annum on a loan amount of up to 1 lakh for the economically weaker sections and LIG.

Rajiv Awas Yojna (RAY) aims to create a Mortgage Risk Guarantee Fund to enable provision of credit to Economically Weaker Sections (EWS) and LIG households and to encourage the States to adopt policies that will create a slum free India on 'whole City approach'.

3.13.1.2 Housing and Urban Development Corporation (HUDCO)

Housing and Urban Development Corporation Limited established on April 25, 1970 is an organization fully owned by the Government of India. The government institution channelized their housing finance to HUDCO. The project finance by HUDCO provided homes to three millions families in India in year 1986. Also, most of the allocation went to the LIG. Moreover LIG had lower interest loan and longer repayment period as compared to HIG. This meant subsidies in favour of LIG. (Housing_Introduction, n.d.)

Objectives of HUDCO

- To extend long term finance for construction of residential complexes or to undertake housing and urban development programs in the country.
- To finance or undertake building of new or satellite town, either wholly or partly.
- To subscribe the debentures and bonds to be issued by the State Housing (and or

- Urban Development) Boards, Improvement Trusts, Development Authorities, etc., specifically for the purpose of financing housing and urban development programs.
- To fund or take on the setting up of industrial enterprises of building material.
- To manage the money received from the Government of India and other sources as grants or otherwise, for the purpose of financing or undertaking housing and urban development programs in the country.
- To promote, establish, assist, collaborate and provide consultancy services for the projects of designing and planning of works related to Housing and Urban
- Development programs in India and abroad.

3.13.1.3 The National Housing Bank (NHB)

On the basis of recommendations of a high level group under the national housing policy 1988, NHB as the apex level institution for housing finance was set up.

The NHB has been established to achieve the following objectives:-

To promote a sound, healthy, viable and cost effective housing finance system to cater to all segments of the population and to integrate the housing finance system with the overall financial system.

- To promote a network of dedicated housing finance institutions to adequately serve various regions and different income groups.
- To augment resources for the sector and channelize them for housing.
- To make housing credit more affordable.
- To regulate the activities of housing finance companies based on regulatory and supervisory authority derived under the Act.
- To encourage augmentation of supply of buildable land and also building materials for housing and to upgrade the housing stock in the country.
- To encourage the public agencies to emerge as facilitators and suppliers of serviced land for housing.

3.13.2 Case Study: Mumbai

Mumbai one of the highly populated city in the world facing extremely scarce in land and housing. It has population around 12.47 million with total area of 437 sq. km. It has population density 20694/Sq. Km. Prices of land in Mumbai are extremely high.

Figure 48: 3.40: Map of Mumbai

The city has a shortfall of about 1.5 million housing units, necessary for the 7 million inhabitants who do not live in adequate housing. The worst affected are the poorest segment of the population, constituting about 3 million, who have no alternative but to live in slums constructed on encroached public spaces, many of them along railway tracks, creeks and pavements. Vertical resettlement of slum dwellers occupying expensive urban land offers a promising and affordable solution to the problems of housing and infrastructure development in Mumbai. (Gill & Bhide, 2012)

In Mumbai, only about 41% of land is developed or available for housing and commercial development. The remaining 59% comprises of forests, coastal wetlands, water bodies and agricultural plantation that cannot be developed.

Mumbai the commercial and financial capital of India has most of the high rise buildings in India. More than 2500 high-rise buildings are already constructed in Mumbai Metropolitan Region. It is the city with the 12th highest number of high-rise in the world. Most of the high-rises are residential in Mumbai, some are hotel and commercial (Wikipedia). The original residential skyscrapers in Mumbai were constructed in the 1970s, when Usha Kiran and Matru Mandir were developed and stood at about 250 feet, or 25 floors each.

Figure 49: 3.41: Mumbai Skyline at Night

Mumbai is undergoing a massive construction boom, with more than thousands of high-rises under construction. Currently Mumbai is home to largest number of under construction supertalls and skyscrapers in the world.

The Brihanmumbai Municipal Corporation's (BMC) high-rise committee cleared 78 towers at 2015. There are various developers working for high-rise construction in Mumbai i.e. Tata Housing, Puranik Builders, Runwal Groups, Vakil Housing, Supertech, Mantri developers, Ahuja Construction, Kalpataru, Hiranandani Construction, Lodha construction...etc.

Low-rises are a luxury and perfect for rich countries while for the middle-class it is high-rises. They are a solution not only for Mumbai but also for India.

The areas of central Mumbai; like Lalbaug, Parel and Sewri, which until a few years ago had settlements for housing mill workers and lower-income groups have been changed by constructing apartments which cost upwards of Rs 5 crore.

According to encyclopedia, out of 81 constructed high rises in Mumbai, 70 are for residential purpose. Some famous apartments are:

S. N.	Name	Location	Floor	Year	S.N.	Name	Location	Floor	Year
1	Antilia	Altamount Road	27	2010	5	Ashok Tower	Parel	49	2009
2	Imperial Tower	Tardeo	61	2010	6	Planet Godrej	Mahalaxmi	51	2009
3	Ahuja Towers	Prabhadevi	53	2014	7	Shreepati Arcade	Nana Chowk	45	2002
4	Lodha Fiorenza	Goregaon	62	2015	8	JK House	Breach Candy	36	2012

Table 9: 3.9: List of Some Popular High-rise Apartments in Mumbai

Figure 50: 3.42: Name of Apartments of Mumbai Antilia, Imperial Tower, Shreepati Arcade, JK House from left

Almost 62 building having floor range 50 -117 are under construction and 66 buildings below 50 floors ranges from 29-49 floors. Six buildings are on hold i.e. once these were under construction and are now on hold and are planned to rise at least 150 m or 50 floors tall. In this category one is India Tower supposed to be 125 floors if completed it becomes second tallest manmade structures in the world. Almost 43 high rises are under the approved and proposed category.

The pioneer of superstructures in Mumbai is architect Hefeez Contractor. According to him" "Mumbai has nice opportunity to go vertical since its population is almost around 20 million but land area is too small i.e. only 470 sq. km. and also predicting that city's population will rise to 30 million in the coming years. Then only answer to settle such growth is to increase FSI (floor space index) for high-rise buildings. Then after city will get on its own feet and earn enough to create the infrastructure that will be needed to sustain this vertical growth.

"Encouraging vertical growth is very important to Mumbai's future. Many successful land-constrained global cities like Manhattan and Hong Kong have prospered as vertically-dense cities. The problem in Mumbai is that there are too horizontally-dense, and not vertically-dense enough. Even without many tall buildings, Mumbai is already one of the densest urban agglomerations in the world; more than 50% % of Mumbai's residents live in slums."

The model of densification through vertical resettlement of residents of informal slums in Mumbai, Which has helped free up vital land for other essential puposes, while providing essential housing for the poor at no cost to them or to the government of the city of Mumbai.

An FSI of only 1 is permissible in the island city of Mumbai and 1.33 in the suburbs, which are a small fraction of FSI used in other large cities in the world.

The developers of high rise in Mumbai feels that although Mumbai's skyline increasingly aspires to look like Shanghai or Dubai, there are issues which need to be

addressed. Such issues are related to good infrastructure. For sustaining both tall buildings and good infrastructure should be created simultaneously while there is problem in India for good infrastructure.

Shanghai and Dubai were also cities with inadequate infrastructure at some point. One idea to improve infrastructure is that the revenue that the government can get from taxing increase FSI can be used to invest in infrastructure.

3.13.3 Problems and Issues for High-Rise in Indian Countries

Most large cities in India are choking on two fundamental problems: ever increasing population and a shortage of development space. Cities like New York, Shanghai, Singapore and Hong Kong have successfully managed to expand vertically, but the situation is very different in India. Despite the demand, India does not have the high-rises it needs.

Figure 51: 3.43: Worli skyline as seen from Bandra

Lack of adequate infrastructure is one of the biggest reasons behind the slow growth of high-rise buildings in the country. Almost all Indian cities do not have the necessary infrastructure, facilities and amenities to support high-rise buildings except some part of the city like Bandra-Kurla Complex in Mumbai. (Mirza, 2012)

Most infrastructure projects are stuck in lengthy approval processed and red tape. There are over 56 clearances required for a single project, and approvals are given in bits and parts. In Mumbai, It takes on average 24-30 months delays on approvals. Since the infrastructure is not available, the government authorities keep delaying project approvals. The lack of infrastructure has a

Figure 52: 3.44: Mumbai High Rise Scenario

direct impact on city's development.

In modern metro cities like New York or Tokyo, the FSI/FAR is 20 plus. In India, it is of 2.5, which is scalable to a maximum of 4. For densely populated cities like Mumbai, lower FSI means no room for vertical expansion.

Developed countries enforce strict regulations for safety and environment, which enables them to grant higher FAR, leading to development of high-rises.

Other challenge facing by Indian countries is about enforcing strict norms with regards to structural safety, disaster, environment and fire safety as it is normal in developed countries.

Developers are handicapped by issues such as lack of necessary technology and construction expertise, availability of raw materials and high construction costs.

3.13.4 The Housing Problem of Mumbai

Almost 50% of the city's population currently lives in slums and about 40% of the 7 million slum dwellers live in Type II slums, characterized by temporary structures primarily located on pavements, railway corridors, waterways, creeks, pipelines etc. 50% of the slum-dwellers of Mumbai do not have access to toilet facilities since there is no land available for toilet construction in densely populated slum areas. More than 200,000 actually live on pavements. (Gill & Bhide, 2012)

It is estimated that Mumbai would need more than 1000 additional hectares of land if all of its slum dwellers were to be provided basic, low rise housing. The possible resettlement of slum residents through a process of "verticalization" which could be facilitated through involvement of the private sector.

The political motivation of providing free houses to all the eligible slum dwellers (about 4 million in 1991) also prompted the adoption of the model of vertical resettlement. Vertical resettlement of slum dwellers occupying expensive urban land

offers a promising and affordable solution to the problems of infrastructure development, and acute land and housing scarcity in Mumbai.

In order to resolve this twin challenge of affordable housing and need for land for infrastructure development, the government of Mumbai, in collaboration with the private sector, non-governmental organizations, international development agencies and community organizations, developed a highly innovative model of urban development that employs vertical resettlement of large number of urban slum residents as an instrument to provide affordable housing to them and to free up highly valuable urban land for alternative land use. (Gill & Bhide, 2012). Compared to a total housing deficit of 1.7 million housing units in Mumbai, 1.5 million of those being for slum dwellers, the model has helped generate 94,600 housing units including the PAP housing units and 36,000 are under construction, valued at roughly Rs. 30 billion or USD 6 billion. A total of 75 private developers have been involved in the implementation of this model.

Benefits of the vertical resettlement model seem to be significant, and it can become an important component of the strategy to address the challenges posed by urbanization in metropolitan areas around the World. Mumbai has developed this very promising model which needs to be studied more rigorously by urban researchers and better disseminated among policy and decision makers in cities around the World. (Gill & Bhide, 2012)

3.13.5 Essential Pillars That Can Reduce the Urban Housing Crunch in India

Boosting affordable housing: In a country where millions of people are homeless, the importance and relevance of affordable housing can hardly be exaggerated. Majority of reputed developers in India do not build affordable housing projects. They are mainly focused on mid to high-end and luxury projects. As mentioned, India's urban housing shortage is led by EWS and LIG sections but the upcoming supply in urban centres is beyond the reach of the people who belong to such sections. (Cushman & Walkfield, 2014)

Integrated townships are built in places where a large tract of land is readily available. These townships essentially contain retail, housing as well as commercial developments. Such townships also have hospitals and schools; so every amenity is in close proximity. Several states in India are promoting the concept to ease pressure on big cities.

Slums are unfortunately a part of Indian cityscape. Majority of the people who belong to the EWS and LIG groups work in unorganized sectors and live in slums for lack of better options. The problem can be resolved by demolishing slums, temporarily housing dwellers in another locality and creating better quality housing to replace the slums. Similarly existing old buildings can give way to vertical cluster development. Slums and old buildings are a part of central business districts and city centric locations at the moment. Unfortunately redevelopment is a much politicized subject in India; tenants often do not agree to move to temporary houses in far flung locations. However, urbanization mandates effective land-use and redevelopment is an intrinsic part of that process. It needs to be streamlined in a manner that benefits all stakeholders.

There is a strong pitch to increase **permissible Floor Space Index (FSI**) in Indian cities considering the space crunch in the city. Higher FSI brings in more supply into the market, creating more homes. But vertical growth must be planned. Without the required infrastructural upgradation, higher FSI will result in extra load on the already congested and chaotic roads. It must be noted that India lags behind in FSI norms compared to top cities of the world. Cities such as New York, Tokyo, Hong Kong and Shanghai offer FSI limits between 10 and 15.

Comparatively in Mumbai, the permissible FSI ranges between 2.5 and 4 for redevelopment projects and between 1.33 and 4 for non redevelopment projects. Interesting anecdote about Mumbai is that perhaps it is the only city where FSI limit has been downscaled; FSI limit was set as 4.5 in Mumbai when it was introduced in 1960s. (Cushman & Walkfield, 2014)

Suggestions for the Improvement of High Rise Scenario in India: There is the need of mega plan at the macro and micro level to solve the problem and issues facing by Indian cities about high-rise, keeping in mind the fact that there will be tremendous pressure on limited space and critical resources, due to the ever increasing urban population. Higher FSI should be promoted to encourage and accommodate vertical development. There is a need to ease the approval process, which often results in time as well as cost over-runs on projects. The standards of fire and safety mechanisms should be increased as they are among the most crucial elements in growing vertically. (Mirza, 2012)

As the cities grow vertically, the transport infrastructure will have to be developed to support the increase in population. Public transportation like metro and monorail could help in reducing traffic on the streets.

Building technology like 3-S system of precast construction, auto-lift fromwork, mivan…etc should be applied for better and fast construction of high-rise. These technologies not only facilitate faster development but also provide better quality and reduced cost of construction, which impact the prices and delivery timelines.

Feasibility of high-rise: Going taller also ensures more open spaces within the complex which can be utilized for landscaping and recreation purposes, thus providing better amenities to the customers. Most high-end customers are willing to invest in high-rise structures that offer 360 degree views, good lighting and ventilation. Today customers are even willing to pay a premium for higher floors, with most developers charging a floor rise in their projects. (Mirza, 2012). There is a need as well as demand for high-rise projects in the country. Now it's up to the city planners and developers to make the most of the situation.

3.13.6 Case Study: Pune City

Pune is the seventh largest city in India and second largest city in Maharashtra after Mumbai. Pune Municipal Corporation (PMC) jurisdiction extends up to an area of 243.84 sq. km. housing 2.54 million populace within 144 wards. The city has experienced a long standing urban tradition: first as an historical centre of pre colonial urbanism, then as an important military centre during British rule, after independence as a rapidly growing contemporary industrial centre, and today identified as a growing metropolis.

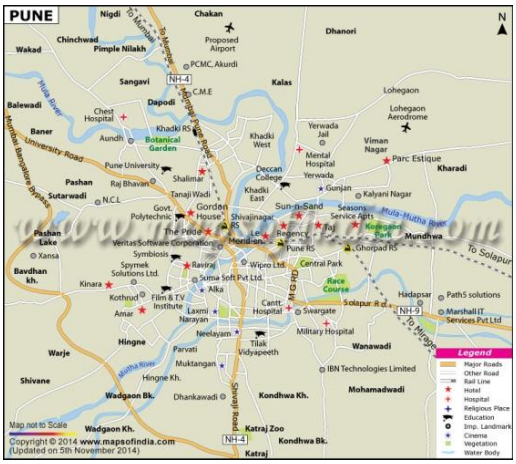


Figure 53: 3.45: Map of Pune

Additionally, Pune is popularly nicknamed as "Queen of Deccan", "Pensioners Paradise", "Cultural Capital of Maharashtra", "Cyber City" etc. owing to its location, pleasant climate, historical importance, educational hub, vibrant culture and upcoming Information technology centres. (Kavilkar & Patil, n.d.)

Figure 54: 3.46: High rise and low rise.

The annual population growth rate of Pune is 4.94 percent. It is the most preferred destination for many citizens in Maharashtra for job, education, healthcare treatment, real estate investment, better quality of life etc. as Mumbai is already crowded, complied with comparatively high cost of life. Rapid growth of the city however mainly attributed to industrialization of PMC/PCMC after 1960 and expansion of Information Technology (IT) industry in the last decade. (Kavilkar & Patil, n.d.)

High Rise Residential Buildings in Pune

There was 36 meter maximum height of buildings in Pune few years ago but currently the Pune Municipal Corporation permitted builders to construct 100 meter tall buildings based on the approval of the State Government.

To fulfill the Pune city's housing needs and demands some tall buildings of 11 floors are being developed on the city's urban fringe. The tall residential and mixed use buildings have been constructed and occupied. But high rise structures in Pune have remained as proposals. Though suburb areas like Hinjewadi developed as IT hub, have witnessed high rise structures, most of the city and its peripheral suburbs have developed tall structures for residential use and eluded high rise structures.

It is costlier to make high-rise buildings because of the design factors: the vertical members like the columns have to be much stronger and as it raises the cost and time of transportation and scaffolding. Thus the price of flats becomes higher and in case of 30 floors, the cost of flat would be about 40% more than that on the first floor. Further the maintenance becomes very costly compared to a conventional low height building (Kavilkar & Patil, n.d.).

Most high rise building fire and associated losses occur in apartment buildings out of four property account for the majority high rise fires i.e. office buildings, hotel, apartment buildings and hospitals. After the 11 September 2001 terrorist attack, more people have developed aversion to staying in high rise buildings. Many buyers are unwilling to stay in high rise structures due to high cost of residential units and as they are unsure about the effectiveness of fire-fighting measures. Some are also afraid about evacuation in case of earthquake.

Drawbacks Findings of High-rises in Pune: It is costlier to make high-rise buildings because of the design factors: the vertical members like the columns have to be much stronger and as it raises the cost and time of transportation and scaffolding. Thus the price of flats becomes higher and in case of 30 floors, the cost of flat would be about 40% more than that on the first floor. Further the maintenance becomes very costly compared to a conventional low height building.

Many buyers are unwilling to stay in high rise structures due to high cost of residential units and as they are unsure about the effectiveness of fire-fighting measures. Some are also afraid about evacuation in case of earthquake.

Inferences from Pune: Most of the high-rise projects remain as proposals. High rise residential structures are not popular due to user perception that they are expensive and the associated fear of safety during fire in Pune city. The study concludes that fly ash is available abundantly, but not used to it full extent in the construction industry. Fly ash concrete is one of the strong building materials generally used in high rise buildings. It can be more economical to use fly ash in high rise structure. The fly ash concrete can be used to reduce the cost of construction and has the potential to minimize the damage caused due to high temperature. (Kavilkar & Patil, n.d.)

3.13.7 Case Study: Hyedarabad

In Hyderabad, housing in modern ages in the 21st century is more modernized and developed than it has been in the past. The housing sector in Hyderabad has relatively sophisticated infrastructure and is suitable for gated communities and villas, as well as higher-standard flats and condominiums. Hyderabad is home to several skyscrapers, including The Botanika, Lodha Belezza, etc. Many residential infrastructure companies are well-established in Hyderabad (Wikipedia).

Indraganti M.; 2009; tries to illustrate about the practical study of occupancy behaviour of Apartments. Over the Five apartment buildings, of Hyderabad city were chosen for the test of thermal comfort of buildings on the occupant's responses. A field survey was conducted in May, June and July in the year 2008. The use of environmental controls like windows, doors and curtains and comfort responses of about 113 occupants of 45 flats in five apartment buildings were studied. Both psycho-physical and attitudinal impediments and hindrances in the use of adaptive controls have been investigated into. A total of 3962 datasets were collected in longitudinal and transverse surveys conducted in summer and monsoon seasons, for a total of 33 days. Indoor and outdoor environmental data were obtained. Outdoor temperatures in May were very high coupled with low humidity. In June and July moderate temperature and high outdoor humidifies, marked with occasional summer showers were recorded. Indoor environments in all the apartments followed the outdoor conditions closely, with minor differences in individual buildings. The occupants adapted through clothing, metabolism and the use of various controls like windows, balcony and external doors and curtains (Indraganti, 2009).

The following are measurable facts:-

About 60% of the occupants were uncomfortable in summer due to the poor adaptive opportunities available. But increased to 93% in the monsoon period so the adaptive opportunities were adequate in monsoon season.

The occupants have well adapted through clothing and metabolic activity, as the temperature increased in summer. Personal clothing adjustments in women were

limited by socially and culturally acceptable minimum clothing practices, more so in middle aged women.

It was observed that, adaptive opening of balcony doors was higher than windows, as balcony doors offered better sun protection, glare control and privacy.

Curtains were found to be adaptively used as the temperature and discomfort increased. Their adaptive use depended on daylight penetration, orientation and shade factor of the window. In addition, it was also affected by the requirements of privacy, attitudes and other such non-thermal aspects.

Restricted mobility due to age, attitudinal indifference and sluggishness in various groups of subjects was found to hamper the adaptive behaviour and the use of controls, especially, when other easier controls like fans, coolers and A/c s were available to the subjects. However, the air coolers and A/c s were beginning to be in use when the mean outdoor temperature was above 28.5 degree Celsius and 31.3 degree Celsius respectively.

Additional fitments such as (a) additional metallic grill shutters to external doors, (b) planter boxes to windows, (c) grilled enclosures to balconies, (d) mosquito screens etc., were found to improve safety, security and privacy of the interior space, which in turn improved the adaptive usage of the controls, especially in summer.

To increase the occupancy level of buildings in terms of thermal comfort there must be the provision of better adaptive use of environmental controls. To achieve this design should be such as the aspect of 'open-ability and operability' of a window/opening shall be given the top priority in the design process. The provision of appropriate additional fitments/features to improve the adaptive use of controls be made mandatory, as it would improve the occupant's adaptive behaviour, to yield significant energy savings, the codes be modified to make certain mandatory provisions for effective solar heat control through the roofs of top floor apartments to contain direct solar gain; (for e.g. capacitative roof insulation with high time lag, double roofs, etc). (Indraganti, 2009)

Lessons learnt from Hyderabad: How the apartment buildings are influenced by occupants through the better provision of thermal comfort to increase the occupancy level. This is on type of issue in apartments.

3.14. Findings/Inferences from International Case Studies

It is marvellous opportunity to take world scenario experience & perspective of high rise living for achieving feasibility in all aspects i.e. holistic approach about our context.

Vertical Living Scenario is well flourished and established in Singapore. More than 80% of Singaporeans live in HDB flat i.e. Public Housing. Good governance and transparency about rule and regulations are seen in housing sector. Various influencing programmes, policies and incentives schemes are found successful in case of Singapore high-rise scenario. For example; affordable housing for low income groups.

Access & escape by vertical transportation is a very real concern in Singapore vertical living. Scenic view and windy environment are major attraction of High-rise. Main noise-component is traffic flow during evening peak hours. Each and every unit consists of **household shelter** that operates as a disaster shelter. Due to efficient and speedier elevator systems, time needed to go up is not major concern.

10 principles followed to success Singapore high-rise scenario like Plan for long-term growth and renewal, affordable mixed-use neighbourhoods…etc. considering the concept "*planning for more with less*" are highly remarkable and useful to boost the flourish of apartment housing scenario.

Similarly, Hong Kong is also understood well flourished vertical scenario city as ranked dense city with scarcity of land. More than 60% of Hong Kong residents live in apartments, many of them in condominiums. These all are affordable housing.

For such a compact city there are certain principles and factors helping to proved better scenario. Here in the case of Hong Kong, the three 3C contributing factors for a high-density and high-rise city are Changes (population), Compact (living), and Connectivity and dependent prerequisite for success to high-rise and high-density living in Hong Kong are Comfort, Convenience and Connectivity. Failure to meet any of the three would topple the acceptance for high-rise and high-density living.

Findings about satisfaction about high-rise scenario of different country, it was found that 90% of the Glasgow residents of tall buildings have high satisfaction; similarly more than 75% of Singapore high rise residents are satisfied. In Singapore, the percentage of residents willing to live on the 10th floor and above had gradually increased from 27.9% in 1973 to 35.7% in 1977 and to 47.3% in 1981.

Above 85% residents are satisfied with high-rise scenario in Israel. Similarly, more than 90% residents are satisfied with high-rise in Ghana. Scenic view is the major attraction and satisfaction from high-rise living. More than 84% of the high rise residents are agreed that view is a main advantage or benefit of living in a high rise building in Hong Kong. Other advantages of living in high-rise are enjoyment of quietness i.e. 47% and fresh air i.e. 44%.

Inferences from Indian Scenario

- Indian cities do not have necessary infrastructure, facilities & amenities to support high-rise buildings except some part of city like Bandra-Kurla Complex in Mumbai.
- Medium rise buildings are suitable scenario of city planning in Indian cities.
- Demerits founded in Indian high-rises are higher cost of construction and maintenance, problems for children and old people to climb up, lesser private open spaces i.e. private gardens not possible, public housing crime, obstruction to air traffic (communication), aesthetic considerations and fire hazards etc.

3.15 Housing Scenario in Nepal

Shelter is one of the basic needs for human beings not only for protection against unwanted environmental event with including hostile weather, but also for maintaining standard of living acceptable to family or even to elevate one's position in the society through enhanced living status.

The development of housing in Nepal is considered from ancient Lichhavi period. There was famous Kailashkut Bhavan in this period. Then after Malla settlements in Kathmandu Valley is famous.

This modern integrated and systematized housing approach is growing as people are inspired by western culture having high aspiration for modern lavish style of housing.

3.15.1 Group Housing Development in Nepal

With the democratic revolution of 1990 A.D, Nepal got the exposure to the International arena through the media. So Nepalese got an opportunity to observe the living style of other countries. Thus, the demand for such well planned housing with all the necessary infrastructures became the needs of the society. Though, primarily this was the Government's responsibility, the private sectors marched ahead to address this housing need. Organized real estate came into picture when three or four private housings started its venture in the year 2001. (Bhandari, n.d.)

Figure 55: 3.47: Group High-rise Housing

People have migrated from village to cities seeking opportunity, security and improved physical facilities as suffering from decade long civil insurgency. Every one's desire to have their own house. After enactment of Joint Housing Act in 1997, there is a rise in developers and real estate entrepreneurs in Nepal. (Koirala, n.d.)

Figure 56: 3.48: High rise apartment

Legal framework for development, sale and management has been established. This act has been instrumental in initiating a formal housing market in Nepal where developers, design consultants, contractors and bankers have their own role to play. The bankers have found a new avenue for investment (both for builders and prospective buyers). The contractors have found housing market as the source of profitable projects. Similarly designers have found housing as a reliable job and an opportunity to express their creativity and innovation. Housing developers have emerged as the champion in the market because of their skill in bringing together all the above-mentioned parties in achieving their goal. Housing developers have been successful in creating a new kind of business entrepreneurship in the country that can guide planed urban development by the private sector.

Shrestha (2010) in his article also remarks and illustrates about organized housing supply process in Kathmandu valley; that in the mid-1990s, the government began to encourage private- sector investment in land and housing development. In the period 2003-2005, KVTDC sanctioned 15 housing companies for the development of housing units (independent, duplex and apartment types) in the valley. Under this period, 14 private housing programs produced about 965 dwelling units on 254.3 ropani of land. Almost; 150 real estate companies have since registered with the Nepal Land and Housing Development Association (NLHDA). Out of them; about 40 to 50 of those companies are registered as Housing Developers especially involving in various types of developments of housing related to its design, facilities and prices. (Shrestha, 2010).

Dr. Pokharel, 2006, also clearly analyzes the private housing development in Kathmandu in terms of quality of dwelling units, basic services and facilities, tenure ship, financing mechanism and maintenance of the housing colonies.

For group housing, private sector has to take permission from different public institutions; the Ministry of Population and Environment for environmental impact assessment; similarly the KVTDC for planning permits and the municipality for building permits. There is high chance of occurrence of delaying in process to finalize for construction in such the system of bureaucracy involvement for the housing development. That's why there is the creation of uncertainty in the real estate and high cost of housing units.

3.15.2 Housing Demand and Supply

Housing is one of the key indicators of urban growth and economy of a particular city. The article 25 of the Universal Declaration of Human Rights begins with 'everyone has the right to a standard of living adequate for the health and wellbeing of himself and his family, including food, clothing, housing and medical care and necessary social services' (UN, 1948). Housing is understood as a place of human habitation, which has physical, social and cultural infrastructure.

"Population and economic growth does not take place in thin air; it requires land and lots of it." - *David Dowell*

In case of Nepal, investment in housing is dominated by owner-built system which is more of an informal type of housing development. In this system an owner is responsible for purchasing land, providing infrastructure and building the house. The role of public agencies in this system is issuing the building permit, providing basic urban services. With the rising price of land and building materials, it has become very difficult for households to buy land and build the house. One of the prominent features of owner built system of housing is the coherent built environment in residential neighbourhood and major weakness is the lack of various types of community facilities. Land is fragmented in small parcels which are serviced by narrow and winding roads. Plotted development in most of the cities of Nepal has been responsible for inefficient land development and rising price of land.

With the availability of housing finance from banks and financial institutions, housing development in Nepal has been transforming from owner-built system to organized housing development. Housing in major cities of Nepal is now being considered as a commodity rather than a social asset. Dwelling units can now be bought, sold and rented out as per the housing demand. Investors are finding housing as an attractive area for investment because of its expanding market and lucrative return.

Business Plan -2014 illustrates on the issues demand and supply of housing by clarifying the Status of availability and demand for housing. The total population of Nepal has reached 2, 64, 94,504 (census 2011).Out of them, urban population is 45,

23, 820, 17.1 % and rural population is 2, 19, 70,684, 82.9%. On the comparison from last census of 2001(having total population 2, 31, 51,423; urban 3227879, 13.9% and rural 19923544, 86.1%), it is increased by 34 lakhs i.e. in percentage increased by 15% within ten years period. The number of household which was 42,53,220 in 2001 increased by 22% and has reached to 54,27,302 which means an addition of 11,74,082 household within ten years. Out of the total 54, 27,302(Urban 10, 47,297 and rural 43, 80,005) households, 4005 are the institutional households (Barrack, hostel, Gumba etc.) and the rest are the domestic households. The average household size is 4.88 members in total, urban4.32, rural 5.02 (DUDBC, 2014).

The population growth rate of Nepal is 1.35 per annum. Total number of households in the country is 5,427,302 with 5,423,297 individual households and 4,005 institutional households (Barracks, Hostels, and Monasteries etc.) (NPHC, 2012)

In Nepal, 22 percent of people think that their housing facility is inadequate and 77 percent say that the facility is just adequate. The proportion of households reporting the housing facility as "less than adequate" is the highest in the mountains (42 percent) and the lowest in the Terai (17 percent) (NLSS, 2011).

Total Population of Kathmandu Valley is 2510788 (Census 2011) and annual population growth rate in the Valley is 4.63 %.

The demand for housing going up because of urbanization. Kathmandu valley is growing annually at the rate of 6,500 new houses, there are more than 30 housing companies but they don't create more than 2,000 houses a year (Koirala, n.d.)

3.15.2.1 The Projection of Housing Needs in Nepal

On the estimation about the urban population of Nepal in the census year 2021, it will increase from 45 lakhs to 91 lakhs and similarly rural population from 220 lakhs to 249 lakhs. Similar manner for the projection of housing needs, the urban and rural household size has been taken as 4.25 and 5 members respectively based on the need of one housing unit per one family though the existing household size is 4.32 and 5.02 members respectively. According to this, by the end of 2023 AD, the number of household (need of the housing unit) in urban and rural area would be about 2409578 and 5041243 respectively. During the next 10 year; out of the total housing needs of 13.62 lakhs units in the urban areas, 4.08 lakhs units or 30% of the demand is

expected to be fulfilled by the addition of extra rooms or floors in the existing houses while remaining 70% or 9.54 lakhs housing units will be fulfilled by the construction of the new housing units. (DUDBC, 2014).

Description	No. of units
Apartment housing (3000 units per year)	60000
Group Housing(Colony, 1500 units per year)	30000

Table 10: 3.10: Quantity of housing unit requirement for middle and high income group, (DUDBC, 2014).

3.15.3 Types of Housing Supply in Nepal

There are basically two types of sectors involve in private sector housing supply: a) Formal Private Sector and b) Informal Private Sector. Formal and Informal Processes of Housing by these sectors are proceeded as:

Formal process: Land ⟶ Infrastructure ⟶ Building ⟶ People

Informal process: Land ⟶ People ⟶ Building ⟶ Infrastructure

Formal Private Sector: Formal private sector means there may be the involvement of the public sector, the organized private sector or the individual land owner. It is seemed that the contribution of individual owner for the housing supply in Kathmandu valley is very high. On this process; an owner acquired the plot of land, organize and manage for the construction of house. Due to the growth occurrence in family and income both; the house is expanded incrementally over a period of time. Rental housing is another type which serves about 58% of total urban population of Kathmandu valley which generates the income for owner.

The increasing demand for the cheaper housing is always a highly lucrative investment. It is realized by the private sector in the huge demand - supply gap in the housing sector. This is the cause that the major financial investment for housing started to flourish since late 1990s. After few years the distortion in holistic economic scenario occurred due to the lack of proper financial regulation. As a result, NRB sanctioned the Bank Loan Ceiling in 2008. Since then, it has been deeply and drastically lessened to Private Sector involvement particularly in Housing.

Informal Private Sector: The involvement of Informal sector in housing supply is also happening in the context of Nepal. Basically it has two categories: i) Land Broker and ii) Informal Real Estate.

In context of Nepal, Land brokers and land buyers are responsible and getting chance to opening up of the new land for housing up to now. Housing supply is partially fulfilled by informal private sector through land brokers. There are happening improper and inefficient way of the supply of land parcels by brokers due to the lack of proper knowledge of planning. This occurs also due to the lacking in the provision of adequate financial back up.

3.15.4 Land for Housing in Nepal

Government had launched the three main planning techniques under the **Land development Programme** i.e. site and services, Guided Land Development and Land Pooling. Compared to others, land pooling programme is becoming more popular at present and they are implementing effectively in the country.

Land Pooling: The Land Pooling became more successful programme in context of Kathmandu Valley. This Land Readjustment Technique are playing major contribution role for the development of infrastructure, improved quality of life, better environment, created social harmony, comfortable housing plots in Nepal, especially in Kathmandu Valley on the expenses of land owners. The program has been becoming a planning tool for the sustainable urban development of the country. Due to self-financing character of Land Pooling technique, governments are free from financial burden.

Eleven land pooling programs have already been completed in the Kathmandu valley which developed 7320 residential plots within the total project area of 246.76 ha during the 2009 AD. Likewise 15 projects with total area 1490 ha are under planning or implementation phase within the Kathmandu Valley (Singh & Gorkhaly, n.d.).

DUDBC; announced that currently 1100 developed plots have been produced from the completed land pooling projects in the Kathmandu Valley which are implemented

in 4500 ropanis of land. This business plan speaks on the ongoing land pooling projects under implementation in 8000 ropanis of land will produce about 15000 developed plots. Similarly, the Kirtipur second phase project and Nakkhudole land pooling project planned for implementation in 1200 ropanis of land in near future is expected to produce about 3000 developed plots. (DUDBC, 2014)

In reality, only high medium income groups and upper income groups seems to have the capacity of affordability to purchase these developed plots although it is announced that the developed plots are targeted for the medium and high income groups.

There is the lackness of legal structure and Land Pooling carries some demerits like low confidence in procedure, taking long time to complete, land brokers' vested interest and some few examples of incomplete projects; that's why the private sector investment is not attracted yet in land pooling programs. And, the housing demand cannot be fulfilled by this approach only; although it gained its prestige value, enforced to construct organized housing i.e. apartment and colony through the involvement of Private sector Developers for the group housing.

3.15.5 Housing Finance in Nepal

Till early 1990's families in Kathmandu valley had to rely on personal savings and borrowings from relatives for building their houses. Commercial bank did not have any portfolio for individual house loans the interest rate in case of informal borrowing use to be high, about 36% per annum. Self financing through different means including family savings use to be the common mode of financing housing (Joshi, 2013). With the operation of Nepal housing development finance co. (NHDFC) in 1992, may bank and finance companies started giving loan for the construction of houses. Formal lending against collateral in the form of land of other property is legally sanctioned.

Employee Provident Fund (Karmachari Sanchaya Kosh (KSK)) started providing housing loan in 1971/72 A.D.

Nepal Housing Development Finance Company (NHDFC), was established under Finance Company Act (1985) in 1990; is the first finance company completely focusing on the housing sector set up in Nepal with the main objectives of improving

the existing housing delivery system and launching new housing schemes through housing loan facilities and other related service in order to meet the growing demand for housing in Nepal. In Nepal, mortgage financing for housing (collateral) is considered as the most adopted financial framework.

Prime Bank			Rs in '000
Real Estate Loan	This quarter ending on 32.03,2071	Previous Quarter ending on 30.12.2070	Corresponding Previous Year Quarter ending on 31.03.2070
Business complex and Residential Apartment construction Loan	1126783.09	1045073.95	983702.78

Table 11: 3.11: Investment of Bank in Apartment, Source: (Prime_Bank, 2014).

Nepal Bank Limited			Rs in '000
Real Estate Loan	This quarter ending on 32.03,2071	Previous Quarter ending on 30.12.2070	Corresponding Previous Year Quarter ending on 31.03.2070
Business complex and Residential Apartment construction Loan	291656	291556	428770

Table 12: 3.12: Nepal Bank Investment in Apartment, Source: (Nepal_Bank_Ltd., 2014).

Figure: Source of financing for purchase of land or housing construction.

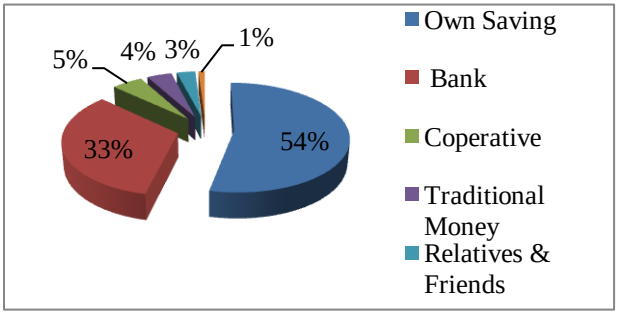


Figure 57: 3.49: Sources of financing for housing

Source: (UNHABITAT, 2010)

3.15.6 Housing Policy, Bye Laws and Act in Nepal

To solve the problems of accommodation, Ministry of Law and Justice, HMG, published Joint Apartment Ownership Act 2054, so that it could lead in the development of planned settlement and show the rights of apartment owners.

"New policy covering to all issues and vision should be clear without delayed, if government wants to develop the housing and real estate sector in the country. One door system for approval is urgently initiated by the government" (Koirala, 2015).

3.15.6.1 Samyukta Awasko Swamitwa Sambandhi Ain 2054 (Apartment Act 2054)

The Apartment Act implemented in 2054 BS. It has legal right and justice for implementation of Apartment. For the development of housing in organized way, the private sector must follow the rule and regulations of this act. The act has made mandatory provision to form users committee for the smooth operation and maintenance of the apartment and the complex.

This act was brought to overcome the housing problems since there was high population growth in urban areas which causes the dramatic price growth of land.

Main features of this Act which emphasizes the special provisions relating to apartment building are given as follows:

- Construction work cannot be started without approval.
- Construction company have to submit permission application along with proposed design, structural design, land area and ownership certificate, Apartment unit shelling process, etc in standard format.
- Flat owner would receive ownership certificate after complete payment.
- Flat owner can sell or rent owned flat.
- Without completing all installment payment the flat owner cannot sell flat to another person.
- Clause 16 Deal with community space and facilities. The flat owner is not allowed to do any kind of activities which affects bad to the other flat owners.
- Clause 17 States that open spaces and public areas are not to be divided among the Flat owners.
- Clause 18 All the maintenan*ce* and service charge are to be paid by the flat owners.
- Clause 19 States that the maintenance and services charges collected thus is to be submitted to the respective community.
- Clause 20 states that the owner denying submitting these amounts is to be discarded from such type of facilities.
- Samyukta Awas has to have the insurance of its own and is to be administratively functioning with the respective community.

- If the apartment is destroyed by any kind of natural disasters then the ownership of the land is subdivided into the respective flat owners. If part of the apartment is destroyed by these factors than the respective community is to bear all the expenses for the maintenance within some fixed time period.
- Dhapa 25 indicates that the house owners are to pay all the expenses for security, maintenance, cleaning of the apartments as specified during the contract signing period.
- Clause 28 indicates the terms for punishment. If one builds an apartment without taking permission with the Governmental acting bodies then he is charged with NRS.1, 00,000.00 and whole of the structure is demolished.

3.15.6.2 National Shelter Policy 1996

This is a two phase policy: first phase till 2000 A.D. and second phase till 2006 A.D. The objectives of this policy are to facilitate the housing production, ensure self reliance, clarify the roles various sectors and reduce the adverse effects on surrounding environment.

The policy states:

- Increase the production of dwelling units and supply of serviced plots.
- Improvement in the use of building materials and construction technology.
- Provide basic infrastructures, facilities and services.
- Mobilization of land and housing credit delivery mechanism in the format and community sectors on an experimental basis.
- Ensure cost recovery of public investment in land, physical infrastructure and other services.
- Increase financial self-sufficiency in the shelter sector.
- Clarity in the roles of public and private sector for implementing the shelter policy.
- Make necessary institutional arrangement for planning, policy implementation, training, research and evaluation in sectors related to the production of dwelling units.

- Introduction of appropriate and effective laws and regulations and amend the existing ones as per the need.
- Creation of database to ensure simpler and more effective decision making and monitoring process of shelter development.

3.15.6.3 National Shelter Policy (NSP), 2068

The main objectives are;

a) To increase housing production, suitable to all income groups, safe and environment-friendly and upgrade the quality of existing housing.

Strategies to achieve the objective are

i. To address the demand of housing in the urban and urbanizing areas by increasing the production of housing so as to effectively utilize the land.

Working policies to support it are

- To carry out land development programs in collaboration with private sector to increase the supply of housing plots
- To control the expansion of unhealthy settlements, where infrastructure services are lacking or available at minimum, and which are constructed in disorganized manner for residential purposes in a risky place from the perspectives of sanitation and security, making provisions of providing rental housing with the involvement of government bodies.
- To provide small land plots for cost effective housing and make arrangements for essential physical services for the low income families, who are settled by encroaching the unregistered, barren land (Ailani, parti), river banks and other different places in the urban areas.

b) To effectively mobilize financial resources required for the development of housing.

Strategies to achieve the objectives are

i) To facilitate the procedure for the distribution of land and housing credits by establishing a housing credits by establishing a housing development fund at national level and the bodies similar to the concept of rural development bank at the local level.

Working policies to support it are

- To prepare and implement the policy for investment in housing by the financial institutions which are active in the field of urban development, including the Town development fund, after conducting a study on the possibility of simplified credits, grants and finances.

ii) To provide a grant by the government, a fixed portion of the cost incurred in the construction of infrastructures under the land development programmes.

Working policies to support it are

- To invest, by the GoN and the local bodies a fixed amount of the total cost estimation of the projects, on the basis of national priority, size and cost of the project and the institutional capacity implementing the project, on the condition that such investment spent only for performing the task of constructing physical infrastructure in the land pooling projects.

iii) To develop the mechanism of simplified loan grant for the low income class.

Working policies to support it are

- To make available small plots of land for housing, basic physical services and facilities, together with grants and subsidized credits in order to construct low cost housing for the low income and homeless classes.

- To manage and monitor acts of establishing cooperative housing organizations by DUDBC by providing them land at the cost price and subsidize loan to the extent possible to construct joint housing for the marginal income class
- To have collaboration with international and national financial institutions and with the saving and credit cooperatives involved in housing sector.

Working policies to support it are

- To establish housing cooperatives associations, as well as to provide credit provisions against collective – security to make credits available for the provisions of land, construction materials for buildings, and housing to maximum number of families who do not have a fixed income source.

c) To carry out institutional reforms by clarifying the roles of governmental and non- governmental organizations, private sector and communities.

Strategies /working policies to achieve the objectives are

- To play the role of motivator facilitator, as well as the provider, as required, by the GoN in the implementation of NSP.
- To strengthen the role of local bodies in the tasks of land and housing development by providing financial and technical assistance to them by GoN.
- To establish, develop and expand the community organizations at local level in order to resolve the problem of housing in an institutional manner by maintaining coordination among the housing and land development companies and other concerned bodies.

3.15.6.4 National Urban Policy, 2064

The main objectives are:

a) To achieve healthy, secure and economically vibrant urban environment in order to bring about improvement in living standards of the urban resident.

Strategies to achieve the objective are

- To identify and utilize the various financial resources for urban infrastructure development

Working policies to support it are

- Prepare and apply the norms and standards related to physical infrastructure services.
- Diversify the financial resources that could be available for infrastructure development, and make arrangements for legal and policy framework so as to provide incentives to the banking and private sector to invest in this sector partnerships.
- Encourage TDF to participate in land development programs also through mobilization and allocation of its financial resources, and increase the access of the local bodies and other infrastructure development agencies to the financial resources of the TDF.

i) To develop a system for supply of affordable land and dwelling units accessible to the different income groups including those who are economically deprived, by providing easy access to loan through the government channel or through other mediums.

Working policies to support it are

- Arrange for necessary legal arrangements that help towards provision of a specified number of house plots and dwelling units for low-income people while carrying out land development programs.
- Establish a land development fund in DUDBC to assist the local bodies for executing land development programs.

- Adopt and implement innovative approaches in the form of land banking and land exchanges to guide the form and trend of urban development, and foe timely supply of land.
- Keep an inventory of empty land so that land could be made available for town expansion in future.
- Regularize land and house rental market through proper legislation, and encourage private investment in this sector.

b) Action Policy about Management of Housing for Urban poor

This action policy comprises following key features:

i) Identification of urban poor and low income groups

It is done through advertisement on public notice and through selection of applicants as per the criteria thus developed.

ii) Selection and management of land for onsite up gradation, resettlement or rental housing schemes for providing housing for urban poor

The implementation of the programme can be done on the land which is either; acquired for onsite up gradation, land bought by GoN, land of Town Development Committee (TDC) or granted by others. The housing thus developed should have proper provision of infrastructure services, built as per norms and standards. The user rights are given to the beneficiaries by making agreement about periodic renewal in 10 years, but the land ownership will be in the name of GoN. The user rights are handed over to the users only after the clearance of the debt.

iii) Management and mobilization of financial sources

The financial resource is managed from land development revolving fund, until next alternative is developed. It is either through the budget of GoN, or through national or international grant/loan given for housing, or through any sources. DUDBC provides prescribed loan in minimum interest on installment basis. For this, the community has to open up bank account. The beneficiaries have to repay the loan within 15 years period. Besides, the community has to open the community cooperative fund and has to save, monthly, the minimum of 10% of installments of the project cost 50% thus saved amount is utilized in repaying the debt.

3.15.6.5 Urban Financing Policy

The overall urban financing policy is still largely dependent upon budgetary grant from the central government. However with the enactment of LSGA, power has been delegated to the local governments to raise taxes and reduce the amount of grant from the central government. In order to make the local bodies self-reliant, arrangements have been made to empower the local bodies to raise land revenue, local development fee, registration fee, entertainment fee and house tax. (Upreti, 2006)

3.15.7.6 Kathmandu Valley Development Authority Act 2045

i) Purpose

- To control unmanaged Urbanization in Kathmandu Valley and helps manage urbanization
- Focused on the population growth and urbanization in different city of the Kathmandu valley and re construction and expansion of physical infrastructures, services and economic growth

ii) Main legal provision and aims of this Act

- Clause 3 Establishment of Authority for controlling haphazard urban growth, supervising and building managed city.
- Clause 5 Preparation and permission for Physical Development Plan e.g. to develop Kathmandu as a administration Centre and Tourism, Cultural and Economic centre.
- Clause 7 without permission of related authority, physical change and land division.
- Clause 8 not to the construction of building in tourist area, cultural area and dense settlement area, related Authority can protest.
- Clause 10 by managing land development program authority can shell land plots in reasonable price.
- Fine 1-50 thousand for the prohibited works.

3.15.6.7 Building Act 2054

- To protect the buildings from natural hazards like earth quake, fire and to regulate the construction work.

- Main characteristic of the Act:
  1. Classification of Building in four categories.
     - International state of Art.
     - Professionally Engineered Buildings.
     - Mandatory rules of thumbs.
     - Guide lines for rural/earthen buildings.
  2. Clause 11 approval of design/drawing, Clause 12 Design and Drawing according to Building Bye-Laws.
  3. Punishment if Bye Laws not followed like.
     - Stop further construction work.
     - Break off water supply, electricity, telecommunication line.
     - Fine 50-75 thousands.

3.15.6.8 Contract Act, 2056

This act helps in dealing with the contract formed in between any two companies. This act helps to establish smooth and reliable contract in between any two persons or even companies.

3.15.7 Efforts on Housing by the Private Sector

Housing can be understood one of the most essential needs of human life. There should be the availability of good housing for better life style and to sustain healthy environment. "The provision of good housing in any town planning scheme is desirable and it is to be accomplished by various means and measures (Rangwala, 2011)." It is known that the government alone cannot fulfill the total demand of the customers for housing due to their own problems and limitations. So, to meet the demand, private sectors emerge on housing as a business. The private sector in one hand has assisted the government for housing and on the other hand; they have established it as a profession. More than ten such companies with required manpower are engaged on this sector.

3.15.8 Occupancy Status in Nepal

Housing occupants are broadly categorized into owner, renter, and others. In Nepal, 89.2 % of the households reside in their own housing units, 9.2% are renters (pay

rent) and 1.7% live on others category may in rent, free housing units or others institutional buildings. One of the surprising factors is that percentage of renters in urban areas is highly increased as it is 61.5%. Kathmandu valley alone has these rented households more than 51%.

In the table given below shows, the owner with own house in Kathmandu valley less than 50 percent, where as the people who live in rented house are more than 50 percent.

Description	Owned	Rented	Others	Total
Nepal	89.2	9.2	1.7	100.0
Urban	61.5	61.5	35.7	100.0
Kathmandu valley	46.6	51.6	1.8	100.0

Table 13: 3.13: Distribution of households by occupancy status, Source: (Koirala, n.d.).

But according to latest data of NPHC, altogether, 85.26 percent of the households reside in their own house whereas 12.81 percent in rented, 0.63 percent in institutional and 1.30 percent in other arrangements. In urban areas, 40.22 percent live in rented house. Kathmandu district has the highest percentage (58.65) of households living in rented house (NPHC, 2012).

The average income of Nepalese household per month is NRs 16864.5 and the nominal household consumption is NRs. 14228 (NLSS 2010/2011).

3.15.9 Evolution of High Rise Apartment in Nepal

First legal constructed high-rise is Kathmandu Residency developed by Ansal Chaudhary Company at Bagdol, Lalitpur.

Private housing development in the country started with Tashi Rijal industries in eighties era. Due to lack of legal permission; they could not sell apartments. Hence, it had to be given on rent for a long time.

Figure 58: 3.50: Apartment Building

Ansal Chaudhary Company was the first of its kind in rendering the services with the sale of apartments legally. Then after, as many as 30 private companies have come forward in

supplying the houses; but only 15 companies have got the necessary sanction from the Kathmandu Valley Town Development Committee (KVTDC). Even in Pokhara private companies have come forward in supplying the ready-made houses (Pokharel, 2006).

Every year there are numbers of housing growing in Kathmandu valley. The housing situation is made all the more complicated by high cost of land, scarcity in the supply of land for individual housing and the very low level of affordability by the majority of the city residents. In this situation, high rise residential buildings are seen as solutions or as compromises between high cost of land and construction cost of housing (Shrestha, 2012).

The construction of private sector housing developments were did using reinforced concrete frame structures including parking facilities; electricity and telephone lines provision through NEA (Nepal Electricity Authority) and the Nepal Telecommunication Corporation. Water was pumped from groundwater sources. Within the housing complexes, there were availability of swimming pools, gymnasiums, saunas and whirlpool rooms which depend on the quality of the development and the target groups. User committees were formed to manage solid waste disposal and maintenance of the buildings.

With the increase in the flow of remittance in the country, land transaction has been increasing. In the beginning, Civil Homes, Comfort Housing and Sunrise Housing Company started constructing individual houses to meet the demand of the rich. Civil Homes had constructed separate houses in Bhaisepati in the first phase in 2003. Due to stagnation in other economic activities, real estate is looked as a good area for investment especially by middle class families and Nepalese living abroad. People want to get a good return on their investments; and real estate is the best bet. As a result, until the recent recession in 2009, it prospered and created opportunities for investments and jobs for many people. Housing companies also introduced the concept of high-rise buildings in the country. This can be an efficient solution as many people are housed in a single building.

Most developers have constructed houses after taking payments in advance from the buyers. Under the concept, Sunrise Company had constructed a high rise with 28 flats in Dhobighat in 2007, about Rs. 85 billion was reported to have been invested in the real estate sector across the country.

In 2007, at least 16 apartment buildings and four housing projects were registered for approval in Kathmandu alone. Housing and real estate was became profitable business from 2001 to 2006 period and did good profit. In the past more investors develop the housing and real estate haphazardly not even maintaining the level of standardization and quality. As the rural area was threat of killing for those who are not support to insurgencies. Therefore developers could manage to build and provide the housing and real estate even they were feeling lot of risks as mentioned above.

Offers	Location	Product type	Units	Unit cost (in million rupees)
Kathmandu Residency	Bagdole	Apartments	123	1.8-2.5
Mount View Residency-I	Harisiddhi	Apartments/Duplexes	70	1.3-1.7
Mount View Residency-II	Hattiban	Apartments	140	3.0-4.0
The Comfort Housing	Sitapaila	Standalone houses	60	1.6-3.7
Sunrise Homes	Balkumari	Apartments/ Duplexes	102	2.0-2.8
Civil Homes	Bhainsepati	Standalone houses	59	0.7-1.1
Subha Avas	Naya Naikap	Duplexes	75	0.7-1.5
Oriental Colony	Kuleshwor	Apartments	500+	1.2-2.8
Shangrila Villa	Gangabu	Apartments/Duplexes	36	3.8-5.2
Grace Apartments	Naxal	Apartments	56	1.8-2.5

Table 14: 3.14: Some Housing and apartment developers and price, Source: (Koirala, n.d.)

There has been fast growth in colony and apartment housing since last decade with the implementation of Apartment Act and Regulation. DUDBC is the main governmental institution and legal organization to monitor about the implementation of these housing in planned way. The role of the private sector in the housing

production has presented remarkable image in Nepal. There became a few decade on the production of housing by private sector. Before it; the scenario shows that the production of housing lies in the individual itself. Almost 90% of the total residential houses are being built on individual basis without the involvement of the technician shows risk from disaster. Hence to mitigate such risk and facilitated all types social-physical infrastructure, well planned organized housing concept is being flourished by private sector. (DUDBC, 2014)

Specially targeting the middle high income group; the various private sector housing companies are involving in apartment and group housing production on the application of different indicators of standard. Some are focused on high classed families while some are focused on the medium classed families. Such companies are always interested to produce housing for higher classed family for being large benefitted from project although the percentage of homeless low classed family is high. Some of the familiar private sector formal housing companies practicing in Kathmandu valley are listed below:-Comfort housing, Civil homes, Oriental colony, Pacific housing, Ace housing, Sunrise homes, Mount view residency... etc.

Under the organized private sector the construction of group and apartment housing in the Kathmandu Valley in the last 10 t0 12 years were done by the land and housing development companies. There are more than 60 housing companies and developers in the Kathmandu Valley constructing apartments and group housing in various parts of the cities of Kathmandu and Patan and some companies and developers have already completed and distributed their production in the past.

In recent years this type of housing construction is becoming very much profitable therefore their number is increasing day by day. But as per the monetary policy of the Nepal Rastra Bank the ceiling or restriction has been placed whereby banks and financial institutions are not allowed to invest more than 25 % of their total investment in housing and real estate and the experience indicates that this has slowed down the business to some extent. The main target groups or the customers for the housing constructed by this sector so far have been almost high income group residing in Nepal and Non Resident Nepalese. Though there is huge demand of housing from

medium and low income groups and poor families but the houses produced by these companies are very far from their access due to excessive prices of these houses. This type of housing development is not possible to address and fulfill the demand of these people. As of 2068 BS; Asoj ; 123 companies have received approval to implement such housing plans and as per the news published in a local paper and it is estimated that there has been about Rs. 1 Kharba rupees being invested only from the banks and financial institutions in this sector. (DUDBC, 2014)

Project	Location	Type
Kathmandu Residency	Bagdole, Lalitpur	Apartments
Mount View Residency I	Harisiddhi, Lalitpur	Apartments, duplexes
Mount View Residency II	Harisiddhi, Lalitpur	Apartments ,duplexes
Sunrise Homes	Balkumari ,Lalitpur	Apartments ,duplexes
Civil Homes	Bhaisepati , Lalitpur	Independent houses
Subha Awas	Naya Naikap	Duplexes Naikap Duplexes
Oriental Colony	Kuleshwor , Kathmandu	Apartments
Shangrila Villa	Gongabu , Kathmandu	Apartments ,duplexes
Ace Apartments	Naxal Kathmandu	Apartments
Kusunti Housing	Kusunti , Lalitpur	Duplexes
Paradise Housing Colony	Sano Bharyang ,Kathmandu	Twin and Independent

Table 15: 3.15: Housing developers active in Kathmandu/ Lalitpur

Regarding the quality of dwelling units most of the housing colonies are made up of the frame structures. All of them have provision of electricity and telephone and for the water supply they have been relying upon the underground water. House owner can directly transfer the tenure of the house by full payment at a time or pay money in installment basis and get the tenure ship after the all bills are paid to the company. The housing companies have very often provided the housing loan from the financial institutions. Usually there is a user committee is formed for the solid waste disposal and maintenance of the areas. Quality is regarded as the fitness to the purpose. So far as the physical fitness is concerned, the houses built by the housing companies are fine. But these houses lack the economic fitness. People feel that the buildings that are constructed by the Housing Colonies are costly and the owners can construct such buildings in much lesser a cost.

For example a survey conducted in Stupa Housing in Buddha Nagar Baneshwor showed that despite communication facility, the lack of open space, the lack of parking for the vehicles, the weakness in management and security were sighted as the drawbacks. But in Sunrise Home, all the nine interviewed appeared happy despite some comments on the quality of construction. It can however be seen that the byelaws have not been fully implemented in the planning. Moreover, these houses are only for the sophisticatedly rich class of people. Local people in general and the poor in particular do not have the opportunity to have housing in such premises. While in India, we can see how provision is made for Economically Weak Section (EWS), Low Income Group (LIG), with Medium Income Group (MIG) and Higher Income Group (HIG) to stay through cross subsidy. There should be a proper legislation to ensure such an opportunity for the poor in Nepal also. These companies construct generally the buildings. But they do not construct the community buildings such as temples etc. In a large housing colony, there should be open spaces such as gardens and parks. Such provision is not seen in the housing colonies.

Overview of Apartment and Its Builders

According to Giri, in daily news Kathmandu Post (May 15, 2015),Apartment builders have been gearing down after the earthquake as they wait for the market to revive with unsold flats gathering dust and banks breathing down their necks. According to the Department of Urban Development and Building Construction (DUDBC), nobody has applied for construction permits at its Division Office for the past two years.

There has been little interest in launching new projects among developers after recession set in on the real estate sector and credit from banks and financial institutions dried up. Only a few projects whose applications started to be processed four to five years ago have received building permits after fulfilling the requirements like Initial Environment Examination (IEE) and Environment Impact Assessment (EIA).

As of May 2013, a total of 67 apartment projects have received construction licenses to build 6,474 units of apartments in the country over the past decade, according to

the DUDBC. Among them, 15 have been completed, one is partially complete, two have sought permission to cancel the project and the rest are either under construction or have not started work. All these projects are located in the Kathmandu valley. According to DUDBC "Those who have obtained permits to construct four towers are asking for permission to build only two, and those with permits to construct a 15-storey building want to build only 10 stories.

Land Revenue apartments have seen some improvement in the past few months; new projects are not being started due to the reluctance of banks and financial institutions to invest in the sector. According to the NLHDA (Nepal Land and Housing Developers' Association), around 8,500 apartments and group housing units out of the 12,000 constructed by the organized sector have been sold. Of the remaining 3,500, most are apartments and expensive bungalows under the group housing category.

Adhikari (2012) expresses about housing as the private sector's involvement in prevailing housing market is profit-oriented targeting high-income group, and limited to capital city and other few urban centres which cannot address the issue of equity and social justice over urban poor. Housing development is a creation of society. City should be friendly to all section of the society, especially to elder and children. Use of scarce natural resources such as, water/ minerals, greeneries, open spaces, fresh air, light, sound etc. should be in equitable manner and all should have equal access to these resources (Adhikari, 2012).

Dr. Joshi (2013) states that there have been new modes of housing delivery with growing share of the organized housing in urban areas, Kathmandu Valley in particular. The spectacular growth of such housing has increased dependency on outside economy and technology. The management of urban development has become more challenging. New types of interests have emerged, and it became more difficult to deliver housing and urban services to the growing population (Joshi, 2013).

The demand for such housing has led to a growing interest of the private sector in real estate since 1999. Developers have taken initiatives to develop housing in Nepal during the past few years. They first submit the plan to the KVTDC, now KVTDA. After receiving permission from it, they go to other concerned offices to take permission for construction as per the planning of the project. KVTDC had given

planning permits to more than 200 groups and separate housing companies for constructing more than 6,000 units.

Thapa; in his article tries to emphasize the key points which must be followed immediately for the improvement of housing standards and to overcome the new challenge as well as opportunity in the future. Such valuable key points are: the improvement in technical and managerial expertise of consulting firm, ensuring healthy competition between Nepalese firms in getting projects , investing in training, research and development in housing and building Sector, retaining qualified and dedicated human resource within the country, partnering with public agencies in different types of housing and building projects. Housing is an emerging sector of national economy that will grow with the growth of national economy. (Thapa, 2009)

S.N.	Major Programme	Annual quantity	Rate per Unit Rs.	Investment requirement in the base year Rs. in' 000				
				Government	Corporation	Institutional	Individual	Total
Housing development from the private sector								
1	Apartment housing	3000	2000000			6000000		6000000
2	Group housing	1500	2500000			3750000		3750000

Table 16: 3.16: Annual proposed quantitative target of the housing sector, Source: (DUDBC, 2014).

S.N.	Major Programme	Indicator or quantity	Unit	Annual quantitative target				
				Government	Corporation	Institutional	Individual	Total
Housing development from the private sector in coming 20 years								
1	Apartment housing	60000	Family	0	0	3000	0	3000
2	Group housing	30000	Family	0	0	1500	0	1500

Table 17: 3.17: Annual estimated cost, Source: (DUDBC, 2014).

Growth of Apartments									
Year	2061	2062	2063	2064	2065	2066	2067	2068	2069
No.	1	3	1	7	23	18	7	8	1

Table 18: 3.18: Growth of Apartments

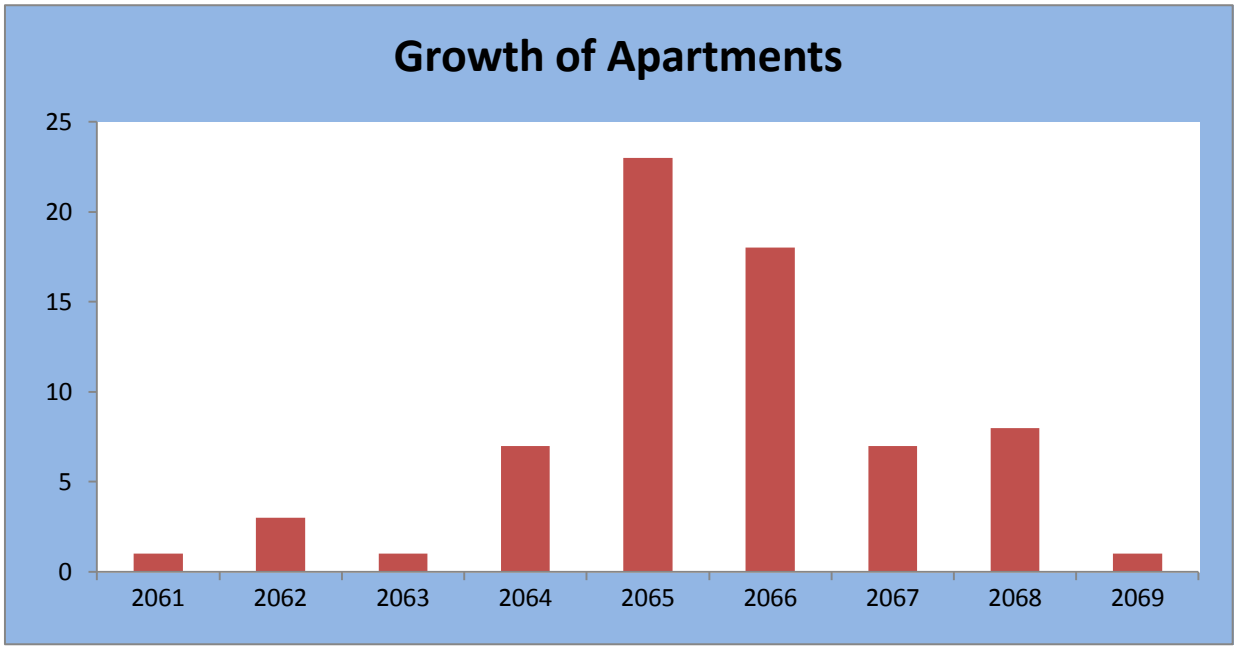


Figure 59: 3.51: Growth of Apartments in Kathmandu Valley

3.15.10 Building Bye Laws for Apartment

- Minimum land area should be 2 ropani
- Maximum ground coverage for the cities of Mountain, Terai and Kathmandu valley region should be 50% of the total
- FAR excluding old city areas should be:

  Terai City Areas: 1.5

  Mountain City Areas: 2

  Kathmandu Core City: 3

  Kathmandu Outer City: 3.5

- The main access road should have minimum width of:

  4 m for 4 housing units

  4.5 m for 10 housing units

  6 m for 50 housing units and

  8 m for more than 50 housing units

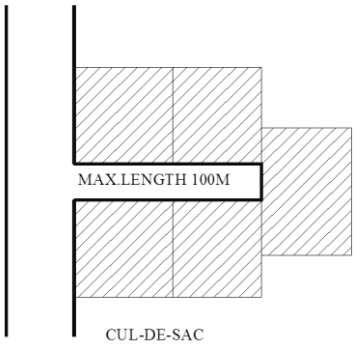


Figure 60: 3.52: CUL-DE-SAC

- Cul-de-sac can only be on a straight road and the maximum length should be 100 m
- The radius of driving curve should be 9 m and the intersection curve of two roads should have minimum radius of ½ width of the road
- Open space for the provision of water seepage to the ground for city areas of Terai, mountain and Kathmandu region should be 20%
- Open space for other purposes for city areas:

  Terai Region: 40%

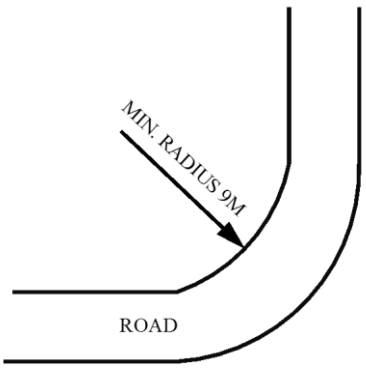


Figure 61: 3.53: Min. Radius 9m.

Mountain Region: 30%

Kathmandu Valley: 30%

- Minimum set back should be:

  Front: for Terai Region 8 m, Mountain Region 6 m, Kathmandu Valley 6 m.

  Back: for Terai Region 6m, Mountain Region 4 m, Kathmandu Valley 4m.

  Side: for Terai Region 6 m, Mountain Region 4 m, Kathmandu Valley 4 m.

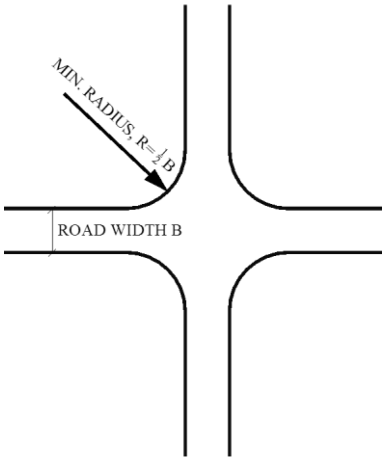


Figure 62: 3.54: Road Width

- The distance between two blocks in the city areas of terai, mountain and Kathmandu valley region should be 6 m.
- Ground floor, basement or semi basement of these apartments should not be used as housing purpose. If those ground floor, basement or semi basement is used as lift well, electrical room, water tank then that area is not counted in FAR.
- Width of main gate should be minimum 4.5m.
- Basic infrastructure like water supply, drainage should be fully equipped.
- Lift, Fire escape stair, stand by generator, overhead tank (20,000 lit), underground tank (50,000 lit) should compulsory provided.

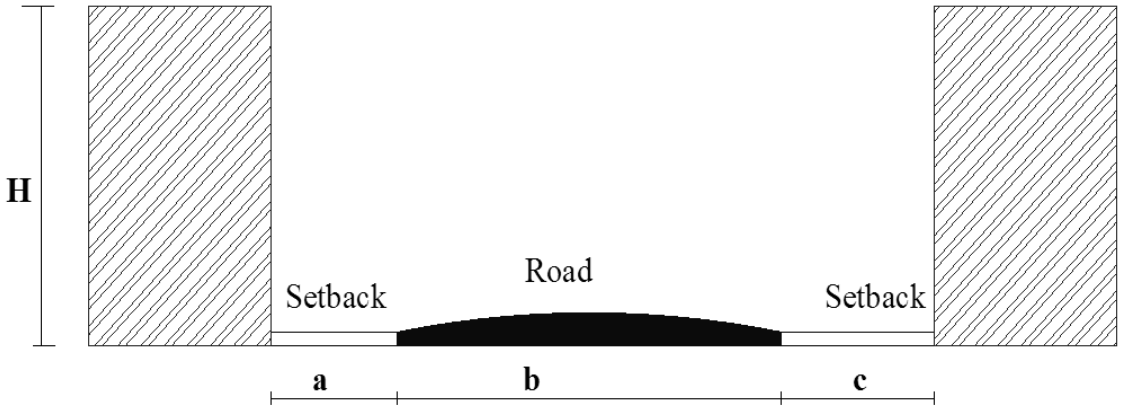


Figure 63: 3.55: Setback and Road

- Minimum parking area for a housing unit of area 80 m^2 or more should have a space for 1 car, 2 motorbikes, and 2 bicycles. For every 4 housing units, area less than 80 m^2 should have space for 1 car, 4 motorbikes, and 4 bicycles.
- The height of a building cannot exceed, H = 2 X (a+b+c)

Distance of other facilities from housing site

- Housing site – industries (1 mile walk/ drive 1 hour)
- Housing site – office (1 mile walk/ drive 1 hour)
- Housing site – commercial (1 mile walk/ drive 1 hour)
- Housing site – local (1/2 mile walk / 10 – 15 minutes drive)
- Housing site – college (1 mile walk / 1 hour drive)
- Housing site to municipal (1 mile walk/ 15 minutes drive)

3.15.11 Risk in Housing in Nepal

By nature, the construction work is being risky and complex; creates chance for disputes. Due to unclear policy of government; developers are facing the risk. It is observing that some projects are selling even before taking final approval from the authority. Political, social, environmental, technical and dispute risk are being as usual.

There were risks to develop housing in beginning. Since the colony system was a new concept at beginning and in this country, people don't really trust others to build houses for them. Today's people are more qualitative and environment conscious. If one can't sell houses according to their design and taste, then all investment is wasted. The investment is billions of rupees in one colony. By chance and favour; the first phase in Bhaisepati of housing was so successful that all the houses were sold.

The rate of urbanization is rapid and we must not turn the city into a concrete jungle. The government needs to allocate specific packet areas in the city to build houses so that the city can be managed effectively. Due to scarcity of land after construction of

colony housing to go vertical became right choice and thus the multi-storey apartment system was promoted. (Chhetri, 2009)

Due to the civil insurgency period ended by doing agreement between government and Maoist, Developers are facing tremendous risk in housing and real estate. Since the people want to be own house in cities and do some business in cities where security and physical facilities are available.

Housing and real estate is rapidly growing one of new sector in Nepal and also suffering from various adversities. It is also observed that the recent crisis observed in financial institutions of the country is the consequence of the investment on this sector. However, no systematic effort has been initiated either by government or by professionals to study the role that has been played by this sector in national economy as well as the risks associated in this sector. The first problem is price of land increased in the cities consequently the price of housing and real estate also increased. Secondly more people invested their money on land and liquidity problem seen on the economy of the country so that bank and financial institution stop to invest in this sector, thirdly Bank and financial institution increased the interest rate. Fourth the political system became unstable and there is no clear policy from government to monitor and control the unmanaged land polling (plotting) and housing, apartment system. Beauty of the city has become worse as compared to Nepali's original median period. Regulating this has not been effective. Dispute has been arising about the ownership within the neighbour because of the lack of open space. Safety and security to the citizens has become big problem during construction and maintenance period. (Koirala, n.d.)

3.15.12 Vacancy Issues of Nepalese Apartment Unit

Financial capacity due to high price rate of apartment units is major problem for the vacancy. The fear of living in apartment due to current earthquake is also giving negative impact for vacancy.

Shreshtha; 2012 in his article mentions that a rough estimate of already completed and ongoing real estate projects ; the total real estate value comes about NRs. 71 billion, equivalent to $800 millions. For a two bed room apartment, it costs ranging from NRs. 5 million to NRs. 15 million. With the bank interest rate of 14%, the annual interest rate comes about NRs. 7 lakh and such apartment needs to be rented for nearly NRs. 0.1 million per month (adding profit, monthly management fee and maintenance), which is beyond the capacity of many Nepalese. How can a Nepalese with per capita income of $460 afford such unit? Though the government of Nepal claims that it was able to reduce the urban poor population from 49% to 31% in the last two decades, recent study based on combination of different indexes on quality of life has projected 65% of Nepalese as poor. As a result, about 70% of such units are not occupied (Shrestha, 2012). There is no affordable flat for all income groups.

Some socio-cultural practice of Nepalese people to live in own territory also becoming the reason of vacancy of apartment.

3.15.13 Impact of 2015 Nepal Earthquake in Housing

A disaster is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources. (Wikipedia). A disaster occurs when an extreme event exceeds a community's ability to cope with that event.

Unsustainable development is one of the major factors in the rising costs of natural disasters.

3.15.13.1 Deadliest Natural Earthquake Disasters of the Past Century

Rank	Maximum Death toll	Event	Location	Date
1.	242,419-779,000	1976 Tangshan earthquake	China	July 1976
2.	92,000-316,000	2010 Haiti earthquake	Haiti	January 2010
3.	234,000	1920 Haiyuan earthquake	China	December 1920
4.	142,000	1923 Great Kanto earthquake	Japan	September 1923
5.	120,000	1948 Ashgabat earthquake	Turkmenistan	October 1948

Table 19: 3.19: shows the five deadliest natural earthquake disasters

3.15.13.2 History of Earthquake and Damages Cause in Nepal

History of earthquake happening in Nepal started from old date December 24th, 1223 in which lots of residential buildings collapse and many people died. The gradual date of earthquake happened in Nepal are June 7th, 125, 1260(king Abhaya Malla died), Sept 14th 1344 (King Ari Malla died), 1408, 1681, 1767, June 4th, 1808, 1810, 1823, 1833, 1834, 1837, 1869, 1897, 1917 (1918?), 1934, 1936, 1954, 1966, 1980, 1988, 1993, 1934, 1980, 1988, 2015.

Year (A.D.)	Deaths	Damages
1934	Estimated Magnitude 8.3 (epicenter, eastern Nepal). 8519 people died out of which 4296 died in Kathmandu valley alone	Over 200,000 buildings and temples etc Damaged.55, 000 building affected in Kathmandu (12,397 completely destroyed).
1980	Magnitude 6.5 (epicenter far Western Nepal). 103 people died	12, 817 buildings completely destroyed.
1988	Magnitude 6.5 (epicenter in SE Nepal). 721 people died	66,382 buildings collapsed or seriously damaged.
2015	Magnitude 7.8(epicenter Barpak, Gorkha). Around 8020 people died. Injured around 16,033 and missing-375	Total of 416359 houses were damaged (fully damage – 202157, partially damage-214202).

Table 20: 3.20: History of Big-Earthquake, Source: (Pokharel, 1999) .

Modern scenario of lavish facilitated modern style apartment's buildings is highly popular in worldwide popular cities. Kathmandu is also one of them. But the history of earthquake shows that this city is no. one vulnerable city lies in prone zone of earthquake. The nature of soil is not good to erect high rise buildings in some places of Kathmandu Valley. To dream the lavish style living standards, one must be able to afford economically and there must be the provision of all dimensions safety parameters application of such high rise buildings in Kathmandu Valley.

3.15.13.3 Status of Apartments in Kathmandu Valley after Earthquake

Figure 64: 3.56: Sunrise, Nakhkhu

After damaging the various buildings of Kathmandu valley during the earthquake of Baisakh12, 2072, an assessment has been done by DUDBC (Department of Urban Development and Building Construction). The DUDBC categorized the buildings under three categories—marking them red, yellow and green. Red refers to unsafe for immediate use, those marked yellow require repair before use, and green are buildings which are safe for use. Shortly, green (safe), yellow (requiring repair) and red (demolition or serious repair necessary). (Republica, 2015)

The DUDBC has given permission for the construction of 70 high-rise buildings in Kathmandu. Of the total, construction of 56 has been completed, 31 apartments have settlements, 14 are being used for different purposes and 11 are under construction. Nepal Land and Housing Developers' Association has said 31 apartments in the Kathmandu valley accommodates more than 4,000 families. (National, 2015).

The Park View Horizon at Dhapasi and Oriental Apartment Phase II at Kuleshwor are unsafe and not usable. 31 apartment buildings are used after appropriate repairs. Seven high-rises are totally safe have to live in (News, 2015). According to the engineers and property developers; there has been no significant structural harm to high-rise buildings from the earthquake and that the damage is mostly "cosmetic

damage". The geologists say that the buildings sustained cracks in their walls due to lack of an in-depth study of the soil where they have been erected.

Figure 65: 3.57: Park View Horizon

The answer to say about earthquake safe apartment is that some of them certainly are not safe and from most of them it is uncertain whether they will be strong enough to withstand 8.5 to 9.0 earthquakes. So many high rise buildings suffered a lot of damage after the earthquake. Far from core area of Kathmandu say about 80 kilometres outside; most of the high rise buildings probably won't be strong enough to withstand a much more powerful earthquake. Buildings guidelines should be strictly followed for safety purpose.

3.15.13.4 Occupancy in Apartments after Earthquake

Before disaster, people are living in 31 apartments of Kathmandu Valley out of 70 registered apartments. Currently, there is the creation of fear & psychological impact in occupants to live in apartment so not all those apartments are occupying, some occupants leaving apartment and living on rent after the earthquake Baisakh 12, and 2072.

Figure 66: 3.57: Westar Residency in Balkumari

The occupants of high rise buildings should be aware about whether a building is considered to be safe enough or not. If doubtable, it should be prohibited to buy or rent an apartment of office spaces in such a building. Besides that it is better to avoid older unsafe buildings especially when they are 4 to 10 storey high (i.e. in the Old Town, Gongabu, Balaju and similar vulnerable areas having full of unsafe buildings).Owners of high rise buildings become alert to be checked their buildings by foreign (i.e. Japanese); well experienced engineers. Also; the government should create other reliable ways of certificating safe high rise buildings. Building code should be well improved and mandatory applicable i.e. it might be needed to revise and implement well remarkable policy.

CHAPTER4: CASE STUDY AND DATA DISCUSSION

The case study is defined as a process or record of research into the development of a particular person, group, or situation over a period of time (oxford dictionary).For example "the case study was undertaken over a period of two months through a series of visits to the apartment".

In brief, it can be clarified as a particular instance of something used or analyzed in order to illustrate a thesis or principle. For instance "Recently gone earthquake provides a case study of the effects of the occupancy rate of apartment of Kathmandu Valley."

Figure 67: 4.1: Map of Nepal

In other words, the case study is defined the act or an instance of analyzing one or more particular cases or case histories with a view to making generalizations." The case study means a study of an individual unit, as a person, family, or social group, usually emphasizing developmental issues and relationships with the environment, especially in order to compare a larger group to the individual unit.

On more clarification about case study it can be also stated as a published report about a person, group, or situation that has been studied over time; also a situation in real life that can be looked at or studied to learn about something. According to Webster dictionary case study is defined as an intensive analysis of an individual unit (as a person or community) stressing developmental factors in relation to environment.

Case study research is a methodology which can take either a qualitative or quantitative approach. In the qualitative approach, case study refers to the in depth analysis of a single or small number of units. A case study unit may include a single person, a group of people, an organization or an institution.

Some case study research may involve the research of a series of cases. Case study research ranges in its complexity:

- From a simple, illustrative description of a single event or occurrence.
- To a more complex analysis of a social situation over a period of time.
- To the most complex approach which is an extended case study which traces events involving the same actors over a period of time - enabling the analysis reflect changes and adjustments.

Case studies aim to:

- Offer a richness and depth of information by capturing as many variables as possible to identify how a complex set of circumstances come together to produce a particular manifestation to as identify how a complex set of circumstances come together to produce a particular manifestation.
- Case study as a method is very versatile, as it uses many methods of gather information, from observation to interview to testing.

One of the criticisms of the case study method is that the case under study may not be representative of a wider social setting and therefore it is argued that the results of the research cannot be used to make generalizations.

Therefore, the purpose of case study research is to describe that particular case in detail and take learning from that and develop theory from that approach - it is particularistic and contextual.

4.1 Study Area Description

In the Kathmandu Valley, urban activities are mostly performing in core areas so most of the high-rise apartments are being constructed near to the urban center i.e. core area. But due to the availability of land outskirts of ring road in low price having FAR more than 3 has also attracted to build high rise in the suburban areas as well.

Some of the apartments of Kathmandu Valley are

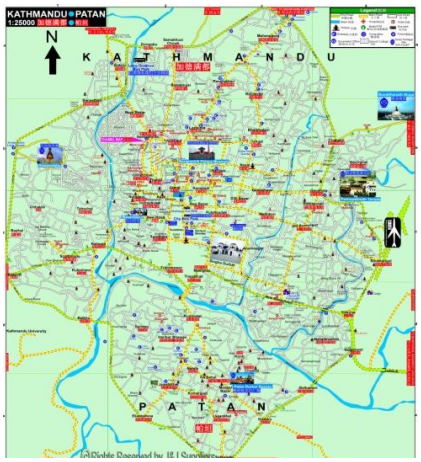


Figure 68: 4.2: Map of Kathmandu Valley

selected for study area. As far possible, it has been tried the selection of the high rise apartments to represent the whole scenario of the high rise apartments situated in the Kathmandu Valley.

The criteria's for selection of the high rise apartment includes:

- Location of the apartments (inside ring road and outside ring road).
- Promoted by different developers.
- Green Stickers labeled Apartment and yellow stickers after Earthquake.
- Target for high income group and middle income group.

4.2 Spatial Location of Growing Apartments in Kathmandu Valley

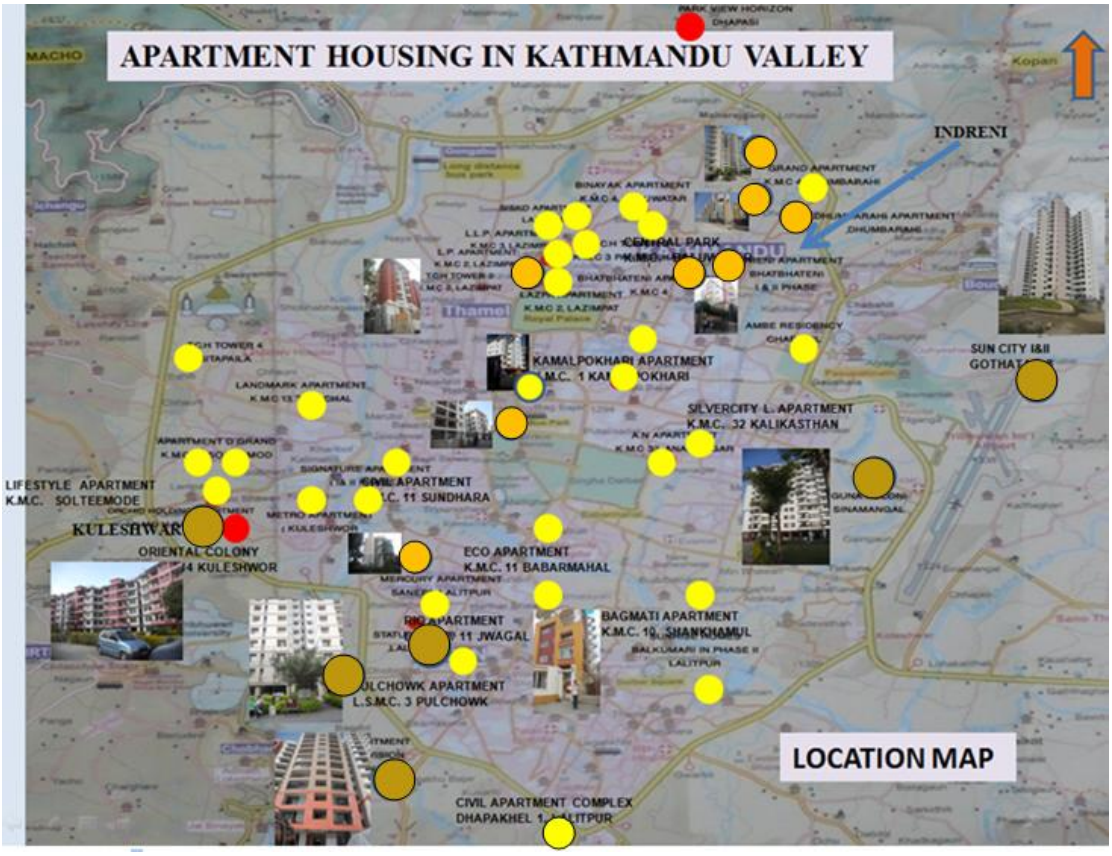


Figure 69: 4.3: Spatial Location of Apartments in Kathmandu Valley.

In map below, location of apartments of Kathmandu Valley are shown which includes both outer ring road apartment and inner ring apartments. Most of the apartments lie in Kathmandu than Lalitpur and no. of apartments within the ring road is greater than outside.

4.3 Detail Case Study of Selected Apartments

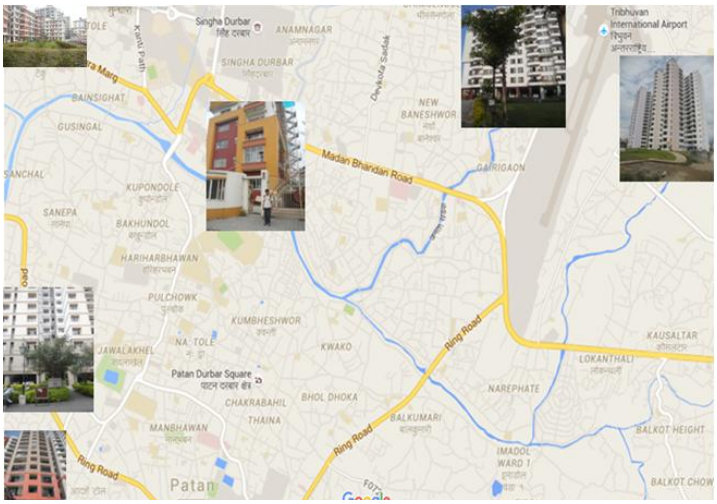


Figure 70: 4.4: Google Map Location of Selected Apartments for detail Case Study

Some few apartments like Guna Colony (Sinamangal), Sunrise Tower (Dhobighat), Sunrise (Nakhkhu),Oriental Colony(Kuleswor), Rio (Kupondole), Suncity (Pepsicola) are studied doing detail case study with questionnaire survey method.

4.4 National Case Study of Apartments

4.4.1 Guna Colony Apartment

General Description

Gun Colony is located in Sinamangal; a core area of Kathmandu Valley which is about 5km from Koteshwar and 100m from the main road named Tara Marga. It lies inside the ring-road. There are

Figure 71: 4.6: Google map of Guna Location

Figure 72: 4.5: Guna Colony

two 11 storied towers (having 10 residential floors and parking in ground floor) which consists of 160 units in total.

It is surrounded by easily accessibility with the public transportation,

markets, educational centres as well as medical facilities.

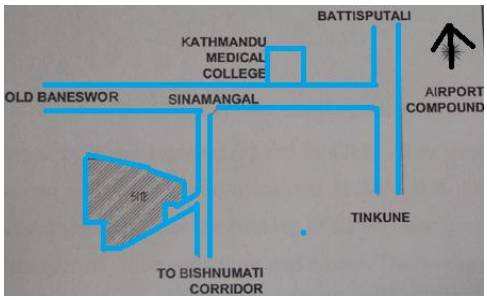


Figure 73: 4.7: Location Map

Stupa Housing, a private limited is the developers of Guna Colony consists the area of land about 42183.26 sq. ft. The construction was completed in 2065 B.S. It took only 1 year to complete. In this apartment, only on type of unit i.e. 3 bedroom type. The average population in this apartment is about 1000 people before earthquake. The complete handover of the project is not yet done.

Figure 74: 4.8: Main Entry gate of Guna from inside area.

There is almost 50% open space area. The responsible person service charge is owner oneself until not handover. Bothe high income and middle income persons are living under same single roof.

There are the facilities of swimming pool, sitting areas, badminton court, table tennis and greenery Small Park with fountain.



Figure 75: 4.9: Open space, greenery park, fountain in front of Guna Colony

Earthquake Damage Notification

Due to recent big earthquake it was damaged little bit and labeled yellow sticker by DUDBC a government organization. The labeling with yellow sticker means that it is suitable to live after doing some maintenance in certain parts of buildings.

Costs and the Area of Units

The cost of 3 bedroom type unit having area 790 sq. ft. is ranging from NRs. 33 lakhs to NRs 37Lakhs at the time of booking in the year 2064 B.S. as vary in area 873 sq. ft to 915 sq.ft. for upper flat. The price increases as the floors go to up in storey. At 2012, the price of unit is 49 lakhs to 53 lakhs and renting charge is NRs 20000 per month (Shrestha, 2012). Presently, the price of unit is ranging from 98 lakhs to 103.76 lakhs for the unit of same area which is according to the developer. In the year 2064 B.S. the cost per square foot of unit was average of NRs. 3500 and at 2012 the cost is NRs. 5600 per square foot. Now, it 11340 NRs. per sq. ft.

Occupancy Issues

Occupancy Factors before Earthquake: The 50% units of apartment were booked in starting time at 2064 after that almost 130 units out of 160 units were booked up to 2065. And only 100 units have been occupied out of which 30% stay in rent and the rest in their own apartment. (Joshi 2013)

Then recently, before the earthquake 143 units are occupied with the rate of occupancy 89.37%. It means apartment had very low vacancy rate in recent few months ago.

Occupancy Factors after Earthquake: After the earthquake, vacancy rate of this apartment increased since unoccupied units are increase by 33 i.e. total no. of occupied units became 110 only. In others word, the occupancy rate of apartment affected seriously went down as 68.75%.

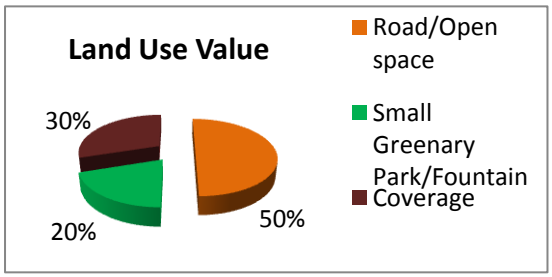
Community Organization

Due to not fully booking of units of apartment till now, the developer has partially handed over the apartment to the society office.

There is the existence of the reputed society office is being run by its various committee members. Current president of this office is Shiva Subedi, a very high intellectual person. The Society office is responsible for conducting

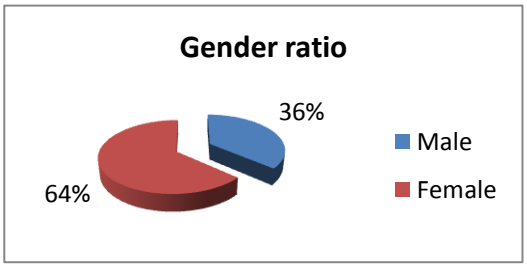
various programs in the apartment premises. For example it co-ordinates with the occupants to organize various community programmes during festivals and occasions. The Community organizes various sports events and competition for children and almost 90% of children are actively participating in the competition. Elder people generally play badminton at morning and evening times and enjoy swimming. Society office has put certain rules and regulations in the office like the certain days are allocated for male and female for swimming and there should not be noise after 9.00 pm in the apartment. Some literate people feel the need of library in the apartment. (Shrestha,2012)

There is also Mahila Samuha playing vital role for the enhancement of living society. Mahila Samuha has organized various programmes for which it collects fund with those occupants who are interested to participate in the programme. It is further planning to collect funds with the occupants weekly or monthly for the saving purpose and empower women in the society.

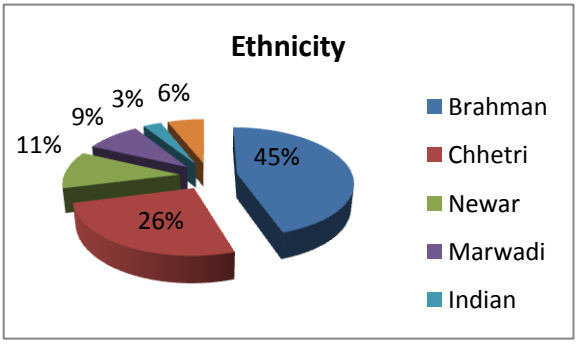


Road and open space covers the maximum land area about 50%, ground coverage is 30% and remaining 20% is covered by greenery.

Occupants Background



Number of respondent: During the survey using questionnaire method, it was found that 36.4% are male while 63.6% are female. The total no. of respondents is 33 out of 110 occupied units (i.e. 30% samples).



Ethnicity: The findings from data shows that the majority of households having large no. of caste is Brahman (about 45%), then after Chhetri, Newars, Marwadi, Indian and Thakuri.

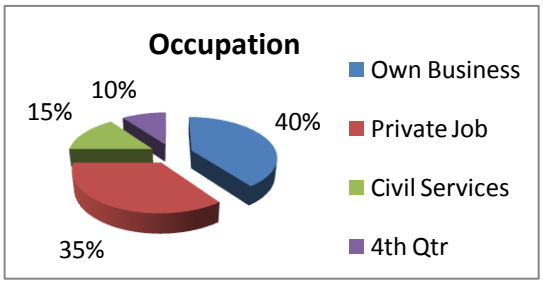
Spoken Language: The occupants of this apartment generally prefer Nepali language for communication although many of them know English, Hindi, and Newari…etc.

Migration: Most of the occupants have migrated from inside the valley. There are slightly less no. of occupants having migrated from outside valley some from Jhapa, Biratnagar, Pokhara, and Janakpur…etc. The no. of migrated of Indian family are only two in this apartment.

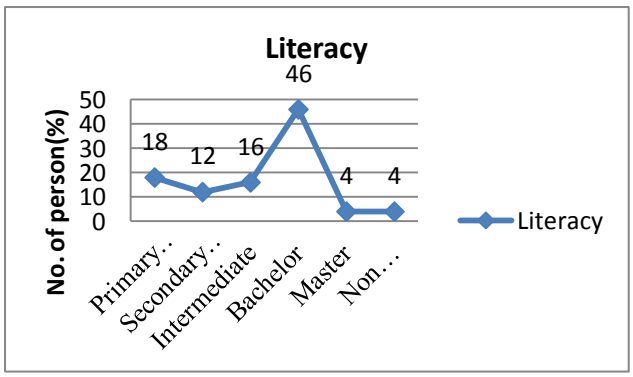
Ownership Status: Currently, more than 95% have their own apartment. Only 5% are living in rent.

Family Status: Almost 95% occupants are living with their family. The household survey on this apartment shows that majority of occupants belong age group ranging from 41 to 50 (i.e. 35%), then from 31 to 40 (i.e. 30%), 6% from 25 to 30, 10% between 51 to 60 , 5% above the 60 years and 14% below 25 years.

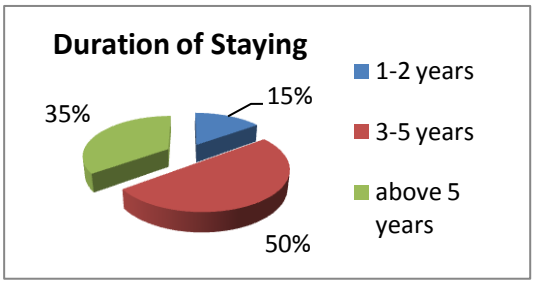
Occupation: Many occupants of this apartment are businessman, then doctor, engineer and students…etc. The survey shows that majority of occupants have their own business and private job. Guna colony is also occupied by some civil service officers.

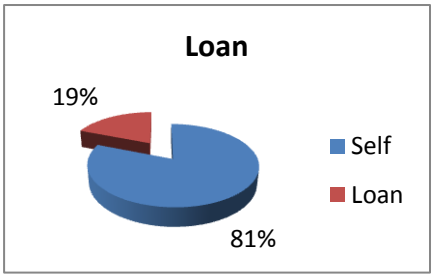


Level of literacy: Most of the occupants (46%) surveyed units are found bachelor degree holder,4 % of master degree and then 16% of intermediate, 12% having secondary level of education and 18% have primary level while 4% non-educated.



Duration of stay in the apartment: 50% percentage of household is residing in this apartment since 3 to 5years. There are 15% of household has stayed since 1-2 year and remaining 35% of the households are living since above 5 years.

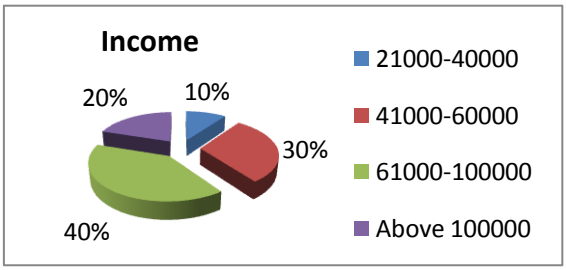


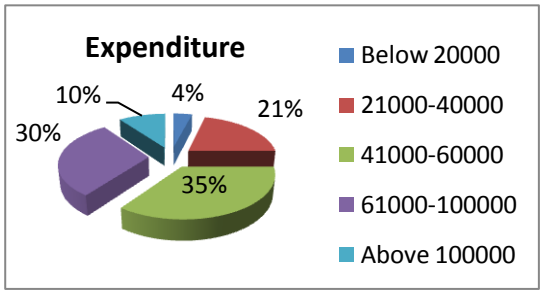


Socio-Economic Status

Loan: The survey findings showed that the majority 81% of the households has not taken loan to buy the apartment and only 19% of the household have taken the loan. Loan has been generally taken from bank.

Income Range: Findings show that the majority of the household i.e. 40% have income ranging from NRs 61000 to 100000. Then after 30% shows on the range 41000 to NRs 60000. Only 10% of households account on the range 21000 to 40000 and also, only 20% of household's incomes exceed NRs 100000.

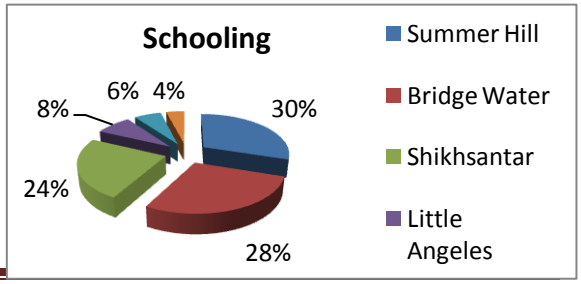


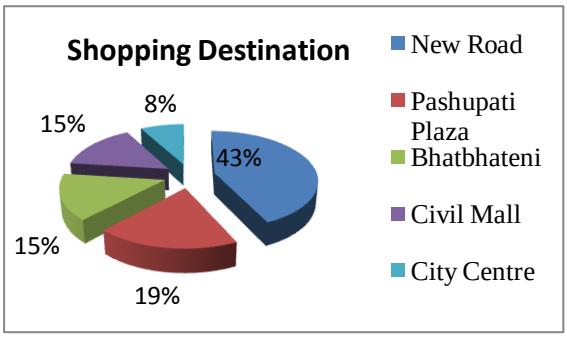


Expenditure Range: Almost 21% of household have expense equal to the income ranging from NRs 21000 to NRs 40000. 35% of the household have expense ranging from NRs 41000 to NRs 60000 and 4% of household have expense below NRs 20000. 30% of the household have ranging from NRs 60000 to NRs 100000 and above 100000 are 10%.

Social Infrastructure in and Around the Apartment

Schooling: Findings on schooling show that the majority of the household send their children to the nearby school like Summer Hill, Bride Water and

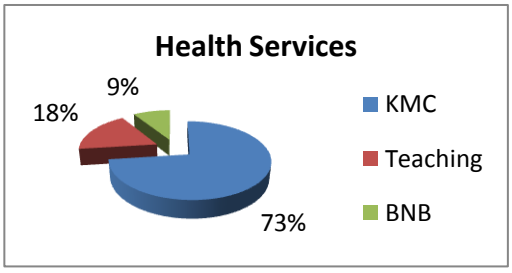




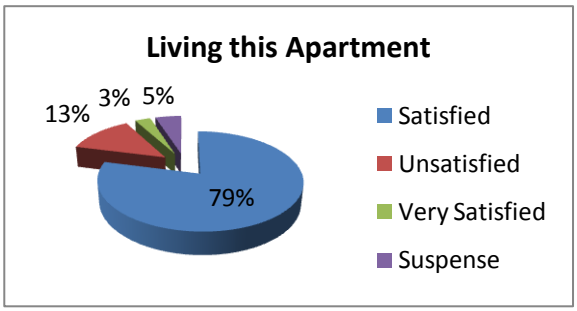
Shikshantar. Some few household's children go to Little Angels School while some parents have sent their children abroad for higher study and some are also studying in Kathmandu University.

Shopping Destination: Many occupants are using Bhatbhateni as shopping destination which is in percentage 39%. Then after, 19% of the household prefer going to Pashupati Plaza. Equal no. of occupants is using Bhatbhateni and civil mall i.e. 15%. And only few preferred going to city centre. For daily consumption goods, almost all occupants prefer local market.

Health Services: When occupants become sick, generally they use KMC hospital. It is about 73%. Similarly few of occupants use teaching about 18% and less uses BNB i.e. 9%.



Occupancy Issues on Satisfaction Level of Occupants



Level of Satisfaction: Level of satisfaction was done under two sup topics, one is satisfaction about living this apartment and another is satisfaction about provided facilities, services and management.

	Unsatisfied (%)	Very Satisfied (%)	Satisfied (%)
Water Supply	1.5	10.6	87.9
Garbage disposal	4.6	15.9	79.5
Electricity Provision Backup	77.4	1.7	19.9
Smoke detectors	1.2	5.5	93.3
Phone services	7.5	30.3	62.2
Management of facility	65.4	5.5	29.1

Security & Safety	5.4	37.6	57
Noise Disturbance	9.1	40.5	50.4
Conducive overall environment	17	30.5	52.5
Thermal Comfort	3.7	33	63.3
Social & Cultural Perspective	19	32.5	48.5
Lift functioning	34.5	20	45.5
Accessibility (Road Network)	4.6	25.7	69.7
Design of apartment	10.3	29.9	59.8
Provision against Emergencies(earthquake, fire…etc.	11.4	24.6	64
Noise from neighborhood	4.6	26.7	68.7

Table 21: 4.1: Table Satisfaction level with High Rise Living

Above table shows about the satisfaction level of provided facilities and services. On analysis of above data, it was found that 87.9% occupants are satisfied with water supply, 79.5% from garbage disposal,93.3 % from smoke detectors,62.2% from phone services,50.4% from noise disturbance, 52.5 % from overall environment…etc.

Earthquake Impact: Earthquake impact on building is labeled by yellow sticker which means able to live after repairing in certain part. Overall structure of this building is looking not having many cracks but only in part of staircase, it is little bit disturbed seriously due to not gaping between these two towers.

Similarly, after some few months it impacts high on occupant's mind and created depressed, grief, sorrow as psychological impact. It happened for some beginning months due to repetition of earthquake shacks. But now, negative impact of this is decreasing and residences are returning back in their own apartment.

Challenges Faced by Occupants: On rating the challenging factors of apartments which are faced by occupants, many occupants rated moderately important on structural safety i.e. 77.4%. Similar way they rated moderately important on the issues of lift problems i.e. about 43.5%. Then, less important are given for problem with waste disposal (48.6%), lack of safety/security (56.7%) and problem with location (57.5%) while moderately important on the problem with operation/maintenance(52.4%) , its cost (47.7%) and also on resilience of building(60.4%).

	Least Important	Less important	Moderately Important	Very Important	Most Important
Fear of height	10.9	28.4	36.9	15.5	8.3

Absence of community living	15.6	37.5	25.9	21	-
Safety concerns	3.6	5.5	29.6	42.9	18.4
Lift Breakdown Frequently	17	22.5	32.2	19.3	9
Provision of Emergencies	-	5.9	42.6	30.5	21
Fear of Earthquake	-	8.5	25	44.9	21.6

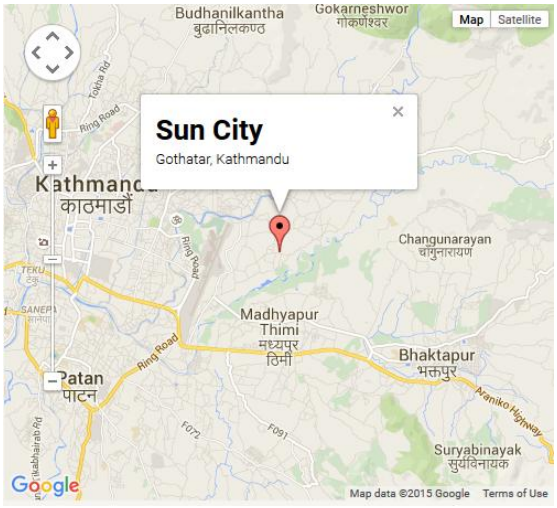
From this above data table analysis, it can be found that the majority on fear of height is moderately important factor causes not living in tall buildings. In percentage, it is 36.9%. Similarly, on the majority base 37.5 % occupants are saying absence of experience is less important fact for causing not living in high rise. On the safety concern for not living in high rise buildings, the majority (42.9%) shows very important. On the same way, the majority (32.2%) shows moderately important about lift breakdown causing not living in high rise and also same importance for Provision of Emergencies (42.6%). There is very important fact which causes not living in high rise buildings is 'fear of earthquake' with 44.9%.

	Least important	Less Important	Moderately Imp	Very Important	Most Important
Structural Safety			77.4	22.6	
Lift Problems	6.8	40	43.5	9.7	-
Problem with waste disposal	4.5	48.6	40.9	6	
Safety/ security	8.9	56.7	30.4	4	
Problem of operation/maintenance	2.5	29.9	52.4	10.2	5
Problem of operation/maintenance cost	3	31.5	47.7	13.2	4.6
Problem with detectors	17.2	58.3	24.5		
Problem with location	30.4	57.5	12.1		
Resilience of building		5.2	60.4	24.5	9.9

Suggestions and Comments: It should be better if fundamental things related to apartment are provided by builders in proper way. On the scarcity, many people suggested that there should be provision of CCTV camera, Wi-Fi Zone, Children Playground…etc.

4.4.2 Sun City Apartment

The Sun City is luxurious and affordable Apartment located at eastern side of outer ring road area. The



local name of area is Pepsicola planning, Gothatar. It has five 17 storied tower each having 100 units. Upto now 317 units out of 500 are handover. The project site occupies 65 ropanies of Land area.

The location of property oversees a wonderful landscape of the Valley and gives you a green and Environment friendly feeling being close to the city it has easy access to major locations and necessity such as shopping mall, academic and health care facilities at comfortable driving distance. With the upcoming 6 lane Arniko highway which is in full construction now, the road from Tinkune is going to be a pleasure to drive.

Description	Features:
Project Name: Sun City Developer: Shangrila Housing Pvt. Ltd Project Consist of: Apartment Location: Pepsicola, Gothatar Construction Date: September, 2009 Handover Date: April, 2012 Total Number of Units: 5 Total Site Area(Ropani, Sq. Ft):	[✓] 24 hr Generator Backup [✓] Basket Ball/ Tennis Court/Badminton Court [✓] Car & Bike Parking [✓] Children Playzone [✓] Community Shop [✓] Fire Fighting System [✓] Health & Fitness Club

65-0-0-0 (355940 Sq. Ft.) Price Range: NRs.3,221,250.00 to NRs.5,422,824.00 Area Sizes Range: 0-2-2-0.16 (859 Sq. Ft.) to 0-3-3-2.46 (1336 Sq. Ft.) Housing Nepal ID: Project_14	[✓] Internet/Wifizone [✓] Lift System [✓] RSS Frame Structure [✓] Security System and Devices [✓] Society /Community Hall [✓] Swimming Pool [✓] Treated Water Supply [✓] TV/Telephone points

Cost of Apartment

The cost of area of apartment having 859 sq. ft. with type 3 bedrooms is NRs 3221250. Similarly, the cost of flat with area 859 sq. ft. having 3 bedroom type but facing south is slightly high i.e. NRs. 3486681. The cost of 2 bedroom type flat facing south with area 1187 sq. ft. is NRs. 4818033. The cost of 4 bedroom type flat facing lawn with area 1336 sq. ft. is NRs. 5010000.The cost of 4 bedroom type facing south with area 1336 sq. ft. is 5277200.

Social Programmes Held in Sun City Apartment

There is the facility of Suncity Youth Club. Provision of Amphitheatre to celebrate various cultural programmes interlinked the built up are with open space in liveable way.

Figure: Yoga and Aerobic Programmes

Drawing and Painting Program

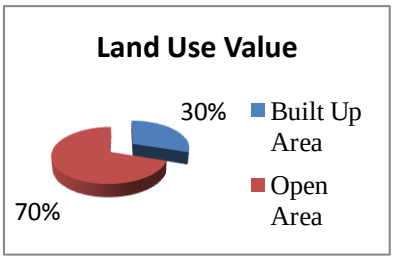


Momo Festival

Blood donation

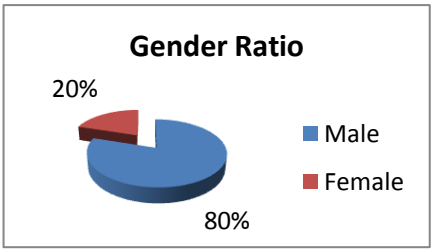

Figure: Suncity Cleaning

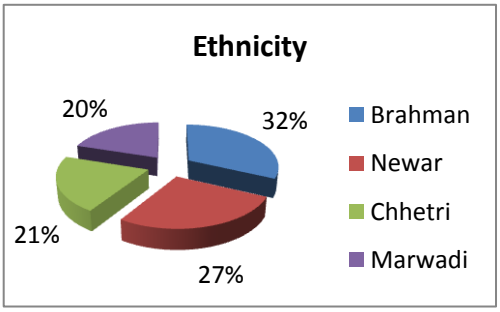
Land Use: Built up area 30% and open area including road coverage %70%.



Occupants Background

Number of respondent: During the survey using questionnaire method, it was found that 80% are male while 20% are female. The total no. of respondents are 44 out of 110 occupied units (i.e. 40% samples).

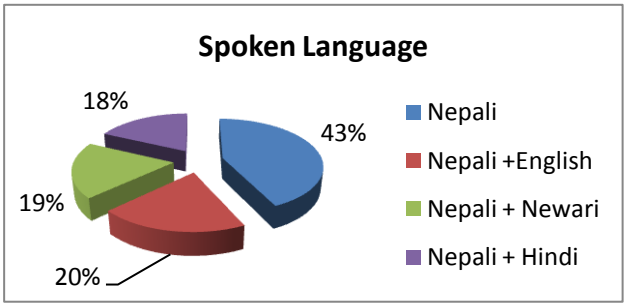


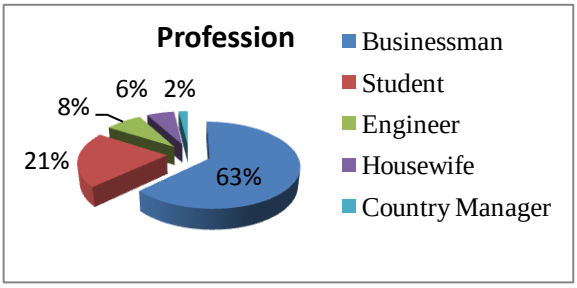


Ethnicity: The findings from data shows that the majority of households having large no. of caste is Brahman (about 32%), then after, Newars, Chhetri, Marwadi.

Religion: All surveyed household occupants are Hindu

Spoken Language: Nepali is generally preferred by all household.



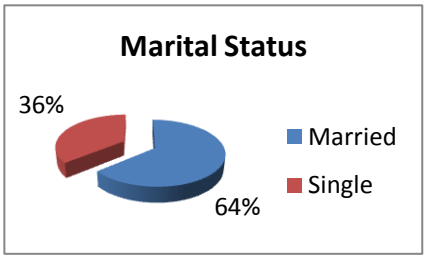


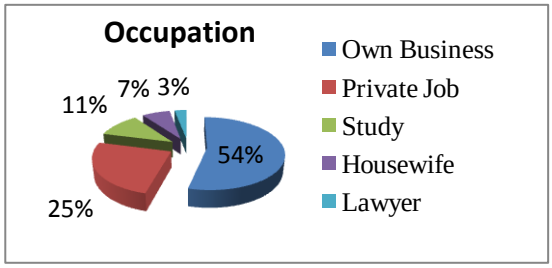
Professions:

In Suncity, the majority of household are businessman i.e. 63%. Then after, 21%

Marital Status

The majority of households are married having high 64%.



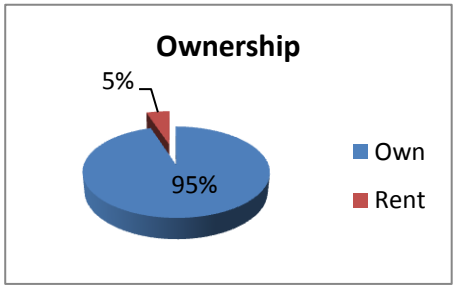


Occupation

Most of the households have their own Business. It is about 54%.

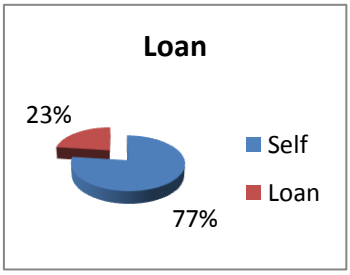
Ownership Status

Almost all occupied units behold to own ownership. Before earthquake, there is also some more household on rent but currently negligible.



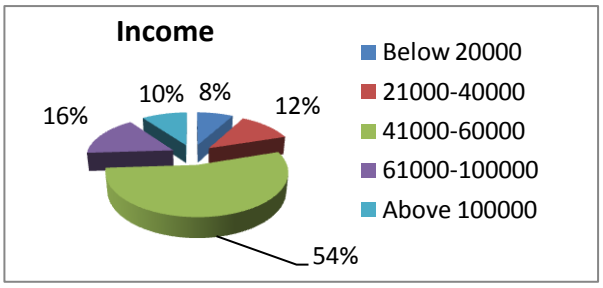
Socio Economic Status

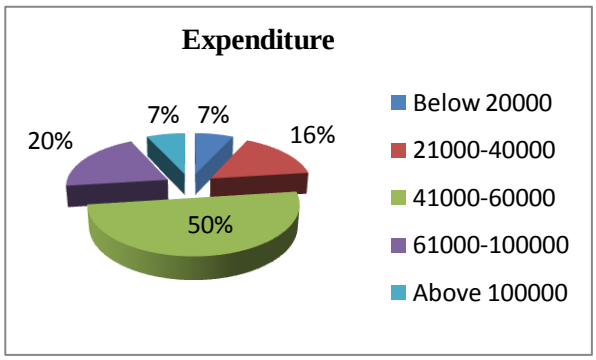
Loan: Asking the question about how to buy this apartment, many occupants almost 77% said by self. One who bought it by loan generally taken from Bank.



Cost: The cost of apartment unit ranges from 45 lakh to 75 lakh depends upon orientation of unit. The south facing flat has high price in Suncity.

Income Range: Findings show that the majority of the household i.e. 54 % have income ranging from NRs 41000 to 60000. Then after 16% shows on the range 61000 to NRs 100000. One of the measurable facts about income is that there is an almost 10% occupant who yearns above one lakh.

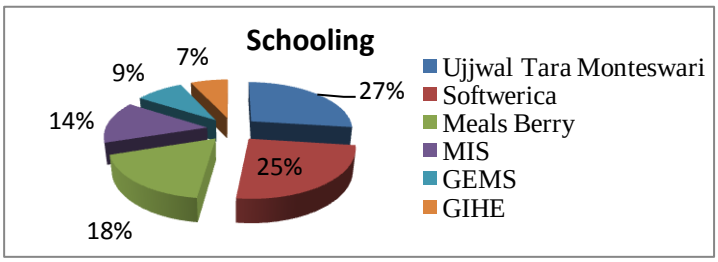


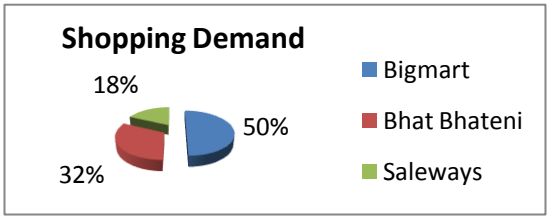


Expenditure Range: Almost 50% i.e. the majority of household have expense equal to the income ranging from NRs 41000 to NRs 60000. 20% of the household have expense ranging from NRs 61000 to NRs 100000 and 7% of household have expense above 1 lakh and also 7% of household expense below NRs 20000. 16% of the household have ranging from NRs 21000 to NRs 40000.

Social Infrastructure in and Around the Apartment

Schooling: Findings on schooling show that the majority of the household send their children to the nearby school like Ujjwal Tara Monteswari. Then after they send their children to Softwerica, Meals Berry, MIS, GEMS, GIHE respectively.



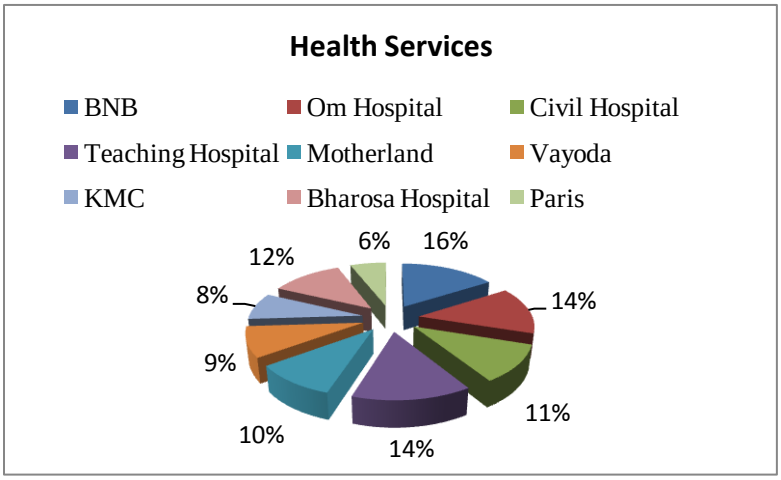


Shopping Demand

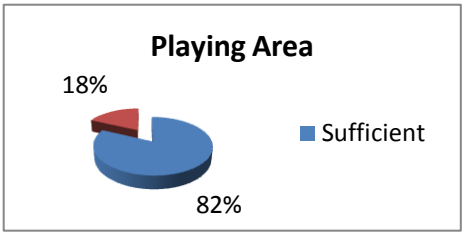
50% occupants go to Bigmart for shopping.

Health Services

Maximum no. of occupants uses BNB hospital i.e. 16%. Then after Om hospital 14% and so on as in chart.



Recreational Activity



Children Pay Area: There are sufficient facilities about Swimming Pool, Health Club, Gym, and CCTV. Suncity has very nice jogging and morning walking area and greenery.

Occupancy Issues on Satisfaction Level of Occupants

Level of Satisfaction: Level of satisfaction was done under two sup topics, one is satisfaction about living this apartment and another is satisfaction about provided facilities, services and management.

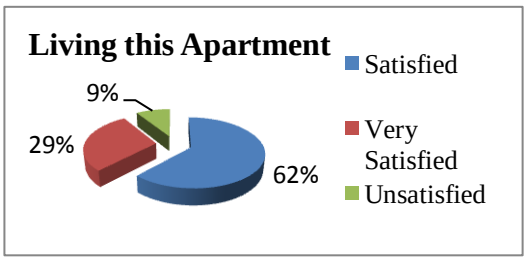


Table Satisfaction level with High Rise Living

	Unsatisfied (%)	Very Satisfied (%)	Satisfied (%)
Water Supply	0	20	80
Garbage disposal	5	30	70
Electricity Provision Backup	30	50	20
Smoke detectors	0	92	8
Phone services	10	72	28
Management of facility	15	77	8
Security & Safety	3	83	14
Noise Disturbance	0	85	15

Conducive overall environment	0	10	90
Thermal Comfort	5	60	35
Social & Cultural Perspective	14	35	51
Lift functioning	20	70	10
Accessibility (Road Netwrok)	0	17	83
Design of apartment	11	45	44
Provision against Emergencies(earthquake, fire…etc.	0	87	13
Noise from neighbourhood	0	90	10

Earthquake Impact: Earthquake impact on building is labeled by yellow sticker which means able to live after repairing in certain part. There came change about perception of earthquake impact. Many occupants are feeling now normal on the effect of earthquake. Duet to earthquake 13% of neighbours are left the apartment while many neighbours of household living on that flat. The main cause of leaving apartment is earthquake repetition shacks on large numbers. Such occupants are basically old people.

Challenges Faced by Occupants

Table Occupants rating of challenges in high rise buildings

	Least important	Less Important	Moderately Imp	Very Important	Most Important
Structural Safety	2	27	65	6	0
Lift Problems	14	62	14	6	4
Problem with waste disposal	15	46	32	7	
Safety/ security	28	47	21	4	
Problem of operation/maintenance	6	25	45	19	5
Problem of operation/maintenance cost	5	23	40	28	4
Problem with detectors	33	57	10		
Problem with location	20	34	30	9	7
Resilience of building		21	43	31	5

Table: Reasons for low occupancy of apartments

	Least Important	Less important	Moderately Important	Very Important	Most Important
Fear of height	10	6	27	44	13
Absence of community living	18	0	49	28	5
Safety concerns	8	0	22	53	17
Lift Breakdown Frequently	0	4	30	61	5
Provision of Emergencies	0	5	15	68	12
Fear of Earthquake	5	5	10	20	60

Making Apartment Satisfactory: There should be high security and well provision of water treatment for satisfactory considerations. Additions of departmental store walk path trail, social programmes, and neat and clean environment make apartment satisfactory

Impressive Factor: Enough open space and affordable with familiar people are the common impressive factor about this apartment. Someone impressive factors are location, facilities, nice and pollution less environment. There is the creation of family environment. Neighbourhood is very nice in this apartment. It is luxurious too.

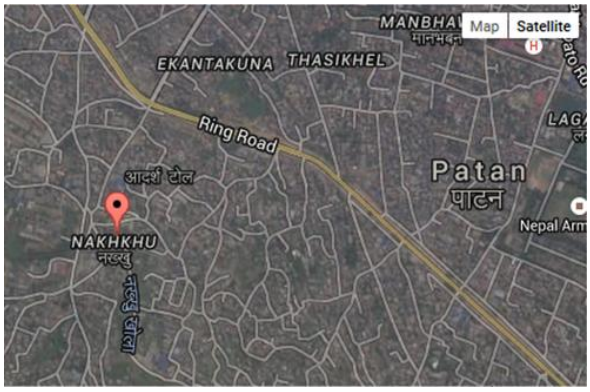
Comments: Many occupants criticized about the problem of operation of lift, water pressure in top floors and water leakage due to lack of standard care, waste disposal. There are problems of sunshine in few apartment flats. Water treatment problem and water seepage occurs.

Suggestions: To increase the occupancy level marketing should be in proper channel with high aim and vision and objective should well clarified to reach the goal. There should be provision of proper communication and better management. There should be some promotional events, advertisement for attraction and also to know real knowledge and scenario about high rise buildings. It is suggested that there should be the provision of well trained technicians and engineers for improve the lift-operation problem. It is ongoing process. There should be some special feedback to the house slayers about life in apartments

4.4.3 Sunrise Apartment

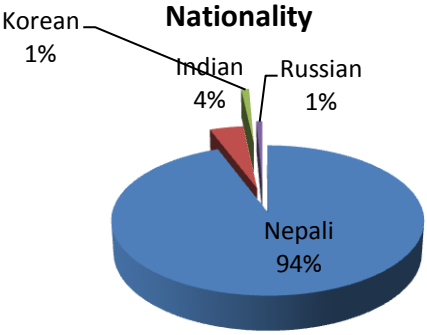
General Description

It is located in Lalitpur district at the street famous as Sunrise Apartment Street and having close vicinity to ring road. Total area of site is about 325000.00 sq. ft. Apartment has feasible accessibility with 5 meter access road width having black topped and very near i.e. 100 meter from the main road. It has 2 to 5 bedroom type. The builder's name of this apartment is Sunrise Developers Pvt. Ltd. The size of 3 bedroom apartment is 1364.15 Sq. Ft.



Some of the facilities available in this apartment are ample green space, rich flora & fauna, Emergency backup power supply, Round the clock security, Natural ground water supply, Adequate parking, Lifts, Sewerage treatment system, street lights, Water Supply, Electricity, Land Line Telephone. Cable TV. Solar Water, Drainage

There are 21 respondents for this apartment. Total units of apartment are 262. The occupied units before earthquake are 195 and after earthquake 51. There are three towers of this apartment called apartment A (57 units), Apartment B1 (109 units), Apartment B2 (96 units). Each tower is 15 storied.



Occupants Background

Among respondents, 71% are male and 29% are female living in this high rise building. Occupants are generally Businessman (both Marwadi and Newar), Doctor, Air hostage, Pilot, Engineer, Bank manager, Students…etc.

Nationality: Almost 94.3% are Nepali, 4% Indians (basically from Sikkim and Darjeeling), 1% are Korean and 0.7% are Russian.

Cast: There are many Kshetri, then Brahman (Jha, Pokharel, Neupane…etc), Newar, Teraibashi and Dalits too.

Religion: Many are Hindu, then Christian, Buddhist, Muslim, Jain

Age: There are living more elder persons. Many elders are retired person from his/her professions.

Family Size: Almost 90% occupants are living with their families and 10 % not living with their family. The maximum percentage of family size is between 1-2(71.8%), then 3-5(24%) and over 5(4.2%).

Floors Occupied

Figure shows that 41 % occupy the 1st to 3rd floors, 28.5% occupy 4th to 5th floors, 20.5% occupy 6th to 8th floors, 9.5 % occupy the 9th-10th floors and 5 % occupy the apartments above the 10th floors.

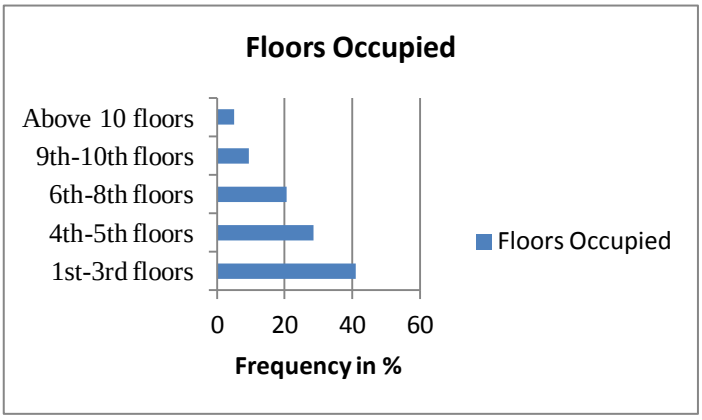
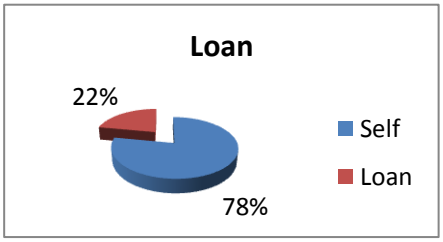
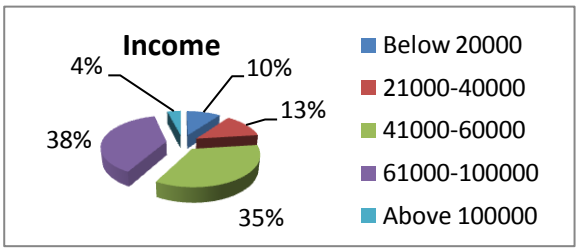


Fig.: Floors respondents occupied in the building.

Socio-Economic Status

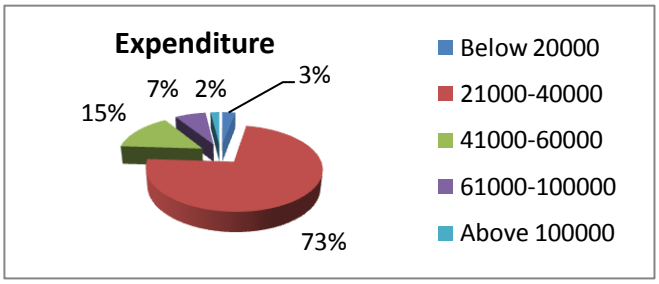
Loan: The survey findings showed that the majority 78% of the households has not taken loan to buy the apartment and only 22% of the household have taken the loan. Loan has been generally taken from bank.



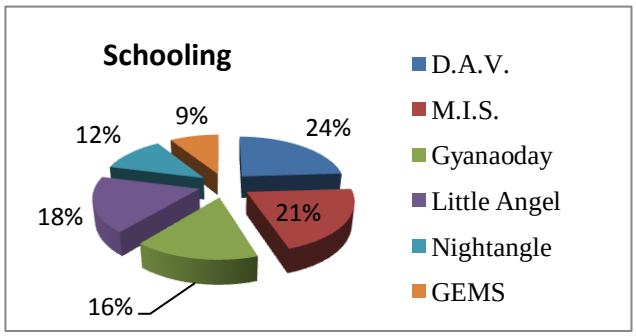


Income of Household Owner

Income Range: The high majority of income yearning range is 61000-100000 and majority value is 38% and above lakh only 4%.



Expenditure of Household Owner: On the expenditure category, majority about expense lies on the range 21000-40000 i.e. 73% and then 15% on the range 41000-60000.

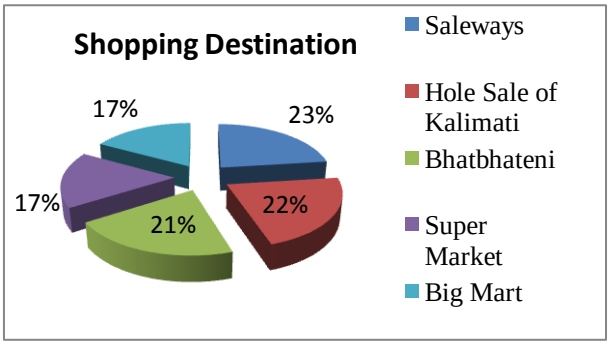


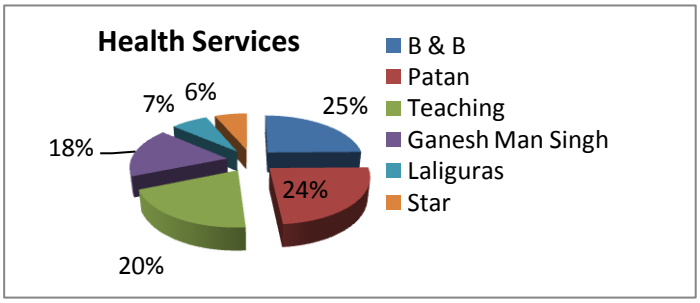
Schooling of Child

On the surroundings schools of this apartment, 24% of students go to DAV, then after 21% MIS and so on as in chart.

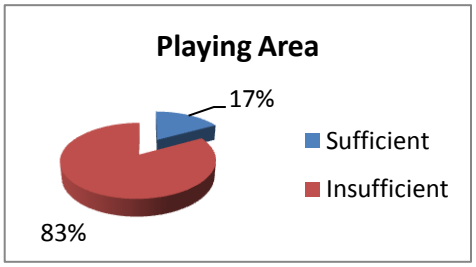
Shopping Demand

Generally, in large no. of occupants want to go Saleways, Hole sale of Kalimati, Bhatbhateni for shopping.





Health Services: On the health services surroundings facilities, many occupants around 25% go to B n B hospital and then 24% go to Patan hospital…etc.



Children Play Area: The 83% of respondent said that the children playing area is not enough i.e. insufficient.

Apartment has health club but no swimming pool. Jogging and morning area not so sufficient.

Occupancy Issues on Satisfaction Level of Occupants

Level of Satisfaction: Level of satisfaction was done under two sup topics, one is satisfaction about living this apartment and another is satisfaction about provided facilities, services and management.

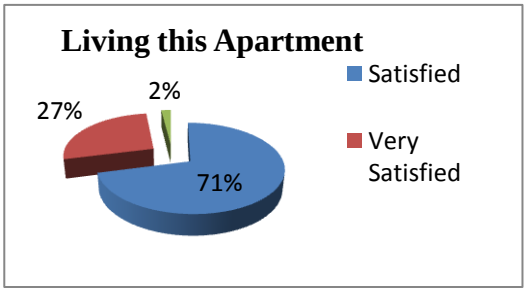


Table Satisfaction level with High Rise Living

	Unsatisfied (%)	Very Satisfied (%)	Satisfied (%)
Water Supply	3	73	24
Garbage disposal	5	79	16
Electricity Provision Backup	17	40	43
Smoke detectors	0	56	54
Phone services	13	37	40
Management of facility	8	78	14
Security & Safety	2	86	12
Noise Disturbance	0	89	11
Conducive overall environment	0	20	90
Thermal Comfort	5	69	26
Social & Cultural Perspective	29	30	41
Lift functioning	13	77	10
Accessibility (Road Netwrok)	1	18	81
Design of apartment	13	54	33
Provision against Emergencies(earthquake, fire…etc.	7	88	5
Noise from neighborhood	4	86	10

Earthquake Impact: Psychological fear created in the mind of occupants is slowly disappearing. Occupants who left apartment due to Earthquake are willing to come back. After repair and maintenance of apartment, more units of apartment will be again occupied.

Challenges Faced by Occupants

Table Occupants rating of challenges in high rise buildings

	Least important	Less Important	Moderately Imp	Very Important	Most Important
Structural Safety	4	5	21	11	59
Lift Problems	5	15	16	7	57
Problem with waste disposal	20	21	31	9	19
Safety/ security	21	27	25	22	5
Problem of operation/maintenance	20	15	31	27	7
Problem of operation/maintenance cost	7	28	29	12	24
Problem with detectors	5	21	25	35	14
Problem with location	22	9	43	17	9
Resilience of building	7	12	31	27	23

Table: Reasons for low occupancy of apartments

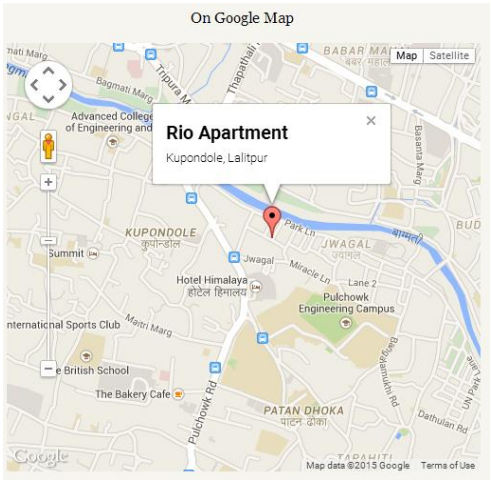
	Least Important	Less important	Moderately Important	Very Important	Most Important
Fear of height	20	3	44	25	8
Absence of community living	7	1	25	45	22
Safety concerns	8	12	38	32	10
Lift Breakdown Frequently	0	7	31	57	5
Provision of Emergencies	3	7	10	58	22
Fear of Earthquake	4	6	11	19	60

Suggestions and Comments: There must be the provision of checking of apartment by well trained foreigner technicians.

4.4.4 Rio Apartment

General Description

Rio Apartment is located at a prime location in Kupondole, Lalitpur built in about 2 ropani and 7 anna (13347.75 Sq. Ft.) of land is a true emblem of modern architecture. It comprises of 2 and 3 bedroom apartment units holding 28 apartment units in its 8 floors, the connecting portion at the 4th, 5th and 6th floors is truely innovative. Arriving into an outstanding façade from a simple rectangular plan was the main challenge of the project, the continuous play in projecting different sizes of boxes, thereby generating the interplay of extrusion and surface.



Rio apartment was developed by CE developers (Pvt.) ltd. in 2008. It consists of two types of units comprising of units having 2 bed rooms and 3 bed rooms. This apartment is targeted to the higher income group (HIG).

Apartment is well equipped with 24 hour generator backup, car and bike parking, fire fighting system, internet/wifi zone, lift system, security system and devices, society hall, TV/telephone points. The apartments comes with a modern kitchen, there is 24 hours hot water with a geyser or via the buildings hot water supply. The Living/dining room has a dining table for six, comfortable chairs with a sofa a flat screen TV and wooden floor.

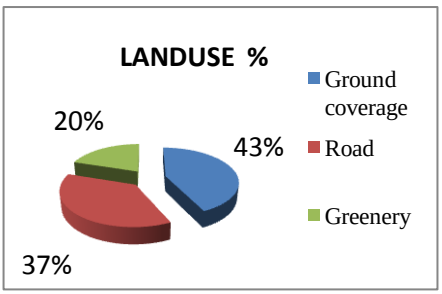
But unlike other apartment the occupants over here could not enjoy the facilities of basket ball/ tennis court, central air conditioning; children play ground, community shop, health and fitness club, laundry and dryer system, swimming pool. It has 5 meter black-topped access road width and is 500 meter from the main road.

Costs and the Area of Units

The unit with two bed rooms occupies the 1200 sq. ft of floor area and the unit with three bed rooms occupies the 1800 sq. ft. the cost of 2 bed room unit is NRs. 8163000.00 and the cost of three bed room unit is NRs. 12076000.00 in the year 2011 B.S. the cost of 2 bed room unit is NRs. 7000 in the year 2011 and now its NRs 8000 per square foot. The rent is also very high which $1100 per month. The parking charge is NRs 350 for one vehicle.

Customer Demand and Occupancy Ratio

The booking of apartment was started in 2067(2010 AD) during which 100% booking was done and till 2069, 12 units were occupied out of 28 units. Out of 12 units 8 are owner occupied and the 4 are rented. According to the office majority of the Newars are the owner of the units who do not themselves stay but rent the apartment and the customer demand is high. Before few months (i.e. before earthquake), the apartment is fully occupied.



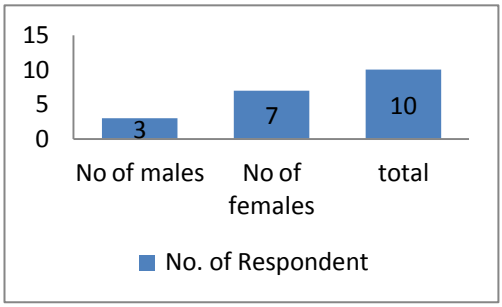
Land Use: 43% of the land area is covered by the plinth of the building. About 37% of the land area is covered by the road and 20% by the greenery.

Detail Description of Rio Apartments

S.N.	Description	Permissible sq. ft.	Actual sq. ft.	Total sq. ft.
1	Plot Area		13354.66	13354.66
2	Ground Coverage	50% (6698.75)	5757.689	43.11%
3	FAR	@3.0	.925	
4	Total Floor Area	40063.98		39056.033
5	Open Space,	30% (4006.37)	4904.766	4904.766(36.72%)

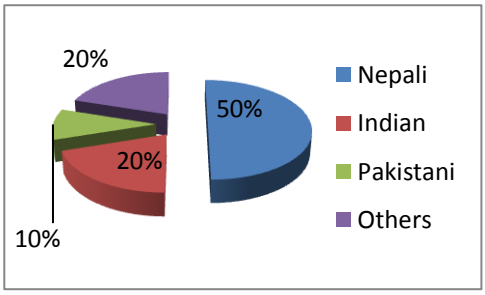
	Road			
6	Greenery	20% (2670.91)	2681.068	2692.79 (20.163%)
7	Set back			
	Front	6m	7.69m	
	Back	4m	4 M + 4.62m	
8	Parking			
	Car		28	
	Bike		40	

Occupants Information



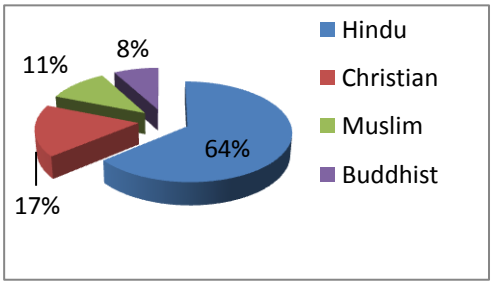
Gender Ratio: Out of surveyed households on in this apartment 30% of the population are male and 70% of the population are female.

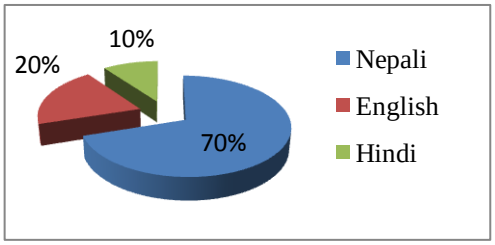
Household size: Most of the occupants have nuclear family in which 45% of household have 4 members in their family. 22% households have only 1 member and the household having 2, 3, 5 members accounts for 11%.



Nationality: Occupants from majority of the household in this apartment are Nepali 50%, Indian account for 20%, and others are 20% and 10% Pakistani stay there.

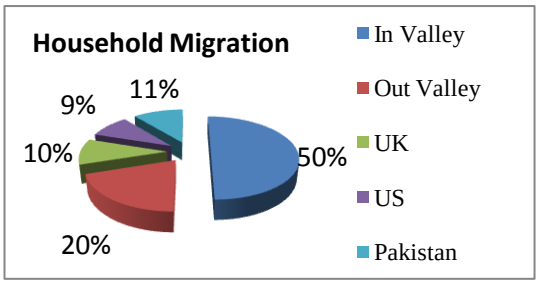
Religion: Most of the households (64%) follow Hindu religion. 11% of the household occupants is Muslim and other 8% of the household occupants is Buddhist and rest 17% are Christian.





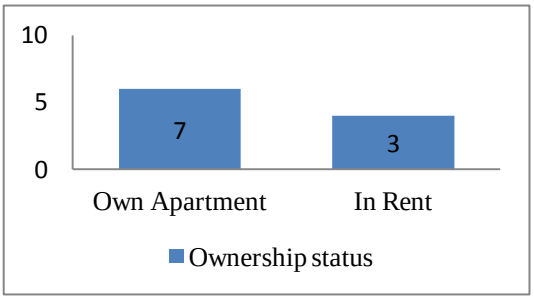
Language spoken: The occupant's mostly preferred speaking Nepali language (in about 70%) but 20 % of people like to speak English because they belong from US, UK

and 10% speaking the Hindi (India and Pakistan).



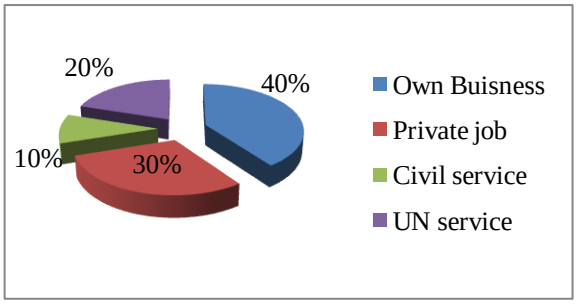
Household migration: The survey showed that most of the occupants renting in the apartment were the resident of Kathmandu valley which accounts for 50% of household and occupants from 20% of thee households are from places out of Kathmandu Valley. They used to reside in the rent in Kathmandu Valley and now they have bought apartment for having their own house in a safe and secured place as well to maintain their status whereas the others occupants are from foreign country. They are here for their job in UN services for temporary living.

Socio-Economic Status

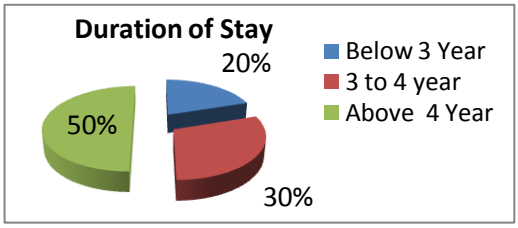


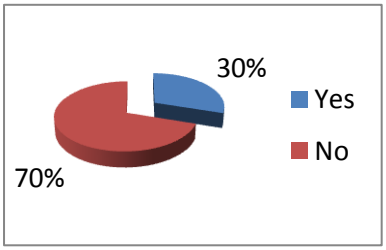
Ownership status: Out of the surveyed units people from 70% of the household lived in their own flat and the rest were resting in rent. Mostly the staffs from abroad country who are currently working in UN services were residing in rent.

Occupation: Unlike other apartment, majority of the occupants are engaged in UN services and their own business which accounts for 40% of the household and about 10% of the household had members both working in private offices as well as doing their own business and the same percentage of household had members working in government offices.



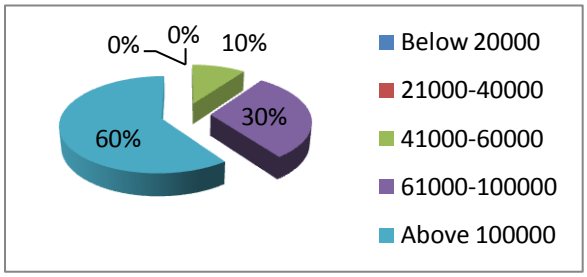
Duration of Stay: Most of the occupants have been staying in this apartment for four years.

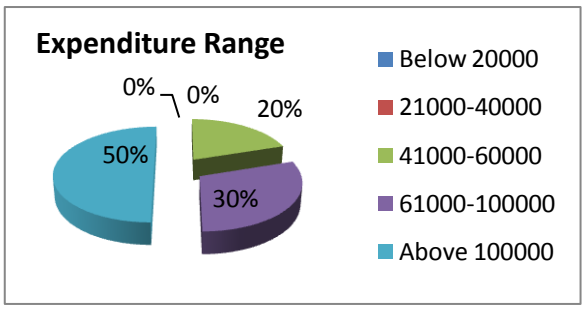




Loan: The survey findings shows that 90% of the household has no loan but 10% of the household has taken loan which means 1 household has taken loan from NMB bank at the rate of 14% interest rate and payback period of 10 years. According to the respondent, they need to pay 90000 per month for loan and the collateral was their own flat.

Income Range: The majority of income above 100000 is earned by 60 % occupants. The 30% yearns on the range 61000-100000. Then 10% of occupants lie on the range 41000-60000.

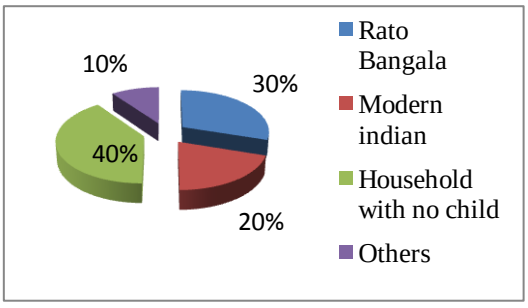


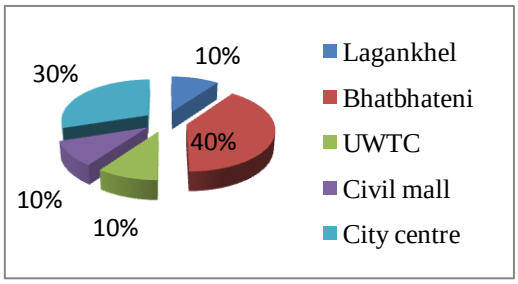


Expenditure Range: The maximum amount on expenditure of oocupant lies above NRs.100000. Then 30% in 61000-100000 and 20% on the range 41000-60000.

Social Infrastructure in and Around the Apartment

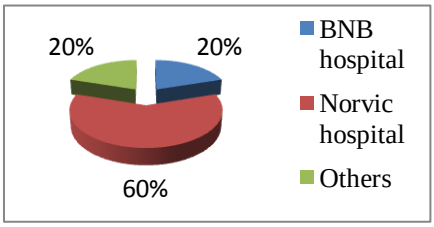
Schooling: In 50% of the household there are no children of the age going to school. 40% of the household send their children to high standard school like Rato Bangla and 10% of the household send their children to modern Indian school.



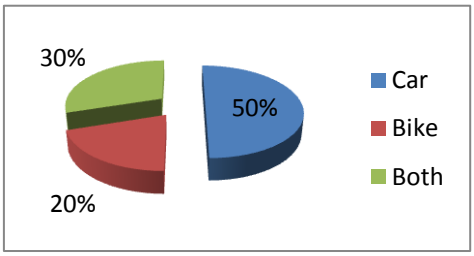


Shopping Destination: The most preferred shopping destination of the occupants is city centre according to the response of 40% of the household. Occupants from 30% of the household prefer going to civil mall for shopping and 10% prefer going to UWTC, other 10% of the household prefer

going to Bhatbhateni for shopping and the rest prefer going to Lagankhel. For buying daily consumption, goods and vegetables all most all the occupants prefer going to departmental stores than local market nearby.

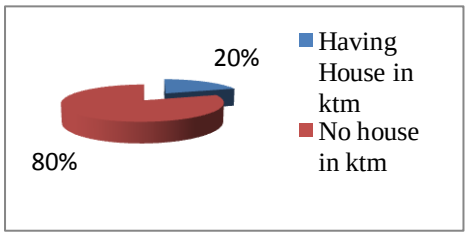


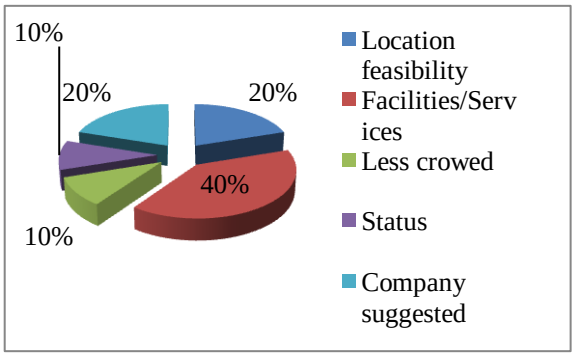
Health Services: Occupants from 40% of the household prefer going to B n B hospital and the rest preferred going to Norvic Hospital.



Transport (Vehicle Ownership): Majority of the household (60%) owned car as mode of transport, 30% of household owned both bike and car and bike for transportation and only 10% of household owned.

Property Detail: 20 % have house in KTM and 80 % do not have another house within KTM valley.





Reason for staying in apartment: The survey showed that maximum number of household (about 30%) has chosen this apartment for living because of location feasibility. Occupants from 20 % of the household chose this apartment not only due to location feasibility but also due to facilities, 20% because of fewer crowds and 10% also because their company suggested where as 20% of the household occupants is residing just for the sake of facilities, services and status. The problem of water supply and electricity has hit life style of people. Even though people can pay for extra facilities of water and electricity, government is not able to provide with it. And in apartment for those who can afford need just pay more and get more facilities.

Occupant's Perception towards Apartment

Occupants staying in this apartment are convinced with the living trend in apartment. When asking Choosing factors of this apartment to stay most of the occupants answered for these reasons; location feasibility, safety, security, provision of services, facilities.

The occupants responded that the location of the apartment is appropriate for the activities related to their employment and education of their children. The crime and misdeeds that is constantly going in the Kathmandu valley has no safety of life and property of an individual and the living in apartment provides safety and all the people living in the apartment are happy with the security systems of the apartment. Besides the crisis of services in the Kathmandu valley has been long term problem in Kathmandu valley and in apartment they are provided with water supply and electricity during load setting too and they pay for those very well. But at the same time they reveal that it's not easier for all general people of Kathmandu valley to afford the space, facilities and services of apartment because of the problem of unemployment, salary below ones skill level and less household income compared to expenses in case of developing country like ours.

In the apartment occupants can freely leave their house and there is no fear of property being theft and the household head can freely leave their family when they need to go outside valley for long duration. Some Indians who goes to India tours during holidays can securely leave their flats. The problem of pollution, traffic congestion in the Kathmandu valley is another factor that occupants is also the push factor to shift in apartment.

All the occupants are satisfied with the services of apartment and now they do not want to stay in the individual houses either in rent or individual house. Occupants dared to buy the flat in the apartment because the payment scheme is good. They need to pay 30% down payment and the rest installment can be cleared with the within the year of two years. If one cannot pay the cash amount the flat they have brought can be kept as collateral in bank to take the loan and repay the amount. Well, the amenities were less in all apartments however the respondent were not bothered about it because they think they no time to enjoy the amenities nor do their children have.

4.4.5 Kuleshwor Apartment

General Description

It is located in Kuleshwor, Kathmandu. Price of the flat is about NRs. 30 lakh. It has 5 meter access road width having black-topped road and 50 meter from the main road. It has 2 Bed Room type with 1 Bath Room and 1 Kitchen.

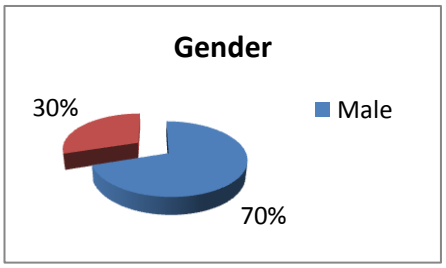
It delivers nice facilities about water supply, electricity, land line telephone, cable TV, and drainage.

This apartment flat is trustable structurally and affordable financially.

There are 10 respondents for this apartment. Total units of apartment are 108. The occupied units before earthquake are 108 and after earthquake 36. There are 5 blocks of this apartment called apartment A (24 units), Apartment B (24 units), Apartment C (24 units), Apartment D (24 units) and Apartment E (12 units). Each block is 6 storied. Some few occupants are living on rent too. The monthly rent charge is NRs. 15000 and basic services charge about NRs. 2000.

Occupants Background

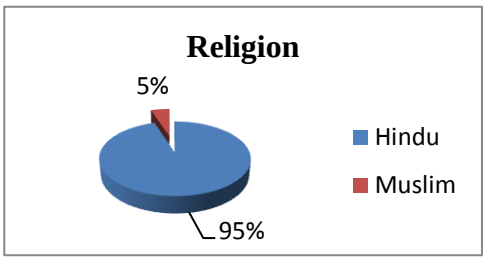
Among respondents, 70% are male and 30% are female living in this high rise building. Occupants are generally Businessman (both Marwadi and Newar), Professor, Engineer, Bank manager, Students…etc.

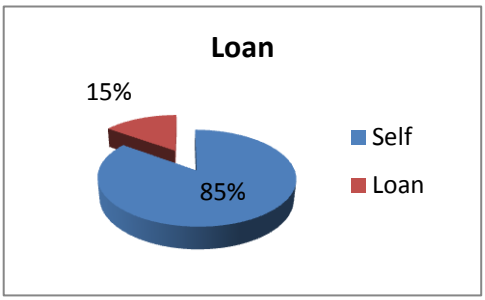


Nationality: Almost all respondents occupants are Nepali.

Cast: There are many Marwadi, then Newar, Kshetri, Brahman (Jha, Pokharel, Neupane…etc), too.

Religion: Many are Hindu (95%), and then some few are Muslim (5%).



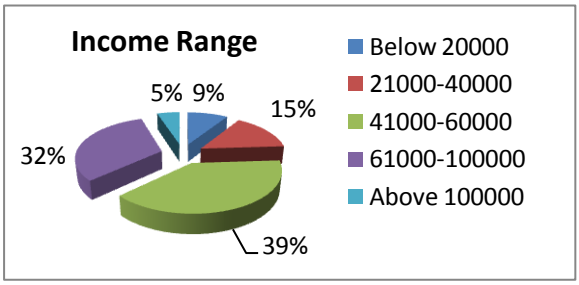


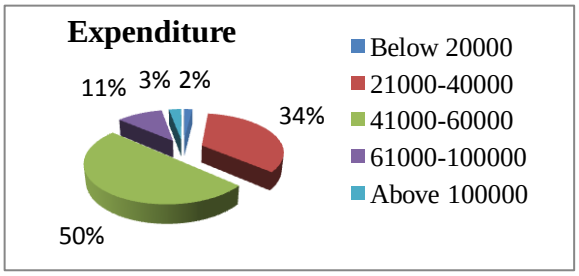
Socio-Economic Status

The survey findings showed that the majority 87% of the households has not taken loan to buy the apartment and only 13% of the household have taken the loan. Loan has been generally taken from bank.

Income of Household Owner

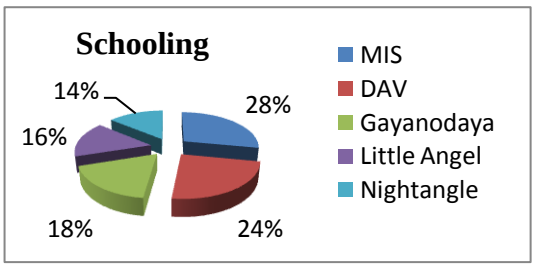
Income Range: The high majority of income yearning range is 41000-60000 and majority value is 39% and then 32% on range 61000-100000, above lakh only 5%.

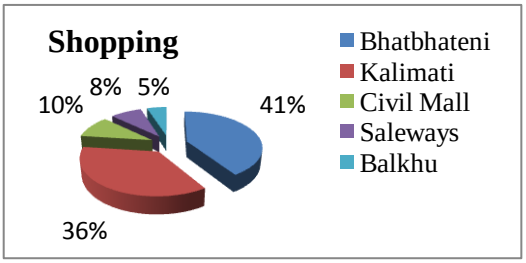




Expenditure: On the expenditure of occupants, majority lies on the range 41000-60000 i.e. 50% and then 11% on the range 61000-100000…etc.

Schooling: Maximum no. of students is from Modern Indian School i.e. 28%

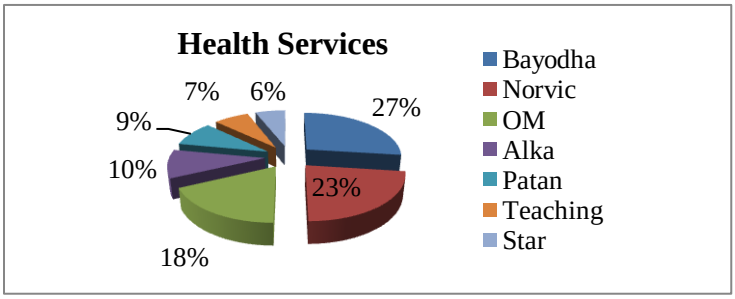




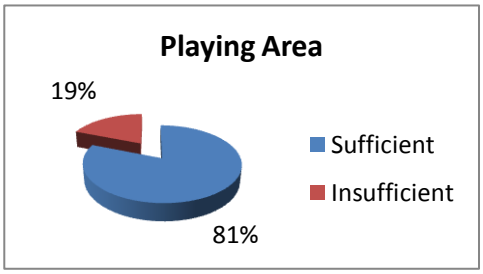
Shopping: For shopping purpose many uses Bhatbhateni (41%).

Health Services

Most of the occupants prefer to go Bayodha hospital. It is 27 % then 23 % go to Norvic…etc.

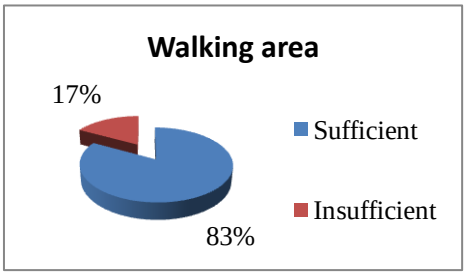


Recreational Activities



Children Playing Area: It was found one special apartment for children playing area as having sufficient as Suncity. But due to improper management of parking, this area is occupied by car parking and there is the chance of increasing no. of cars in near future so playing area will be scarce and also problem on parking space.

Jogging and morning walking area: Also jogging and morning walking area is sufficient in this apartment.



Apartment has no health club and swimming pool.

Occupancy Issues on Satisfaction Level of Occupants

Level of Satisfaction

Level of satisfaction was done under two sup topics, one is satisfaction about living this apartment and another is satisfaction about provided facilities, services and management

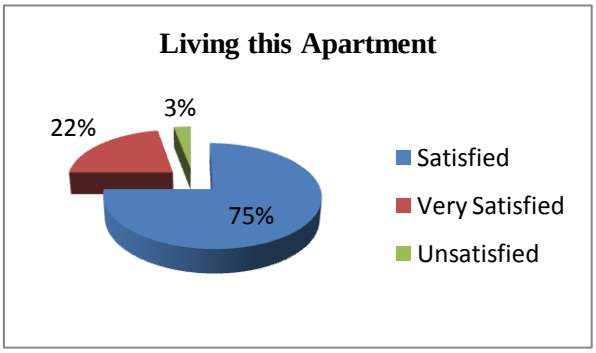


Table Satisfaction level with High Rise Living

	Unsatisfied (%)	Very Satisfied (%)	Satisfied (%)
Water Supply	2	70	28
Garbage disposal	6	63	31
Electricity Provision Backup	18	39	43
Smoke detectors	0	57	53
Phone services	11	35	54
Management of facility	7	72	21
Security & Safety	5	66	29
Noise Disturbance	0	74	26
Conducive overall environment	4	19	77
Thermal Comfort	7	70	23
Social & Cultural Perspective	17	18	65
Lift functioning	57	-	43
Accessibility (Road Netwrok)	1.5	18.5	80
Design of apartment	13	33	54
Provision against Emergencies(earthquake, fire…etc.	43	27	30
Noise from neighborhood	35	25	40

Earthquake Impact: Still one block is fully occupied as before earthquake. After repair and maintenance of apartment, more units of others block of apartment will be again occupied as it was fully occupied before earthquake.

Challenges Faced by Occupants

Table Occupants rating of challenges in high rise buildings

	Least important	Less Important	Moderately Imp	Very Important	Most Important
Structural Safety	5	6	20	11	58
Lift Problems	4	16	16	9	55
Problem with waste disposal	19	22	27	13	19
Safety/ security	22	26	24	22	6
Problem of operation/maintenance	18	15	33	25	9
Problem of operation/maintenance cost	8	29	31	10	24
Problem with detectors	4	22	28	32	14
Problem with location	20	12	40	17	11
Resilience of building	7	11	32	29	21

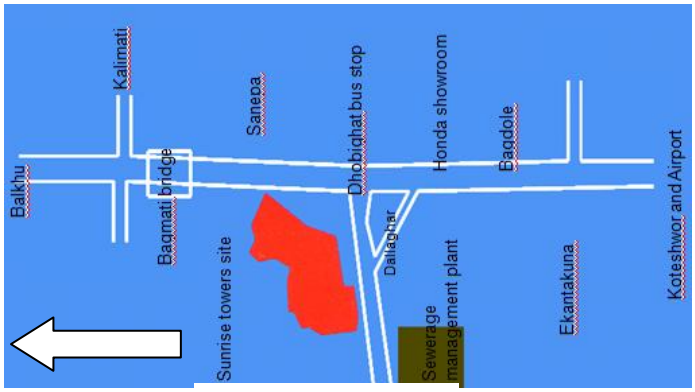
Table: Reasons for low occupancy of apartments

	Least Important	Less important	Moderately Important	Very Important	Most Important
Fear of height	20	44	25	8	3
Absence of community living	22	45	25	7	1
Safety concerns	9	11	39	31	10
Lift Breakdown Frequently	0	7	56	32	5
Provision of Emergencies	3	7	58	12	20
Fear of Earthquake	4	7	10	18	61

Suggestions and Comments: There must be the provision of gardening in open space for aesthetical view. Scarcity of parking space and there is chance of losing open space to due increasing parking area.

4.4.6 Sunrise Towers

General Description: Sunrise Towers is an ambitious launch of a development for a Group Housing Complex with options of Independent Homes and Bungalows. There are available of flats and efficiency apartment with state of the Art design under expert guidance of I.I.T. Chennai for earth-quake resistance and structural safety. There are three bedroom type of apartment available in Sunrise Tower. The price of apartment starts from Rs. 69 lakh onwards. Area of apartments is 1000/1100 sq. ft. Site area: 22 Ropanis.



Location plan

Infrastructural Facilities	Specification
Rich ambience Backup Power for common facilities 24hrs water supply Round the clock security Intercom Facility Close vicinity to Ring Road	**Structure:** RCC frame structure **External Finish:** Superior Paint **Internal Finish**: Flooring and Dado ceramic tiles, Kota, Vitrified tile, ISP. **Wall/Ceilings**: Pop and Distempers **Toilet/Kitchen:** Standard fixtures and CP fittings provision for geyser point for hot water stainless steel kitchen sink with granite work top. **Joinery:** Hardwood for door and windows frames, enamel painted **Electrical Work:** Concealed conduits with copper with copper wiring with provision for two telephone and TV points and modular switches.

(Source: Housingnepal.com)

Costs and the Area of Units

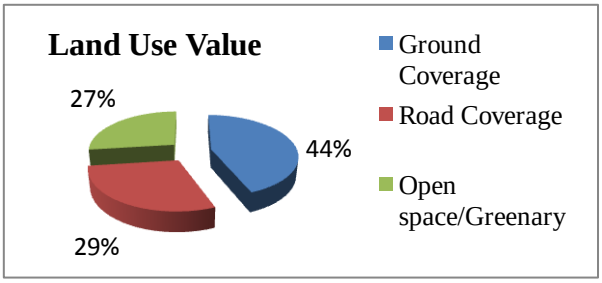
The unit with two bed rooms occupies the 722 sq. ft of floor area and the unit with three bed rooms occupies the 1100 sq. ft. the cost of 2 bed room unit is NRs. 43 lakhs and the cost of three bed room unit is NRs. 69 lakhs. Similarly, for 4 bedroom having area 1634 sq. ft costs NRs. 98 lakhs. At B.S. 2064, the cost of 2 bedrooms, 3 bedrooms and 4 bedrooms are NRs. 17 lakh, 25 lakh and 31 lakh (Shrestha, 2012). The inflation of building materials, high labour costs and land prices as well as customer demand had hit the price of apartment in Kathmandu. The cost per square foot of area in this apartment was NRs. 3000 in 2064 while from 2012, it had doubled. The cost square foot of area is NRs. 6000. The renting charge varies from NRs. 15000 per month to NRs. 30000 per month depending upon the furnishing of the unit.

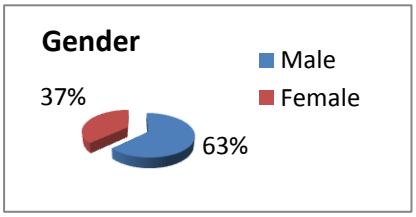
Customer Demand and Occupancy Ratio

The booking of apartment was started in 2064 during which 50% of the units were booked and in 2065, booking became full i.e. 100%. All the units were occupied till 2068. Then after a year, 25% units were vacant because some occupants moved abroad and some went to stay in bungalows.

Before earthquake, again almost all units are occupied. There are 180 apartment units and 20 bungalows. Some technical company like Chinese HAWAI Company had taken the flat on rent for their employee before earthquake. After maintenance of the apartment, they again want to return back. After earthquake, just around 52 units are occupied by owner. Currently, almost negligible people living on rent. The target families were the HIG but mostly MIG are found to be living in the apartment.

Land Use: 44% of the land area is covered by the plinth of the building. About 29% of the land area is covered by the road and 27% by the open space/greenery.

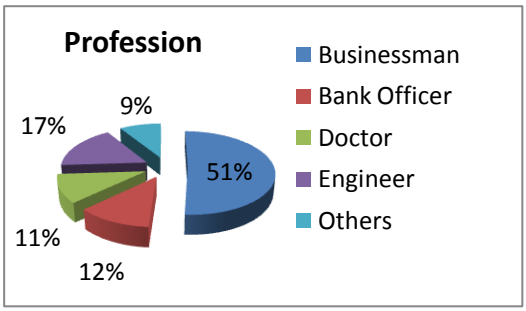




Occupants Background

Gender: Out of surveyed respondents, 63% are male while 37% are female.

Ethnicity: Most of the occupants living in this apartment are Marwadi. They are living in Kathmandu more than 50 years. They sold their own land and bought this apartment on own ownership.



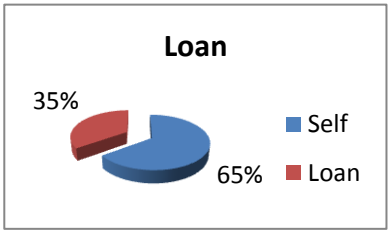
Religion: Almost all are Hindu.

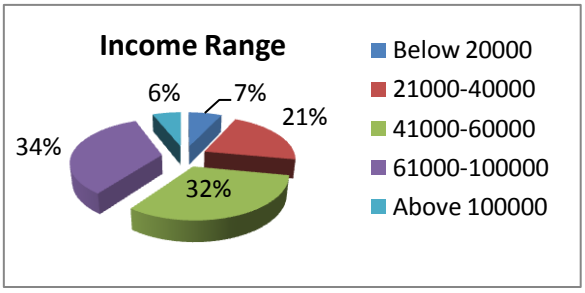
Profession: Majority of surveyed respondents are found Businessman almost 51%

Language Spoken: The most useful and preferable spoken language among occupants is Nepali. But, there is no more difference in percentage of people speaking Hindi.

Socio-Economic Status

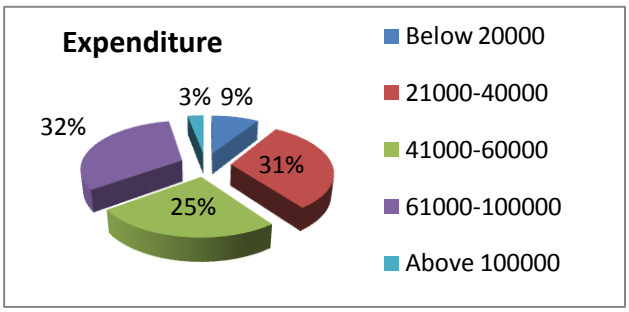
Loan: The survey findings showed that the majority 65% of the households has not taken loan to buy the apartment and remaining 35% of the household have taken the loan. Loan has been generally taken from bank.



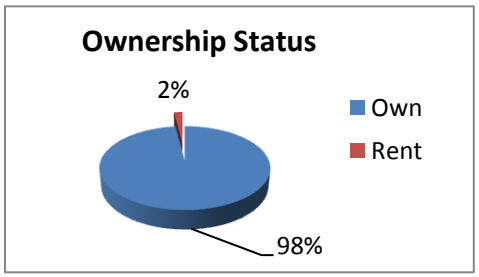


Income Range: Findings show that the majority of the household i.e. 34% have income ranging from NRs 61000 to 100000. Then after 32% shows on the range 41000 to NRs 60000. 21% of households account on the range 21000 to 40000 and only 6% of household's incomes exceed NRs 100000 while 6% have below 20000.

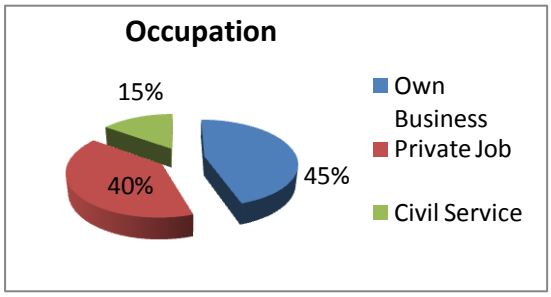
Expenditure: 31% of household have expense equal to the income ranging from NRs 21000 to NRs 40000. 25% of the household have expense ranging from NRs 41000 to NRs 60000 and



9% of household have expense below NRs 20000. 32% of the household have ranging from NRs 60000 to NRs 100000 and above 100000 are 3 %.



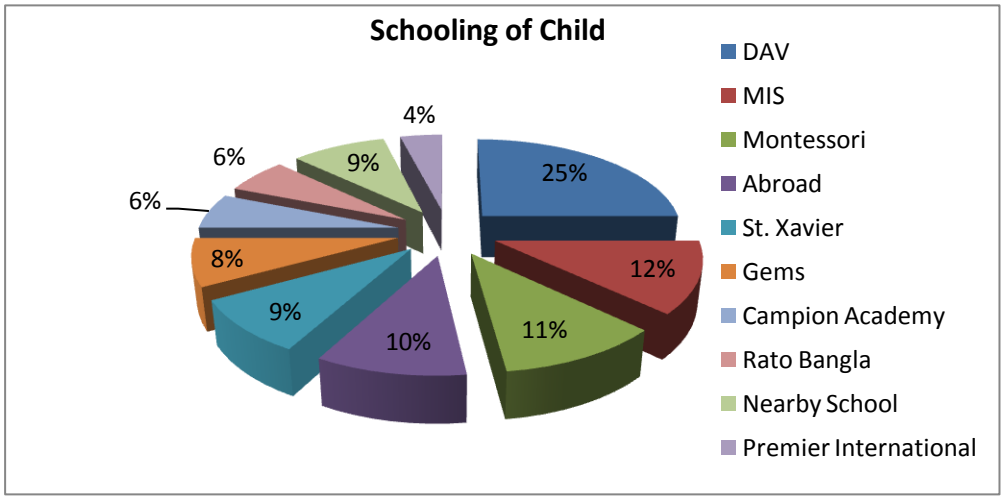
Ownership Status: Currently, there are living who has bought this apartment by own self. Before earthquake, Chinese lived on rent provided by the Company HAWAI Technology.



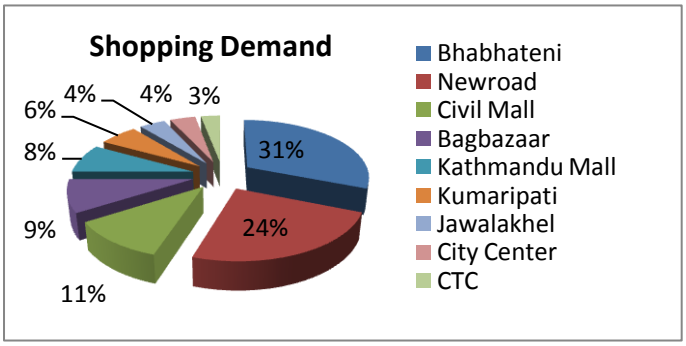
Occupation: In this apartment, most of the occupants have their own business (45%). Also private job holders are in maximum no. i.e. 40%

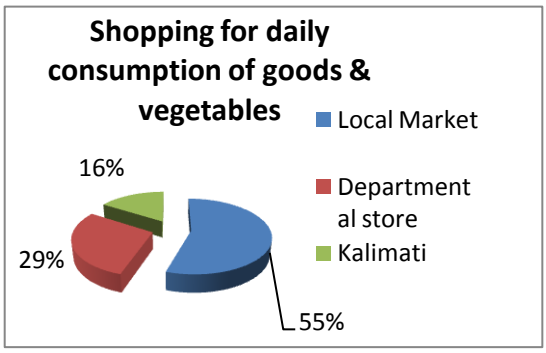
Social Infrastructure in and Around the Apartment

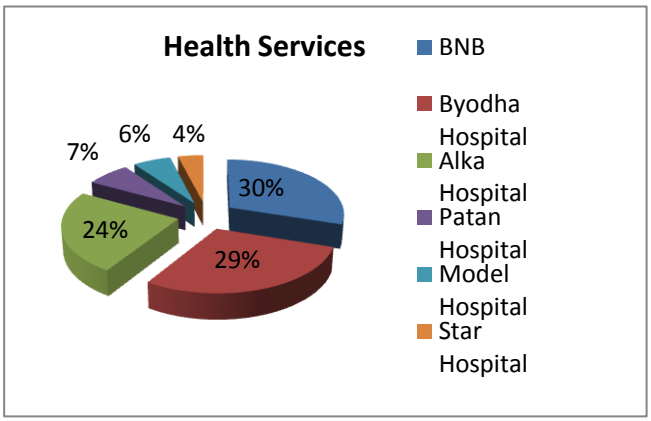
Schooling of Child: The majority of students going to DAV school is high i.e. 25%, then after Modern Indian school, Montessori, St. Xavier, Gems etc.



Shopping Demand: The household survey shows that the majority of occupants use Bhatbhateni for shopping destination i.e. 31%, then after Newroad (24%).



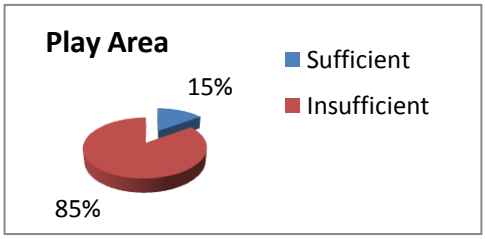


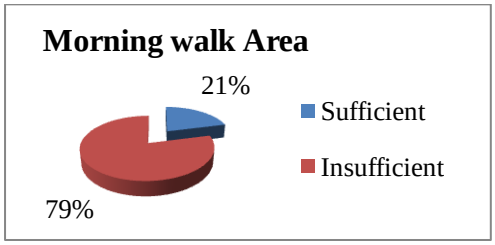


Health Services: For treatment majority of household are using BNB and Byodha hospital almost equal in percentage i.e. 30%, 29%. Then after Alka hospital is preferred.

Recreational Activities

Children Pay Area: In this apartment, there is no sufficient facility about children paying area. Majority of respondent (85%0said it is insufficient Jogging, Morning Walk Area





Occupancy Issues on Satisfaction Level of Occupants

Level of satisfaction

Level of satisfaction was done under two sup topics, one is satisfaction about living this apartment and another is satisfaction about provided facilities, services and management.

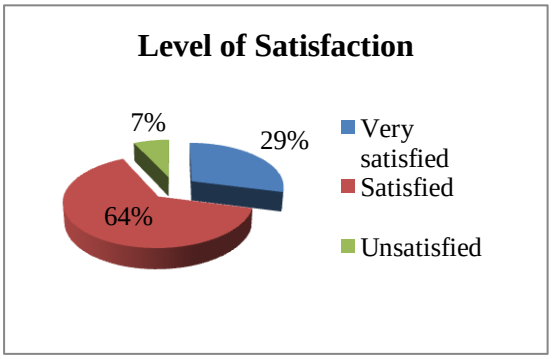


Table Satisfaction level with High Rise Living

	Unsatisfied (%)	Very Satisfied (%)	Satisfied (%)
Water Supply	4	45	51
Garbage disposal	3	35	62
Electricity Provision Backup	19	35	46
Smoke detectors	2	55	53
Phone services	10	39	51
Management of facility	31	20	39
Security & Safety	2	51	47
Noise Disturbance	0	47	53
Conducive overall environment	1.5	44.5	54
Thermal Comfort	2.5	41	56.5
Social & Cultural Perspective	25	32	43
Lift functioning	15	30	50
Accessibility (Road Netwrok)	2	39	59
Design of apartment	4	45	51
Provision against Emergencies(earthquake, fire…etc.	8	43	49
Noise from neighborhood	3	41	56

Above table shows about the satisfaction level of provided facilities and services. On analysis of above data, it was found that 51% occupants are satisfied with water supply and 45% are very satisfied. Similarly, satisfied 62 % from garbage disposal, 46 % from electricity provision, 51% from phone services, 53% from noise disturbance, and 54 % from overall environment…etc.

Challenges Faced by Occupants

Table Occupants rating of challenges in high rise buildings

	Least important	Less Important	Moderately Imp	Very Important	Most Important
Structural Safety	8	11	23	30	28
Lift Problems	3	19	27	28	23
Problem with waste disposal	23	26	20	24	7
Safety/ security	25	23	19	21	12
Problem of operation/maintenance	5	11	21	35	28
Problem of operation/maintenance cost	6	10	23	36	25
Problem with detectors	11	20	32	21	16
Problem with location	20	38	31	6	5
Resilience of building	4	12	33	30	21

On rating the challenging factors of apartments which are faced by occupants, many occupants rated moderately important, very important and most important on structural safety i.e. 23%, 30%,28%. Similar way they rated mod. Important and very important on the issues of lift problems i.e. about 27% and 28% and so on as shown above in table.

Table: Reasons for low occupancy of apartments

	Least Important	Less important	Moderately Important	Very Important	Most Important
Fear of height	5	17	45	16	17
Absence of community living	21	4	42	24	9
Safety concerns	8	3	22	44	23
Community Interaction	7	13	39	32	10
Lift Breakdown Frequently	0	8	30	55	7
Provision of Emergencies	4	9	11	53	23
Fear of Earthquake	5	8	14	31	42

From this above data table analysis, it can be found that the majority on fear of height is moderately important factor causes not living in tall buildings. In percentage, it is 45%. Similarly, on the majority base, 42 % occupants are saying absence of

experience is mod. important fact for causing not living in high rise. On the safety concern for not living in high rise buildings, the majority (44%) shows very important. On the same way, the majority (55%) shows very important about lift breakdown causing not living in high rise and also same importance for Provision of Emergencies (53%). There is another very important fact which causes not living in high rise buildings is 'fear of earthquake' 53%.

Impressive Factor: Location, safety, security and facilities are most impressive factor among respondents.

Suggestions and Comments: There was the provision of swimming pool on the site where currently block D is standing. More people suggest there should be enough children playing area, swimming pool facility, Wi-Fi zone, ATM …etc.

4.5 Post Earthquake Occupancy

To check the post earthquake occupancy some more apartment are also studied as brief case study. Under this category, Candidate has studied general description and occupancy level of apartments before earthquake and after earthquake. For example: Bhatbhateni Apartment, Dhumbarahi Apartment, TCH Tower II (Lazimpat), Prestige apartment (Chandol), Central Park (Bishalnagar), Moksha Apartment (Naxal), Ace apartment (Naxal), City View apartment (Bakhundole), Indreni Apartment (Bhatbhateni).

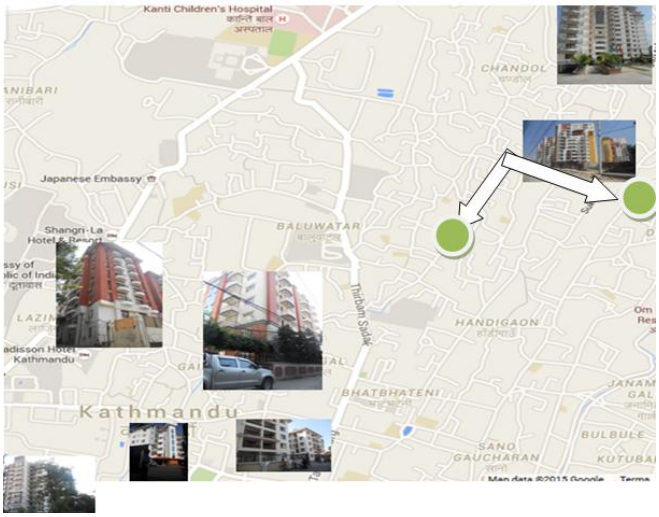


Figure: Google Map Location of Selected Apartments for occupancy rate

Note: Above apartments occupancy rate before and after have been shown in analysis chapter.

CHAPTER5: DATA ANALYSIS

5.1 Comparative Analysis

5.1.1 Analysis on Occupancy Level of Apartments

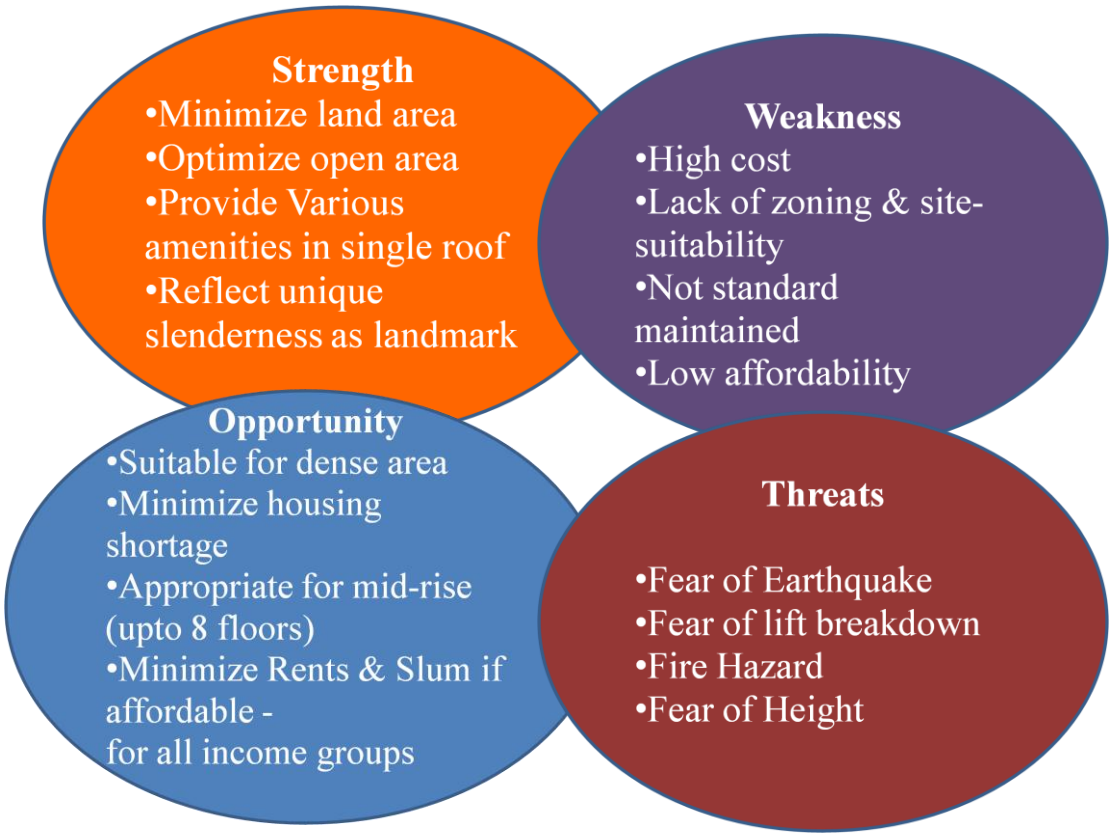
Name of Apartment	Total Unit	Occupied Unit (Before Earthquake)	Occupied Unit (After Earthquake)	Occupancy Rate (%) Before Earthquake	Occupancy Rate (%) After Earthquake
Guna Colony	160	143	110	89.37%	68.75%
Sunrise Tower	180	167	51	92.777%	28.333%
Suncity	500	220	110	44%	22%
Sunrise	262	195	51	74.427%	19.465%
Rio	28	28	0	100%	0%
Kuleswor	108	108	36	100%	33.33%
Some apartments which has been selected for occupancy level only					
Indreni	59	49	59	83.05%	100%
Dhumbarahi	163	163	154	100%	94.47%
Bhatbhateni	40	40	40	100%	100%
TCH Tower	36	36	36	100%	100%
Central Park	190	95	51	50%	26.842%
Moksha	9	9	9	100%	100%
Ace	56	56	56	100%	100%
Apartments having null occupancy after earthquake					
City View	48	17	0	35.41%	0%
Civil Homes	152	77	0	50.65%	0%
Prestige	46	18	0	39.13%	0%
Cityscape	420	200	0	47.62%	0%

5.1.2 SWOT Analysis

Name	Strength	Weakness	Opportunity	Threat
1. Sun City	Highly facilitate, amphitheatre, playing area sufficient,70% open space, good services,	Earthquake-cracks (Structurally damaged), Low occupancy rate after	Walking trail, Occupancy rate increases after maintenance	Fear of earthquake, fear of height

	location, security	earthquake		
2. Guna	Inside ring-road, affordable for HIG & MIG, 50% open space, 89%% Occupied before Earthquake	near to the Airport , only 3BHK type, Low occupancy rate after earthquake	Occupancy rate increases after maintenance	Fear of earthquake,
3. Sunrise	All types of flat, near to ring road, Affordable for MIG & HIG	No swimming pool, open space but not good enough, Low occupancy rate after earthquake	Occupancy rate increases after maintenance	Fear of earthquake, fear of height
4. Rio	Location feasibility, affordable for HIG before earthquake, Fully occupied before earthquake	No swimming pool, less open space, Null Occupancy rate after earthquake	Occupancy rate increases after maintenance	Fear of earthquake, very near to river
5. Kuleswor	Storey ht. low, good location Fully occupied before earthquake	No swimming pool, Parking problem, Low occupancy rate after earthquake	Occupancy rate increases after maintenance	Fear of earthquake, very near to river
6. Sunrise Tower	Nice Architecture façade design, good location, affordable for HIG & MIG, 92% Occupied before Earthquake	Not swimming pool, less open space, not 24 hours backup facilities, Low occupancy rate after earthquake	Chinese Hawai company rent for their workers after maintenance	Fear of earthquake

5.1.3 Overall SWOT Analysis



5.1.4 Attraction of Apartment

5.1.4.1 Comparative Analysis of Different Criteria of Apartments (Under Detail Case Study)

For analysis, candidate have developed some parameters related to the attraction of apartment which are:- Good services & facilities, affordability, safety and security, location feasibility, personal performance, relationship with neighborhood, best housing for Nepalese, family environment, less crowd…etc.

Criteria	Suncity	Guna	Sunrise Tower	Sunrise	Rio	Kuleshwor
Good services & facilities	87%	80%	61%	65%	74%	70%
Affordability	86%	67%	82%	70%	60%	81%
Safety and Security	84%	79%	75%	60%	65%	70%
Location feasibility	40%	65%	87%	85%	90%	91%
Personal performance	26%	45%	65%	67%	70%	51%
Relationship with neighborhood	83%	75%	58%	57%	50%	60%

Best housing for Nepalese	58%	61%	63%	50%	47%	57%
Family Environment	65%	60%	55%	50%	35%	62%
Less Crowd	83	71	69	75	65	67

Affordability: Table shows that Rio has less affordability. The reason behind it is that its flats are highly lavish. Interior is more lavish in comparision with another. Materials used for such purpose are expensive. Due to such reason, there is only HIG occupants in this apartment.

Suncity apartment gets majority i.e. 86% on good affordability, then after Sunrise tower 82% and Kuleshwor 81%

Good services & facilities: It was found that there is the high accepting majority about good services and facilities in all six apartments. Out of them Suncity have high rank then after Guna and Rio.

Safety and Security: Almost all apartment shows high safety and security provision but comparatively more high in Suncity then Guna.

Location Feasibility: Kuleshwor and Rio apartment got high remark on location feasibility then after Sunrise Tower.

Relationship with Neighbourhood: Suncity has high percentage of majority i.e. 83% about good neighbours; then after Guna has 75%

Less Crowd: Again Suncity gets high percentage on less crowd i.e. 83%, the after Sunrise has 75%.

5.1.5 Analysis about Social and Cultural Perspective of High-rise Residences

Saying on social and cultural perspective about various apartments, it was found that Guna has 48.5% satisfaction while 32.5% very satisfied and only 19% unsatisfied. Similarly, in Suncity, highest percentage i.e. 51% is satisfied and only 14% are unsatisfied. Sunrise has 41% majority only in satisfaction and it has highest 29% unsatisfied with the comparision of others. There are highest majority about this perspective satisfaction is 65% from Kuleshwor and Sunrise has 43% satisfaction and 32% very satisfied.

5.1.6 Analysis about feelings of Thermal comfort of High-rise Residences

To say about the feelings of thermal comfort asked by respondents living in various apartments, it was found that satisfaction percentage of Guna's residence is 63.3% in majority while 33% is very satisfied and only 3.3% is unsatisfied. On the similar manner, Suncity has 35% satisfied, 60% very satisfied and 5% only unsatisfied and Sunrise has 69% very satisfied while only 5% unsatisfied. Kuleshwor has 70% very satisfied and only 7% unsatisfied. Sunrise Tower on this topic has majority of satisfied as 56.5% and then very satisfied as 41%

5.2 Summary of Post Earthquake Occupancy Level

After the earthquake, the occupancy rate has highly decreased in some apartments. Some of has zero occupancy rate after earthquake. Maintenance and repair of apartment has been started since it was damaged by earthquake. After finishing maintenance work, occupants return back for living. Some are returning in this stage too. Candidate has done detail case study of those apartments which has large no. of occupants; also living after earthquake. Psychological impact of earthquake on occupants was high during few months. But now decreasing & people who had left apartment coming back to live.

One of the interesting fact about Indreni apartment is that there were some unoccupied unit but after earthquake totally fulfilled. Such effect is called ***spilled over effect.*** Apartment labeled as green sticker means safe to live has almost 100% occupancy rate.

CHAPTER 6: FINDINGS

6.1 Findings/Inferences from National case study

6.1.1 Overall Findings of National Apartment

Cost of apartment/ Target group: None of the apartments in case study was targeted to the LIG people. The cost of area per square foot is above 11340 NRs. implies less affordable for the LIG. In Singapore we can see that Public Housing schemes are affordable to LIG. Also it is the scheme in India for LIG and EWS people; but in our context, it is neither in the scheme of government nor it in the private developers. Therefore, policy measures are needed.

Facilities: It was found that apartment is reliable for living because of availability of various amenities such as safety, affordable, security, services as well as locational feasibility. The migrants and the local resident of Kathmandu are facing the problem of traffic congestion, crowd, pollution, insecurity to lives, lack of infrastructures like improper water supply, drainage, electricity, less socialism especially in case of migrated people. All these are the push factor for shifting to apartment.

Location: Location of an apartment is one of the most important factors for Higher Income Groups and relatively Upper Middle Income Group family, because of easy access to public transport to go to markets as well as work places.

Due to central core area, Rio, Kuleshwor, Guna have high location feasibility and remains are easily accessible from ring road.

Attraction of apartment: On the findings basis, it was found that the *impressive factors* behind the attraction of apartment is location feasibility, high amenities, safety and security, good neighbor, less Crowd and affordable.

Motivation: The need for full infrastructure dwelling unit is acute in Kathmandu. People are busy in their works; to meet the demand of their housing need they are more interested in readymade houses. The large chunk of land inside Ring road so keeping in view of people's interest developer was motivated into this field. They often remarks investing money in housing sector is like safe parking of money.

Unit Handover: Almost all the units are handover in Kuleshwor apartment. But out of 500 units only 317 units are handover in Suncity and there is still need to complete handover in Guna colony.

Unit Price: In Suncity price rise depend on orientation i.e. south facing flat has high price. In others price rise depend on floor height and area of flat as increasing up.

Unit Type: Guna has only 3 bedroom type. Other has more than one type.

Site Boundary: There are 50% apartment has been taken from Kathmandu district and 50% from Lalitpur. Similarly, 50% apartment lies inside the ring road while 50% outside.

Ownership Status: Almost 90-95% occupants have their own flat while only 5 to 10% are on rent after earthquake.

Developers: Developers of all apartments are different

Running Service Charges (Monthly): It is needed to pay some amount of per month for security, water, cleaning, maintenance, electricity (for corridor and apartment lightening) and other activity. The amount is calculated based on flat's area. It's about NRs.1500. One of the occupants of Dhumbarahi apartment having a flat with 3BHK and 2 toilets the largest one in that apartment pay around NRs.1500 /month. Ones separately need to pay their electricity bills. Similarly, service charges for Kuleshwor apartment around NRs. 2000. So service charges ranges from NRs. 1500 to 2500.

Open Space: It was found 70% of open space in Suncity having nice greenery, then after Guna has 50%. Except these, all apartments have less or equal to 20 %. Suncity has neat and clean healthier environment having welcoming entry gate fountain, amphitheatre, large open space, sufficient children playing area. Others have not sufficient walking and playing area.

Suncity has some unique characteristic i.e. availability of Amphitheatre for cultural performance not others have.

Swimming Pool: Except Suncity and & Guna no other has swimming pool.

Educational Level of the occupants: Most of the occupants living in apartments are found to be bachelor.

Satisfaction Level: General satisfaction level of occupants of apartment is normal not as high as in foreign apartments.

In few cases, occupants are satisfied for e.g. basic facilities, securities and services but they are unsatisfied with open space where many leisure and recreational activities are occurred.

Social & Cultural Perspective: Although there is no high percentage above 90% found in any apartment for satisfaction on this concern, majority has accepted it socially and culturally. More acceptances have gotten from Suncity and then Kuleshwor and Sunrise Tower…etc. High-rise should be socially and culturally accepted.

Thermal Comfort: Almost all apartments' occupants said high percentage of satisfied feelings about thermal comfort. In some apartment, it was found more than 90%. Since, there is no high experience of A.C. system and thermal comfort by Nepalese may it got highest percentage as lacking of quality experience. It enhances the level of occupancy of high-rise should be well facilitated.

Social Structure: Generally, nuclear families are found to be occupying the apartments. There are no boundaries for specific traits of culture, religion, language, ethnicity, norms and values to reside in the apartment; however people belonging to same ethnic group tend to form a group within themselves. In Guna Colony, majority of people are Brahmin whereas there is mix kind of traditions in Sunrise, Suncity, Kuleshwor and Rio Apartment. In this apartment majority of groups are found to Marwari and Newars i.e. most of the occupants are businessman. Sunrise Tower, Kuleshwor has more Marwari.

Social Discrimination: Apartment shows disparity in the society. Housing inequality refers to the differences in the quality of housing that exist within a given society. Housing inequality is directly related to concepts of social inequality, income inequality, and wealth inequality. Housing inequality is also often linked to discussions of poverty. This is because it can be seen as both a cause and effect of poverty. Residential inequality is especially relevant, and the scenario of Rio situated to the left bank of Bagmati does not seems to be in connotation with the squatters residing to the next bank, clearly depict the social disparity in the areas between haves

and haves not. One side of living is narrated by high living status in the society, satisfaction of secured living while the other side shows the poverty, insecure living and discriminated society. Despite, apartment has provided employment opportunities to the people like maids of households, security guards; cleaners etc. but these people cannot afford it.

Social Curriculum: Despite the mass vertical structure of apartment, horizontal spaces are equally important as children play space, green spaces, meeting spaces for old age people etc. Despite having fewer amenities in the apartment, occupants do not have any complain about such scarcity of sufficient open space for recreational and leisure activities to boost the mind, health and body in proper way. Such essential demand ignored by people due to the busy schedule of their work and children education. People have become workaholic than social. The social dimensions are slowly declining. But it was found opposite in case of Sun-city, there are nice environment having sufficient open space and available of amphitheatre to perform various kinds of activities.

Schooling: Nearby apartment schools are also famous but more popular are MIS (Modern Indian School), DAV, Gems, Rato Bangla…etc.

Shopping: For shopping Bhatbhateni is most preferable place then Big Mart, Civil mall etc.

Health Services: For health services, Alka, Bayodha, Norvic, BnB, KMC, Teaching, Patan etc. are famous

Economic Activities: Mostly people engaged in private business. The income of household in apartment is higher most of the case greater that NRs. 41000 per month. Average household income of Nepalese according to Nepal Living Standard Survey 2010/11 is NRs. 16864.58 per month. So, the income of average Nepalese is not enough to sustain their life in a better way and occupy such highly facilitated buildings.

Income of occupants: Large income yearning on the range NRs.61000 to 100000.

Expenditure of occupants: Large expenditure on range 41000 to 6000

Business and service background: Most of the people living in that apartment were mostly high income groups and then middle income who were mainly involved in the trading and business activities and working in INGO's. Thus there is found the majority of Businessman. Very few people involved in the government job were living in these apartments.

Impact of Earthquake: All apartments have needed to maintain for creation well living environment after earthquake. Earthquake impact is going slowly down and occupants are returning back and hoping is that after complete maintenance almost all come back who left it.

There is no structural impact from earthquake impact on some apartment like Indreni, Bhatbhateni, TCH Tower, Dhumbarahi…etc and so already fully occupied.

Pre Earthquake Occupancy: Few months ago, before the earthquake the occupancy rate of some apartments is very high like Guna had 89%, Sunrise Tower had 92 and Rio and Kuleshwor had 100%. Similarly, some other apartment like Indreni, Dhumbarahi, Bhatbhateni, Comfort Housing...etc. has still 100% occupancy rate. There is almost no change in occupancy rate of such apartment as being safe from earthquake.

Post Earthquake Occupancy: Due to recent earthquake the occupancy rate of apartments are highly decreased in the comparison of before earthquake scenario. In some apartment, it was found null occupancy rate after earthquake. But, as fear of earthquake is slowly decreasing and also maintenance of little damage part of apartment has been begun, occupants are returning to their apartment.

Middle Height Apartment: On the findings basis, it was found that the high-rise apartments having middle height about **7 to 9 storey** constructed with good location in Kathmandu Valley have not been affected by earthquake and so have nice occupancy rate after earthquake too.

Suggestions from Respondents: Most of the occupants suggested marketing, advertisement; policy should be nice for improvement of occupancy level. There should be nice provision for elders (retired from profession…etc.), provision of walking trail, free Wi-Fi zone…etc.

6.1.2 Problems and Issues

Although many urban planners and architects advocate the vertical city concept as a solution to land scarcity, urban sprawl and environmental damage, very few studies have been conducted on the needs, perception and reaction of the residents, basically because many of the proposals highlighted above have remained as theoretical concepts due to constraints of technology and budget.

As a whole, currently **burning issues** of occupants are facing backup and load shading problem, lifts are not secure and working properly, not loosing fear of earthquake confidently. There is not sufficient open space in many apartments for playing area except some apartment like Suncity etc. Also there is no planning of open space about disaster point of view.

Apartment security focuses on manpower security rather than digital security which is not efficient. Apartment is costly in maintenance. Water purification is not proper in there too. Foundation of apartment is not sufficient strong. Material-composition ratio of sand, cement, water, rock is not properly followed during the construction. It is seemed to be lack of proper management. CCTV camera is not sufficient. It has weakness on back up storage capacity also sometimes not clear image to detect. Also, communication gap between people is found.

The factors behind the low occupancy rate or; in other words why high-rise scenario not getting flourish in our context are as follows:

Affordability: In our context, there is no good affordability considering the all income group. Most of the Nepalese people have low affordability about such accommodation.

Financial Issue: Apartments are costly high not able to afford for all income groups. No well provision of financial mechanism in housing sector for all income groups.

Facilities: Lack of all facilities in some apartment. Not the provision of all facilities. In some apartment there is not available of swimming pool or other enhancing factors also cause to low attraction.

Location: Some location of apartment is in bad area having no high accessibility and facility of public transportation. Also, its location is disturbing the surrounding

property as blocking sun's rays making large shadows. Such located apartment is become very dangerous for surrounding neighbours during disaster period too.

Socio-Cultural Factors: Society and culture play a key role in accepting or rejecting tall building development. In societies where living in a high-rise is the norm, local culture will have no problem with adding new tall buildings. People who were born and reared in tall buildings usually have no problem continuing to live in that environment. In contrast, people in some traditional societies who have been living for centuries in low-rise buildings may initially feel uncomfortable with living in high-rises until they become adjusted to the new lifestyle.

Territory: It is hard to generate new trend. Nepalese people always interested to live in their own community.

Consideration Of Technical Issues: Application of bad technology

Disaster Issues: Currently the main factor is earth quake.

Rental Cost: Running cost difference comparision to ordinary housing rent.

Lack of public media about high-rise living: There is no awareness and educational information about high-rise living. So, people can't interest to know about high-rise advantage and its strength in deep.

Planning Issues: There is no any long term plan for high-rise. So, still not good enough practice in planning and policy about high-rise scenario in context of Nepal.

Community Development Issues: In neighbourhood perspective, it is seemed that lack of neighbourhood facilities. There must be the consideration about social, cultural behaviour.

Site Selection Issues: Vulnerable & sloppy land has high-risk due to bad technology. Many apartments are close to river which is more risky during disaster and it gives negative impact on public image.

Issues of Byelaws Breach: Act, rules, codes...etc are not being strictly followed.

Promotional Issues: Our national policy towards high-rise is not good enough and well established.

Marketing Issues: Marketing system about high-rise is not strong. There is not feasibility in market about apartments in Nepal.

Lack of open space: In most of the apartment it is found that there is no sufficient open space to perform various types of activities which is essential to boost our health, mind and body.

People do not wish to live in high rise buildings due to certain facts which include failure of lifts; frequent power outage, potential difficulty of escaping in case of emergency, elevator breakdowns, lack of neighbourhood facilities, personal fears (such as fear of height), the absence of experience; who their neighbors are; and high density that would result from more people living in taller blocks.

CHAPTER7: CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusion

To find the answer of research question and fulfill the objectives, various national and international case studies have been done. International case-studies are based on secondary data while national are on primary data with the help of questionnaire method except some. The six apartments of Kathmandu Valley i.e. Sun city, Sunrise, Guna colony, Sunrise, Rio Apartment and Sunrise Tower as chosen for case study were studied in detail while more than seven apartments i.e. Indreni apartment, Bhatbhateni, Comfort Housing, Dhumbarahi, Prestige…etc were studied briefly. The apartments like Indreni, Bhatbhateni, Comfort Housing, and Dhumbarahi were found fully occupied due to its prime location and safe to live after earthquake as labeled as green sticker. On the other hand, the apartments like Suncity, Guna colony, Sunrise…etc. got high decreased in occupancy rate after earthquake.

Findings show that only higher income group (HIG) and middle income group (MIG) were residing in the apartment and most of them were businessman.

The vertical living is one of the essential scenarios of urban high density area due to the migration of the people to the urban areas, high land price, and scarcity of land in urban areas as well as better life style for example Singapore, Hong Kong…etc. Also, the role of high-rise can't be forgotten in the sense that it is the solution to the massive housing shortages as providing shelter to the maximum number of people especially in major cities in the world like Kathmandu, Japan, South Korea, Malaysia, Mumbai …etc.

High-rise becomes more effective if all the income group of people can afford it. Cross subsidy schemes as well as encouraging private developers by providing incentives can maximize the EWS and LIG dwelling units. The high-rise scenario of world shows that government can play vital role for its flourish like public housing in Singapore, Hong Kong…etc. Various improvements in policy and incentives should be applied with the mutual understanding and collaboration of government and private sectors by making long term plan to establish actual image of vertical living.

7.2 Recommendations

Housing is basic needs for people so it should be convenient, affordable and accessible for all groups of people. Healthy housing minimizes threats to health and provides safety and also promotes physical, mental, social, and environmental well-being. Provision of reliable lift, maintaining facilities and public education play vital role to make high rise living attractive.

We must be considered the well established policies, strategies and schemes about scenario of vertical living in international level and able to capture the pin-points of such a study in contextual base which can provide a firm basis and future direction for housing and real estate companies in Nepal. Such a pioneering work also helps government for formulating and revising its policies affecting this sector.

There should be high goal setting vision and framework for such type of living if it is really provide better living standards and sustainable environment. It should be flourished in such a way that not only able to fulfill scarcity of housing but also sustain the healthier and liveable environment.

Since apartments have most essential features about land minimization and optimization open space & dwelling units, it is recommended to fix such highly dense area for high-rise considering the all aspects of structural safety.

To solve "*How to improve low occupancy or, what policies measures should be followed to overcome low occupancy problems;* following recommendations are done in contextual manner.

7.2.1 Cost Affordable

Affordability: Apartments should be affordable for all income groups. There should be provision of affordable houses in apartment buildings for low income group too. At least 10 % of dwelling units in apartment housing should be provided to LIG.

If high income group lives more lavish type of flat, there must be the provision for low income group with necessary facilities by considering that if HIG has 3 bedroom or 4 bedroom, penthouse ...etc. then LIG should be provided at least 1 bedroom type flat.

Cross subsidy schemes can be generated by the developers like HIG can be made to pay double the cost of units, MIG pay 1.5 times, LIG pay actual cost and EWS can be provided subsidy from the above benefit.

***Financial Improvement*:** The provision of the adequate financial support in order to produce house as per needs. There should be well provision of financial mechanism in housing sector for all income groups.

Investment Improvement: There may occur win-win situation if social investment on housing is improved in holistic manner. The unit cost of housing shall be optimized through combinations of integrating land development and housing unit construction, integrating with service delivery agencies and making long term housing loan available in the market.

There should be link between a formal financial institution and the urban poor households. An important function of the link institution would be to act as a conduit for providing information to the formal sector about the socio economic characteristics of the prospective borrowers including their earnings, saving potential and repaying capacity. In this aspect, various key players should have their own role.

The role of government

- Provision of **central provident fund** for poor to provide affordable housing & to support their purchase financially.
- Encouraging greater access to funding and participations of NGOs and private sector institutions to develop affordable long-term low-interest loan programs.

The role of NGOs

- To identify the potential beneficiaries.
- Recommend them to formal financial institutions or government fund for housing.

Role of banks and housing finance institutions

- Reassess their strategies with a view to make them more inclusive in terms of EWS and LIG segments.
- Promote innovative financial instruments i.e. more flexible mortgage market.

- Devise flexible and innovative housing finance schemes for targeting the EWS and LIG segments, with suitable subsidy support from the government.

7.2.2 Location

Environment: High-rise should not disturb its surroundings in all manners. There should be well provision about casting of large shadows of high-rise so that as far it shouldn't block the sunlight of adjacent properties.

Accessibility: Apartment should have high accessibility. There should be facility of public transportation.

7.2.3 Facilities

There should be all types of infrastructure and facilities, high safety and security in high rise apartment.

High rise should be incorporated to well energy efficient design solutions in its heating, cooling and ventilation systems to protect from environmentally damaging. Healthy waste management system should be provided.

Open Space: Open space should be in more amount which should be capture all types of recreational and leisure activities like playing, swimming, jogging, amphitheatre for cultural activities like dancing, singing, walking trail path..etc. It also plays vital role during the disaster for safe.

Running cost: Basic services charge should be minimum.

Good neighbour & Less Crowd: Apartment should have friendly neighbhourhood-sense and it should be in less crowd area for the high occupancy level.

There should be certain incentives programmes and party like cultural programmes, welfare meetings...to make good neighbouring-sense.

Promoting rental apartment housing*:* Almost 58% of population of Kathmandu is living in rent. There should be the improvement of the existing housing stocks & promoting rental apartment housing cost effectively.

7.2.4 Policy Implications:

There should be motivative incentives programme from the government sectors to aware and attract people for such living. The considerations of our national policy towards high-rise investment, insurance policy must be well improved. Better housing policies need to be implemented for a sustainable urban development

Byelaws Implementation: Act, rules, codes...etc must be strictly followed shouldn't be breakdown by anyone.

Governance /Political Status: There should be the capability of **good governance** to solve the issues of apartment scenario in Nepal. Politics plays vital role for the flourishment of any trends and scenarios since it is interlinked with adaptation of that scenario as it has governing power and rights.

Transparency: There should be transparency in policy and explanation about such new initiatives through Government that how they affect directly or indirectly to people so that a large number of household are likely to adopt a more responsible attitude towards the development and feedback on policies.

7.2.5 Site Selection and Suitability

High-rise apartment should be constructed in right place should not be constructed in vulnerable site.

Land Topography: For apartment, land should be flat not sloppy and soil bearing capacity should be good enough to withstand the load.

Fixed Zone: There should be certain fixed zone for apartment buildings according to site suitability.

Self-contained satellite towns: There should be the provision by government or private sector to form new self-contained satellite towns through high-rise scenario providing affordable housing having developed neighbourhoods with schools, supermarkets, clinics, food centres , and facilities.

Cultural Identity: Apartment should be constructed in such a way that it should not hamper any **cultural aspects** of neighbourhood.

7.2.6 Plan

There should be long term plan on macro and micro level for high-rise flourish by providing holistic solutions of all concerned issues about high-rise. So, it can get chance as dominating feature on the urban landscape.

3C-principle: Planning should be done by considering three contributing points for high-rise:- Changes (population), Compact (living) and connectivity

3 pre-requisites: Comfort, convenience & connectivity are 3 essential prerequisites for success of high-rise must be interlinked with each other while planning and should be considered in holistic view to attain best result.

There should be the more comfort in psychological and physical terms about high-rise. Also it should be good enough in terms of space usage.

Thermal Comfort: There should be nice indoor environment in apartment buildings. Thermal comfort plays vital role to enhance the occupancy level as providing better indoor environment for the achievement of better performance.

Planning for more with less: In highly dense core area, there must be followed the principle "planning for more with less". Such planning provides large open space for other activities like public realms, shopping centres, greenery…etc.

Revision Improvement of policies and act: For holistic approach; it is remarkable to know about our developed policy and revise it for better improvement with long term vision and plan.

3P principle: Public-private partnership (i.e. people, public, private) should be enhanced for the creation of EWS, LIG dwellings.

7.2.7 Public awareness and acceptability

There should be the increment of policy implications about the level of public awareness and acceptability about such buildings through the provision of public education, feedback and participation.

If People are educated more about the structural quality and the materials used to build, they will feel safe and find high living attractive.

Clarity on Public image through media: There should be well image about vertical living in public through the provision of reliable public-media.

7.2.8 **Penalty and Awarding System**

There should be the provision of award on national and local level for designing & construction best affordable housing and penalty for not following rules and regulations.

Upon the construction of EWS, LIG dwelling units non-profit organization and private sectors can be awarded to encourage.

7.2.9 Good Marketing

Success of any business depends on better marketing system. There should be well market about high-rise too.

High- rise apartments have no importance if it couldn't get market. If the groups of people are not ready to afford that then why to construct the high- rise. The present scenario of the Kathmandu Valley shows that there is a good market for high- rise apartment due to the high price of land and its scarcity. The question arises, how it can be affordable for all income group.

7.2.10 Earthquake Resilient Apartment: Technology

Apartment should be constructed using seismic resistance technology and there should be awareness to people about such types of technology to feel safe and attract towards apartment

Hazard free**:** Apartment should be hazard free for high occupancy rate.

Vertical transportation systems: The provision of spacious, efficient and reliable design for vertical transportation systems that is suitable for all ages. Since lift is the back bone of high-rise, it should be always in better performance.

Standard: The standards of fire and safety mechanisms should be increased as they are the most crucial elements in growing vertically.

***Disaster Risk Management*:** There should be well provision on disaster management. For e.g. good escape route, escape time and such others escape provisions (helicopter facility, fire hydrant...etc.), adequate open space

***Cost effective Technology**:* There should be provision of cost effective technology

Technology adaptation to Building faster and better: There should be provision of pre-cast building system. It gets faster result with high reliability having nice quality and cheaper than cast in situ. Such faster technology like auto-lift formwork, Jump form, Mivan, post-tension technology...etc should be adopted for high result.

7.2.11 Economic Strength

High rise should be economically viable. There should be certain high vision for growth of economy and improvement.

There must be the economic feasibility about following considerations:

***Well Construction-Management**:* High rise buildings need extra premium cost to provide sophisticated foundations, structural systems to carry high wind loads, and high-tech mechanical, electrical elevator and fire-resistant systems.

They also cost more to significantly fortify them against the fierce natural forces of gravity, high winds, and earthquakes.

There should be high consideration about operational costs, such as high energy consumption, elevator maintenance, and emergency response preparedness.

Fine material: Should be availability of high-rise **building materials.**

Skilled manpower: There should be availability of skilled labor.

7.2.12 Construction of Middle Height Apartment: It is recommended to construct the high rise apartments having height **5 to 9 storey** with good location in context of Kathmandu Valley for safe and secure environment and life. Such buildings can withstand the impact of earthquake safely.

Also, for under developing countries, it is good in the sense of cost and technology to construct medium high-rise building. It provides large open space for other infrastructures, recreational and agricultural purposes. Such buildings can appropriate for the growing population having scarcity and expensive of land.

7.2.13 Holistic approach & Vision: City planners must take a holistic approach and vision and then have proper regulation to ensure sustainable growth.

Socio-Culture Aspect: High-rise should be socially and culturally accepted.

The emerging private sector though profit motivative should work together with the government sector and professional bodies for win-win situation.

Last but not the least; it is the duty and responsibility of all Nepalese to contribute from their sides to make better housing conditions.

BIBLIOGRAPHY

Adhikari, Y. R., 2012. Requisite and possibilities of channelizing public sector investment in housing development;. *Sahari Bikas*, 12(20), pp. 52-53.

Alddrich, B. C. & Sandhu, R. S., 1990. *Housing in Asia : Problems and Perspectives.* Jaipur, India: Rawat Publications.

Ali, M. M. & Kodmany, K. A., 2012. *Council on Tall Buildings & Urban Habitat.* [Online]
Available at: http://www.mdpi.com/2075-5309/2/4/384

Ama, A. R., 2012. *The Performance of High Rise Building in Ghana Perspective of the Occupants.* [Online]
Available at: http://ir.knust.edu.gh/bitstream/123456789/4884/1/Asiedu%20Rita%20Ama.pdf

Anon., 2009. [Online]
Available at: http://medind.nic.in/jak/t09/s1/jakt09s1p85.pdf

Anon., 2013. *Concept of Pricing, Affordabilty, Cost Recovery and Replicability.* [Online]
Available at: http://www.studymode.com/essays/Concept-Of-Pricing-Affordabilty-Cost-Recovery-38963716.html

Anon., 2013. *Key Indicators.* [Online]
Available at: http://www.singstat.gov.sg/docs/default-source/default-document-library/statistics/browse_by_theme/population/statistical_tables/hes-keyind.pdf

Anon., 2014. *Hong Kong : The Facts.* [Online]
Available at: http://www.gov.hk/en/about/abouthk/factsheets/docs/population.pdf

Aziz, W. N. A. et al., 2014. *Vertical Living in Malaysia.* [Online]
Available at:
http://www.fig.net/resources/proceedings/fig_proceedings/fig2014/papers/ts08f/TS08F_wan_abd_aziz_musa_et_al_7383.pdf
[Accessed 2014].

Bhandari, O. R., n.d. *Housing Scenario of Nepal A Preview.* [Online]
Available at: http://scaef.org.np/conference/conference/pdf/Session-7/12.%20Why%20housing%20NEPAL%20PPT.pdf

Chatterjee, M., 2009. *Perception of Housing Environment among High Rise Dwellers.* [Online]
Available at: http://medind.nic.in/jak/t09/s1/jakt09s1p85.pdf

Chhetri, D., 2009. *Impact of accessibility for services in housing areas:case study of Kathmandu,* Lalitpur, Nepal: M.Sc. thesis, IOE.

CONTACTS_SINGAPORE, n.d. *Housing.* [Online]
Available at: https://www.contactsingapore.sg/en/overseas-singaporeans/coming-home/living/housing

Cushman & Walkfield, 2014. *Challenges & Opportunities for the Housing Sector in Urban India.* [Online]
Available at:
http://www.cushmanwakefield.com/~/media/reports/india/Challenges%20%20Opportunites.pdf

DUDBC, 2014. *Business Plan,* Babar Mahal, Kathmandu: Department of Urban Development and Building Construction.

Easthope, H. & Judd, S., 2010. *Living well in greater density.* [Online]
Available at:
https://www.be.unsw.edu.au/sites/default/files/upload/pdf/cf/research/cityfuturesprojects/shelter/Living_Well_in_Greater_Density.pdf

Gallion, A. B. & Eisner, F. S., 2005. *The Urban Pattern.* Fifth ed. India: CBS Publishers & Distributors Pvt. Ltd..

Gill, M. & Bhide, A., 2012. *Densification Through Vertical Resettlement as a Tool for Sustainaible Urban Development.* [Online]
Available at:
http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1369969101352/Gill-et-al.pdf

Gupta, Y. P., 1995. *High Rise Structures: Design and Construction Practices for Middle Level Cities.* India: New Age International Limited.

Hays, W., 2011. *Tohoku, Japan Earthquake: Re-Thinking Safety of High-Rise Buildings and Reclaimed Land in Tokyo.* [Online]
Available at: http://www.pitt.edu/~super4/42011-43001/42401.ppt

Hiraskar, G. K., 1993. *Fundamentals of Town Planning.* Second ed. New Delhi: Dhanpat Rai Publications Pvt. Ltd..

Homes, D., 2014. *The Current Setting of Vertical Living.* [Online]
Available at: http://leasing.dmcihomes.com/setting-philippine-vertical-living/

Housing_Introduction, n.d. *Chapter1: Introduction.* [Online]
Available at: http://shodhganga.inflibnet.ac.in/bitstream/10603/3438/9/09_chapter%201.pdf

Husina, H. N., Nawawi, A. H., Ismail, F. & Khalila, N., 2015. *Correlation Analysis of Occupants' Satisfaction and Safety Performance Level in Low Cost Housing.* [Online]
Available at: http://www.sciencedirect.com/science/article/pii/S1877042814056870

Idris, M. F., Hamzah, A. I. & Ayop, S. M., 2011. *Occupants' responses on rain noise underneath metal deck roof system.* [Online]
Available at: http://www.sciencedirect.com/science/article/pii/S187704281200417X

IFHP, 2015. [Online]
Available at: http://www.ifhp.org/sites/default/files/staff/NYC%20report_web.pdf

IFHP, 2015. *Progressive Ideas to Tackle Housing Affordability: Unveil New York 2015; The International Federation for Housing and Planning(IFHP).* [Online]
Available at: http://www.ifhp.org/sites/default/files/staff/NYC%20report_web.pdf

Indraganti, M., 2009. *Adaptive use of natural ventilation for thermal comfort in Indian apartments.* [Online]
Available at: http://www.sciencedirect.com/science/article/pii/S0360132309003667

Jain, A. K., 1990. *The Making of a Metropolis: Planning and Growth of Delhi.* First ed. New Delhi, India: National Book Organization.

Joshi, J., 2013. *Housing and Urban Development in Nepal*. Third Revised ed. Kathmandu: Lajmina Joshi.

Kavilkar, R. & Patil, S., n.d. *Study of High Rise Residential Buildings in Indian Cities : A Case Study - Pune City.* [Online]
Available at: http://www.ijetch.org/papers/671-EA1012.pdf

Koirala, M. P., 2015. *Risk In Housing and Real Estate Projects in Nepal and Role of Cadastral Survey.* [Online]
Available at:
http://www.researchgate.net/publication/235950390_risk_in_housing_and_real_estate_projects_in_nepal_and_role_of_cadastral_survey

Koirala, M. P., n.d. *Risks in Housing and Real Estate Construction Project.* [Online]
Available at: http://www.nepjol.info/index.php/JIE/article/view/10876/8859

Lembo, J., n.d. *Cost of Living in Singapore.* [Online]
Available at: http://www.guidemesingapore.com/relocation/introduction/singapore-cost-of-living

Lohani, K. P., 2015. *Description of Apartment Housing Developers and their projects in Kathmandu Valley.* Kathmandu: DUDBC.

Mirza, I., 2012. *High-Rises: Vertical Limit.* [Online]
Available at: http://www.kalpataru.com/pdf/media/Construction-Week_Oct-2012.pdf

Moller, L. F., 2014. *Popular Public Housing in Singapore:Making Cities Socially Cohesive.* [Online]
Available at: http://www.ifhp.org/ifhp-blog/popular-public-housing-singapore

National_Housing_Policy, n.d. [Online]
Available at:
https://www.academia.edu/4961151/NATIONAL_HOUSING_DEPARTMENT_National_Housing_Policy

National, N., 2015. *Two high-rise apartments, 14 govt offices marked unsafe.* [Online]
Available at: http://www.housingnepal.com/news/national/two-high-rise-apartments-14-govt-offices-marked-unsafe
[Accessed 11 5 2015].

Nepal_Bank_Ltd., 2014. [Online]
Available at:
http://www.nepalbank.com.np/pdf/financialresults/Financial%20highlight%204th%20Qtr.pdf
[Accessed 4 July 2015].

Neufert, E. & Neufert, P., 2000. *Architects' Data.* Third ed. London: Blackwell Science.

News, N., 2015. *40- inhabited-high-rises-unsafe.* [Online]
Available at: http://www.housingnepal.com/news/national/two-of-40-inhabited-high-rises-unsafe
[Accessed 5 6 2015].

NLSS, 2011. *Nepal Living Standards Survey;2010/11*, Kathmandu, Nepal: Central Bureau of Statistics.

NPHC, 2012. *National Population and Housing Census 2011,* Kathmandu: Central Bureau of Statistics.

NUMBEO, 2015. *Cost of Living in Singapore.* [Online]
Available at: http://www.numbeo.com/cost-of-living/country_result.jsp?country=Singapore

Pokharel, J. R., 1999. *Course Manual of Housing,* Lalitpur, Nepal: IOE, Pulchowk Campus.

Pokharel, J. R., 2006. *A Policy Study on Urban Housing in Nepal.* [Online]
Available at:
http://s3.amazonaws.com/zanran_storage/www.mof.gov.np/ContentPages/16797770.pdf

PRAJA, 2014. *The State of Affordable Housing in Mumbai.* [Online]
Available at:
http://www.praja.org/praja_downloads/Report%20on%20The%20State%20of%20Affordable%20Housing%20in%20Mumbai.pdf

Prime_Bank, 2014. [Online]
Available at:
http://www.primebank.com.np/doc/progressreport/141121001615_1st%20quarter%202071-72Unaudited%20financial%20report.pdf
[Accessed 4 July 2015].

Pugh, C., 1990. *Housing and Urbanisation: A Study of India.* First ed. New Delhi: Sage Publications India Pvt. Ltd..

Rangwala, S. C., 2011. *Town Planning.* Twenty-fourth ed. Gujarat,India: Charotar Publishing Housing Pvt. Ltd..

Republica, 2015. *Most of valley apartments need repairs:Experts.* [Online]
Available at: http://www.myrepublica.com/economy/story/20458/most-of-valley-apartments-need-to-repair-doudbc.html
[Accessed 5 5 2015].

Shrestha, A. B., 2012. *Assessing the socio-economic status of apartments in Kathmandu valley,* Lalitpur;Nepal: M.Sc. Thesis, IOE; Pulchowk Campus.

Shrestha, B. K., 2010. *Housing Provision in the Kathmandu Valley: Public agency and private sector initiation.* [Online]
Available at: http://urbani-izziv.uirs.si/Portals/uizziv/papers/urbani-izziv-en-2010-21-02-002.pdf

Shrestha, B. K., 2012. Changing Cities,Building Opportunities:Relevance to Nepal. *Sahari Bikash,* 12(20), p. 61.

Shrestha, N., 2012. *Post Occupancy EvaaZluation of Saibhu Bhaisepati Land Pooling Projects,* Lalitpur, Nepal: M.Sc.; Thesis Report; IOE;.

Singh, R. P. & Gorkhaly, G. P., n.d. *Experience and Prospect of Land-Readjustment in Nepal.* [Online]
Available at: http://ramesh-singh.com/land-pooling/

Thapa, K., 2009. *Housing Development: New opportunity for Consulting Firms in Nepal.* [Online]
Available at: http://scaef.org.np/conference/conference/pdf/Session-3/1.%20Housing%20Development-Theme-Kishore%20Thapa.pdf

Time_Saver_Standards, n.d. *for Building Types.* Third Edition ed. s.l.:s.n.

UN, 1948. *The Universal Declaration of Human Rights: Article 25.* [Online]
Available at: http://www.claiminghumanrights.org/udhr_article_25.html#at27

UNHABITAT, 2010. *Nepal Urban Housing Sector Profile.* [Online]
Available at: http://un.org.np/sites/default/files/NEPAL%20Housing%20Profile_2.pdf

Upreti, S., 2006. Private Sector And Urban Land Development in Kathmandu Valley: Review of Policy Paradoxes. *SONA Souvenier,14th Anniversary, Kathmandu.*

Urban_Land_Institute, 2013. *10 Principles for Liveable High-Density Cities: Lessons from Singapore.* [Online]
Available at: http://uli.org/wp-content/uploads/ULI-Documents/10PrinciplesSingapore.pdf

Wong, G. K. M., 2004. *Vertical cities as a solution for land scarcity: the tallest public housing development in Singapore.* [Online]
Available at: http://www.palgrave-journals.com/udi/journal/v9/n1/full/9000108a.html

Xu, W. & Siu, L., n.d. *Pursuing New Urban Living Environment in the New Millennium: Projecting the Future of High-Rise And High Density Living In Hong Kong.* [Online]
Available at: http://www.generativeart.com/on/cic/papersGA2002/11.pdf

Yuen, B., 2011. *High-Rise Living in Asian Cities.* [Online]
Available at: https://books.google.com.np/books?id=nWyMoEMi2uoC&pg=PA27&lpg=PA27&dq=MILU+application+in+hongkong+high+rise

APPENDICES

Appendix A: Thesis Research Questionnaire for Occupant

Tribhuvan University
Institute of Engineering
Department of Architecture and Urban Planning
M.Sc. Program in Urban Planning
Central Campus, Pulchowk
Lalitpur, Nepal

Thesis Topic: **Occupancy Issues of Apartment Housing in Kathmandu Valley**

Date:……

PART I: OCCUPANTS BACKGROUND

Name of person completing the questionnaire…… …..
Apartment name ……Block …….. Apartment No…….
Gender: Male [ ] Female [ ]
Nationality……
Caste……
Religion……
Spoken Language ……
Professions……
Marital status: Married [ ] Single [ ] Divorced [ ] Widowed [ ]

Age: Below 25 [ ] 25-30 [ ] 31-40 [ ] 41-50 [ ] 51-60 [ ] Above 60 years [ ]

Occupation: Own Business [ ] Private Job [ ] Civil Service [ ] Others ……

Education Level: Below S.L.C.[ ] S.L.C. [ ] Intermediate [ ] Bachelor[ ]
Master[ ] PhD.[ ]

Before coming to apartment, where do you live?.....

It is in… rent [ ] own[ ]

PART II: GENERAL INFORMATION (PLEASE TICK)

Q1. Ownership Status: [ ] Own apartment [ ] In rent [ ] Relatives [ ] Others

Q2. The name of place from which you migrated ……

Q3. Do you have your family living with you?
[ ] No
[ ] Yes, if yes Please state your family size: 1-2[ ] 3-5 [ ] over 5[ ]

Q4. Types of apartment you live: Studio [ ] 2 bedroom [ ] 3 bedroom [ ] 4 bedroom [ ]
Q5. Purpose of buying this apartment ……

Q6. Which floors do you occupy in the building?
1st – 3 rd floors [ ] 4th – 8th floors [ ] 9^{th}-12^{th} floors [ ] Above 12th floors [ ]

Q7. How long have you been living in this apartment?
Less than a year [ ] 1-2 years [ ] 3-5 years [ ] above 5 years [ ]

Q8. Your apartment lies in the direction: ……

PART III: OCCUPANTS SOCIO-ECONOMIC STATUS

Q1. How did you purchase this apartment? Loan [ ] Self [ ]
If loan; from where?
Bank [ ] Finance [ ] Cooperative [ ] Relatives [ ] Others [ ]

Q2. The cost of your apartment unit…….
Q3. Vehicle Ownership: Car [ ] Bike [ ] Both [ ] No [ ]

Q4. Property details
[ ] Having own house in Kathmandu except this apartment.
[ ] No house in Kathmandu

Q5. Income of Household Owner: Below 20000 [ ] 21000-40000 [ ]
41000-60000[ ] 61000-100000[ ] Above 100000 [ ]

Q6. Expenditure of Household Owner: Below 20000 [ ] 21000-40000 [ ]
41000-60000[ ] 61000-100000[ ] Above 100000 [ ]

PART IV: SOCIAL INFRASTRUCTURE IN AND AROUND THE APARTMENT

Q1 Schooling of Children:
Please specify the name of school if you admitted your child……. …….. …….....

Q2. Shopping Destination:
The name of supermarket where you mostly go ……. …….. …….....
If more than one shopping place please specify……

Q3. Has apartment its own Departmental Store….Yes [ ] No [ ]
If yes; do you use it for shopping? Yes [ ] No [ ]
Q4. Health Services:
The name of hospitals where you mostly go for treatment ……. …….. …….....
If you use others places too; please specify…….

Q5. Is there child care centre? Yes [ ] No [ ]
If no; then where do you leave your child when you go out……
Q6. Is there community centre? Yes [ ] No [ ]
If no; where do you perform Wedding/Party……

Q7. Is there banking facilities? Yes [ ] No [ ]

Q8. Write down if any Programme held in apartment…….

Q9. Is there available of Temple/Church/Mosque/Monastery for worshipping Yes [ ] No [ ]
If yes specify the name……..

If no available, then where do you worship?

In own Room [ ] Outside Temple [ ] Outside Monastery[ ] Outside Church[ ]Outside Mosque[ ]

Q10. The festivals you celebrate mostly……

Q11. Where you celebrate festivals? Here in own apartment [ ] Not in apartment [ ]
If not in apartment, then where? Plese write……

Q12. Where do you spent leisure time ……
Q13. Children playing area: Sufficient [ ] Insufficient [ ]
Q14. Has apartment health club (gym…etc.) facilities Yes [ ] No [ ]
Q15. Swimming Pool: Yes [ ] No [ ]
Q16. Jogging, morning walking area: Sufficient [ ] Insufficient [ ]

PART V: OCCUPANCY ISSUES ON SATISFACTION LEVEL WITH LIVING IN APARTMENT BUILDING

Q1. Is this your first experience in a apartment building? [ ] Yes [ ] No

Q2. How high are you willing to go?

Before Earthquake	After Earthquake
[ ] 1-3 floors	[ ] 1-3 floors
[ ] 4-8 floors	[ ] 4-8 floors
[ ] 9-15 floors	[ ] 9-15 floors
[ ] Above	[ ] Above

Q3. What is your level of satisfaction towards living at this apartment?
[ ] Very satisfied
[ ] Unsatisfied
[ ] Satisfied

Q4. What attracted you to apartment living?
[ ] Affordability [ ] Locational Feasibility [ ] Good Services and Facilities

[ ] Safety and Security [ ] Personal preference [ ] Relationship with neighborhood

[ ] Family Environment [ ] Less crowd [ ] Best housing for Nepalese

If others please specify…….

5. Indicate your level of satisfaction for each of the following
I. Unsatisfied – 1
II. Very satisfied – 2
III. Satisfied -3

	1	2	3
Water Supply			
Garbage disposal			
Electricity provision			
Smoke detectors			
Phone services			
Management of facility			
Security			
Noise Disturbance			
Conducive overall environment			
Thermal comfort			
Social & Cultural Perspective			
Lift functioning			
Accessibility (Road-Network)			
Design of apartment			
Provision against Emergencies (earthquake, fire….etc.)			
Noise from neighborhood			

Q6. Are you happy with the floor you now occupy? Yes [ ] No [ ]
Please give reasons for your answer

Q7. Did you choose the floor you occupy? Yes [ ] No [ ]
Please give reasons……
Q8. Did you choose the orientation of your apartment? [ ] Yes [ ] No
Please give reasons……
Q9. Do you know the occupancy level of the apartment?.....
Q10. How to specify the importance of these factors while choosing apartment living?
1. Least important 2. Less 3. Satisfactory 4. More 5.Most important

	1	2	3	4	5
Luxury					
Feeling of isolation and loneliness					
Lack of privacy					
Scared of lift breakdown					

If others please specify……...

PART VI: EARTHQUAKE IMPACT

Q1. Is there any change in the perception of earthquake impact?

……

Q2. Is your neighbor living in apartment? ……

Q3. Who left and why do you know cause?.....

PART VII: PROBLEMS & ISSUES FACED BY OCCUPANTS (PLEASE TICK).

Q1. How do you rate the following factors as some of the challenges/concerns you are faced with in your apartment?

0. Zero Problem 1. Least 2. Less 3. Satisfactory 4. More 5. Most

	0	1	2	3	4	5
Structural safety						
Lift problems						
Problem with waste disposal						
Safety/ security						
Problem of operation/maintenance						
Problem of operation/maintenance cost						
Problem with smoke detectors						
Problem with location						
Resilience of building						

If others please specify……

Q2. What reasons for low occupancy of apartments?

Least important 2. Less 3. Satisfactory 4. More 5.Most important

Fear of height	0	1	2	3	4	5
Absence of community living						
Safety concerns						
Community Interaction						
Lift breakdown frequently						
Provision of emergencies						
Fear of Earthquake						

If others social / economic issues please specify……

Q3. Your best impressive factor of this apartment is?.....

Q4. Do you prefer to stay in future?……

Q5. What is your expectation for making your apartment satisfactory?

……

Q6. Is there anything that prevents you from enjoying your stay?

……

Q7. Problems and demerits:……..

Q8. Suggestions for improving occupancy……

Thank you for your nice help to fill up this questionnaire. Due to your kindly support for data entry; I got chance to do good research. Again say many thanked to you. Have a good day!

Appendix B: Thesis Research Questionnaire for Developer

Tribhuvan University
Institute of Engineering
Department of Architecture and Urban Planning
M.Sc. Program in Urban Planning
Central Campus, Pulchowk
Lalitpur, Nepal

Thesis Topic: **Occupancy Issues of Apartment Housing in Kathmandu Valley**

Date:……

PART I: GENERAL INFORMATION OF APARTMENT
Apartment Name:…… …Apartment No.…… Total No. of units:……. …..**....**

Developers:…….Cost of Apartment……per sq.ft.

% of Open-Space Area……..

Occupants Entertainment Activities……..

Responsible person for operation & maintenance of apartment…….

Responsible person for service charges monthly payment…….

Targeted Group: High Income [ ] Middle Income [ ] Both [ ]

PART II: OCCUPANCY FACTORS BEFORE EARTHQUAKE

No. of unit occupied: Before Earthquake [ ]

Prices of Apartment increasing from lower to upper floors: Yes [ ] No [ ]

Occupancy in Apartment pre Earthquake…….....
……..……..

How you feel about approval criteria of apartment…….
Do you feel causes of vacancy of (Before Earthquake) is policy issues
Yes [ ] No [ ]

If yes, please explain briefly……
Do you feel causes of vacancy of (Before Earthquake) is banking issues
Yes [ ] No [ ]

If yes; please explain briefly……..

Are there another issues about vacancy:……..

PART III: OCCUPANCY FACTORS AFTER EARTHQUAKE

No. of unit occupied: After Earthquake [ ]

Prices of Apartment increasing from upper to lower floors: Yes [ ] No [ ]

Occupancy in Apartment post earthquake……..

Causes of vacancy of (after earthquake): ……

What is the government policies after the earthquake

PART IV: SUGGESTIONS & VISION ABOUT APARTMENT SCEARIO

How to overcome low occupancy problems:……

What is the target, policies, techniques should be followed for the best scenario of apartment in Kathmandu valley?

If anymore you want to suggest……..

Appendix C: List of Various Apartments of Kathamandu Valley

Table: Apartments built before the Apartment act of 2054 has been acted

SN	Name and location	Developers	Area (Sq. m.)	No. of units	Drawing approval status
1	Sunrise Homes,Balkumari-Phase1	Shree Oriental construction & Development Pvt. Ltd. Balkumari, Lalitpur	13518	115	Approved
2	Kathmandu View Residency, Bagdol, Lalitpur	Ansal Chaudhary Developers Pvt. Ltd, Sanepa ,Lalitpur	7301	180	Approved
3	Neon Apartment, Kuleshwor, Kathmandu	Oriental Colony Pvt. Ltd., Balkhu, Kathmandu	3418	100	Approved
4	Stupa Housing, Buddhanagar, Kathmandu	Shree Ragendra Shakya, Pulchowk , Lalitpur	961.83	50	Approved
5	Grace Apartment, Naxal, Kathmandu	ACE Development Company, KMC, Kanthipath	3310	56	Approved
6	Mount View Residency, Harisidhi, Lalitpur	Ansal Chaudhary Developers Pvt. Ltd, Sanepa , Lalitpur	11911	72	Approved

Table: Registered in DUDBC & Settled Apartment, From 2061-2072

SN	Name of the apartment	Location	No. of unit
Yellow Sticker Labelled			
1	Guna colony	Sinamangal, Kathmandu	160
2	Suncity	Gothatar, Kathmandu	500
3	Rio	Kupondole, Lalipur	28
4	Sunrise Apartment	Nakhu, Lalipur	262
5	Sunrise towers	Dhobighat, Lalipur	180
6	Kuleshwar Apartment	Kuleshwar	108
7	Central Park	Bishalnagar, Kathmandu	190
8	Prestise	Chandol	46
9	City View Apartment	Bakhundole, Lalitpur	48
10	Cityscape Club House	Hattiban	197

11	Cityscape Block B	Hattiban	
12	Signature (phase I)	Teku	22
13	Signature (phase II)	Teku	20
14	Civil Apartment II	Dhapakhel, Lalitpur	370
15	Ambe Residency	Chabahil, Kathmandu	48
16	Westar Apartment	Balkumari	80
17	TCH Tower III	Panipokhari,Kathmandu	51
18	TCH Tower IV	Sitapalia, Kathmandu	67
19	Silver city luxurious apartment	Kalikasthan, Kathmandu	54
20	Binayak	Baluwatar, Kathmandu	20
21	LP	Lazimpat, Kathmandu	50
22	LLP	Panipokhari, Lazimpat, Kathmandu	48
23	KL Residency Luxury Apartment	Sano Gaucharan, Kathmandu	49
24	Imperial Court Apartment	Sanepa	104
25	Mercury	Thado Dhunga, Lalitpur	36
26	Metero	Kuleshowr, Kathmandu	58
27	Grande Towers, Tokha; On HousingNepal.com it is learned that this structure is only earthquake resistant up to M8	Tokha, Kathmandu	192
28	Grandy Apartment-2	Tokha, Kathmandu	337
29	Grande	Dhumbarahi, Kathmandu	29
30	Kalash Apartment,	Tahachal	
31	Retreat Apartment	Bijeshwori	
32	Downtown Apartment	Dhapakhel	
33	Vibor Apartment	Kamal Pokhari	
34	Oriental Apartment Phase I	Kuleshwor	
Green Sticker Labelled			
34	TCH Tower II	Lazimpat, Kathmandu	36
35	Indreni(PhaseI &II)	Bhatbhaneni, Kathmandu	59
36	Bhatbhateni	Bhatbhateni, Kathmandu	40
37	Dhumbarahi	Dhumbarahi, Kathmandu	163
38	TCH Tower II	Thaiba	
39	Egrace	Naxal	
40	Southern Height	Thaiba	
Red Sticker Labelled			
41	Park view horizon	Dhapasi, Kathmandu	185
42	Oriental colony-Phase II	Kuleshowr, Kathmandu	144
Some more registered Apartments			
43	A And A	Anamnagar, Kathmandu	32
44	Asirbad	Gyaneshwor Height	27

45	Bagmati	Sankhamul, Kathmandu	80
46	C G	Hattiban, Lalitpur	577
47	Civil	Bagdarbar	71
48	D Grand	Soalteemode, Kathmandu	34
49	Echo Apartment	Babarmahal, Kathmandu	108
50	Everest Apartment	Ghattekulo, Kathmandu	37
51	Imperial Apartment	Naxal, Kathmandu	65
52	Kamal Pokhari	Kamal Pokhari	32
53	Landmark	Tahachal, Kathmandu	48
54	Lazpa	Lazimpat, Kathmandu	80
55	Life Style	Soltimode, Kathmandu	66
56	Orchid holding	Ravibhawan, Kathmandu	48
57	Pulchowk Apartment	Pulchowk	27
58	Sanepa Heights	Sanepa, Lalitpur	47
59	Sisko	Lazimpat, Kathmandu	40
60	Sunrise Bijpark	Dillibazzar, Kathmandu	8
61	Sunrise city homes	Bizulibazzar, Kathmandu	50
62	Sunrise homes	Balkumari, Lalipur	19
63	Sunrise towers	Dhumbarahi, Kathmandu	40
64	Status inclav	Sanepa, Lalitpur	28
65	The Residency Apartment	Sanepa, Thadodhunga	152
66	The land mark	Kamaladi, Kathmandu	56
69	United Basti Bikas Apartment	Sanepa	26

(Lohani, 2015)

Appendix D: Some Special Interviews

<table>
<tr>
<td>Khem Thapa
Sunrise, Nakhkhu
Block B2
Apartment No.:2169
Bank Manager
Retired
  </td>
<td>Sapna Sah
Sunrise Tower,
Dhobighat
Bungalow No.:
19
Artist
  </td>
</tr>
<tr>
<td>Bhaskar Kumar Das
Vice President Of Community Centre
Of Suncity
Block: A
Apartment No.:
604
Country Manager
  </td>
<td>Bipendra Jha
Kuleshwor
Apartment no. A-3
Student of
Urban
Planning
  </td>
</tr>
</table>

Appendix E: Cost of Apartment & Income of People in Different Countries and Cities

Apartment Buying Price per Square Meter		Apartment Rent per month				Salaries	Financing
		1 bedroom		3 bedroom		Average Monthly	Mortgage
in City Centre	outside of City Centre	in City Centre	Outside of City Centre	in City Centre	Outside of City Centre	Disposable Salary(After Tax)	Interest Rate in %, Yearly
United States (in USD $), *1 United States Dollar = 106.353 Nepalese Rupee*							
2,399.60	1,516.13	1,108.22	845.05	1,851.05	1,422.80	2,713.89	4.11
(1,210.94-5,274.32)	936.46-2,960.08	685.00-1,800.00	560.00-1,250.00	1,100.00-3,000.00	900.00-2,200.00	2,000.00-3,891.00	3.50-5.0
New York (in USD $)							
20,223.96	10,519.5	2,996.38	1,819.70	6,004.55	3,070.52	3,371.94	3.96
14,671.21-26,000.00	10,000-12,916.7	2,200.00-3,750.00	1,300.00-2,500.00	4,000.00-8,000.00	2,200.00-4,500.	2,500.00-4,063.00	3.70-4.0
United Kingdom (in £), *1 British Pound Sterling = 160.314 Nepalese Rupee*							
3,221.03	2,597.06	727.21	599.57	1,166.18	919.68	1,654.44	3.70
1,900.00-7,000.00	1,300.00-5,381.96	500.00-1,250.00	400.00-1,000.00	700.00-2,000.00	600.00-1,500.00	1,200.00-2,250.00	3.0-4.69
London (in £)							
16,983.76	8,603.35	1,662.73	1,140.33	3,313.11	1,951.61	1,981.60	3.56
10,000.00-22,000.00	6,000.00-10,763.9	1,300.00-2,000.00	900.00-1,390.00	2,500.00-4,500.00	1,500.00-2,500.00	1,400.00-2,800.00	2.90-4.0
Malaysia (in RM), *1 Malaysian Ringgit = 24.3111 Nepalese Rupee*							
7,673.37	4,385.86	1,472.14	796.12	2,631.12	1,401.65	3,486.14	4.68
4,305.56-11,011.48	3,000.00-6,458.35	800.00-2,500.00	450.00-1,300.00	1,500.00-4,500.00	800.00-2,000.00	2,000.00-5,000.00	4.00-6.0
Shah Alam, Malaysia (in RM)							
8,342.03	5,381.96	1,500.00	633.33	2,733.33	1,000.00	4,000.00	4.10
5,920.15-10,763.91	3,229.17-7,534.74	1,000.00-2,000.00	400.00-800.00	1,200.00-4,000.00	800.00-1,200.00	4,000.00-4,000.00	4.00-4.2
Kuala Lumpur, Malaysia (in RM)							
12,037.09	5,629.26	2,480.42	1,217.44	4,824.64	2,173.61	4,430.90	4.83
9,687.52-16,145.87	4,310.90-7,060.00	2,000.00-3,000.00	800.00-1,600.00	3,500.00-7,000.00	1,500.00-3,000.00	3,000.00-6,130.00	4.25-6.5
Singapore (in S$), *1 Singapore Dollar = 74.656 Nepalese Rupee*							
26,158.78	13,623.1	3,090.67	2,001.70	5,784.75	3,468.49	4,247.52	2.29

18,836.84-32,291.73	10,763.9-16,145.9	(2,000.00-4,000.00)	1,500.00-2,800.00	4,000.00-8,000.00	2,500.00-4,500.00	2,500.00-6,000.00	2.00-2.8
Hong Kong (in HK$), *1 Hong Kong Dollar = 13.7230 Nepalese Rupee*							
208,940.64	113,952.7	16,855.53	11,546.5	36,875.00	23,710.58	22,572.92	2.60
161,458.66-275,000.0	83,428.92-150,000	13,000.00-20,000.0	9,000.00-15,000.0	25,000.00-50,000.0	18,000.00-30,000.0	14,500.00-30,000.0	2.10-3.0
India (in INR), *1 Indian Rupee = 1.60 Nepalese Rupee*							
82,699.84	42,362.07	10,374.97	6,465.37	24,879.76	15,847.34	31,144.97	10.76
45,000.00-150,694.75	26,909.78-69,965.4	5,600.00-15,000.00	4,000.00-10,000.0	15,000.00-40,000.0	9,000.00-25,000.00	19,000.00-50,000.0	10.00-12.00
Mumbai							
474,956.62	175,515.1	34,105.26	17,613.4	84,534.88	39,191.98	45,877.38	10.75
330,000.0-645,834.63	107,639-215,278.2	20,000.00-50,000.0	12,000.0-25,000.0	50,000.0-120,000.0	23,000.00-55,000.0	30,000.00-65,000.0	10.00-12.00
Kolkata							
68,411.58	38,357.71	10,241.63	6,342.11	27,941.18	14,710.53	26,956.52	10.39
45,208.42-96,875.19	27,000.0-53,819.55	8,000.00-15,000.00	4,500.00-8,500.00	20,000.00-40,000.0	10,000.00-20,000.0	20,000.00-40,000.0	9.90-12.00
Pune							
116,593.27	54,408.31	13,144.44	8,488.89	27,357.14	18,568.18	42,695.22	10.45
75,347.37-161,458.66	43,055.6-64,583.46	10,000.00-15,000.0	7,000.00-10,000.0	21,000.00-35,000.0	15,000.00-25,000.0	25,000.00-65,000.0	10.00-12.00
Delhi							
197,142.15	82,129.80	16,776.12	8,855.97	39,485.87	21,971.83	37,458.93	10.66
107,639.10-300,000.0	60,000.0-107,639.1	11,000.00-25,000.0	6,000.00-12,000.0	25,000.00-60,000.0	15,000.00-30,000.0	25,000.00-60,000.0	10.00-12.00
Hyderabad							
55,535.22	30,086.85	9,264.15	5,480.77	23,801.89	14,098.04	32,119.31	10.82
45,000.00-69,965.42	21,527.82-37,673.7	7,000.00-12,000.00	4,000.00-7,000.00	20,000.00-30,000.0	10,000.00-18,000.0	21,711.00-45,000.0	10.00-12.00
Nepal (in NPR; NRs)							
62,557.90	36,072.93	8,309.52	4,052.63	18,342.11	10,045.45	16,147.06	10.59
40,000.00-80,000.00	20,000.00-48,437.6	3,000.00-15,000.00	2,000.00-7,000.00	8,000.00-30,000.00	5,500.00-20,000.00	13,000.00-24,000.0	8.00-12.00
Kathmandu							
140,000.00	50,000.00	11,833.33	6,285.71	25,875.00	13,500.00	15,944.44	9.79
80,000.00-200,000.00	44,000.00-56,000.0	8,000.00-15,000.00	5,000.00-9,000.00	15,000.00-35,000.0	7,000.00-20,000.00	13,500.00-20,000.0	8.00-12.00

Source: (NUMBEO, 2015)