SUITABILITY OF VERTICAL LOW-INCOME HOUSING FOR URBAN POOR IN COLOMBO: A CASE STUDY OF MIHINDUSENPURA LOW-INCOME HOUSING SCHEME AT DEMATAGODA

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DECLARATION

I declare that this my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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I certify herewith that K.H.A.P.N. Seneviratne (Index No. 169192N) of the 2016/2018 group of Master of Spatial Planning Management and Design has prepared this dissertation under my supervision.

…………………………………   …………………………………

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ABSTRACT

Housing is a key human requirement. However, many in the modern world people are living in unsuitable houses. Recently, it has become a global problem and as a result many countries are paying attention to it and various housing strategies have emerged as solutions to low-income unsuitable settlements. According to Sri Lankan census, there are 68,812 families were living in temporary house with poor facilities within the Colombo city area (Sri Lanka's Urban Regeneration Project continues unabated, 2020). To address this, issue the Sri Lankan Government has begun several housing programs and introduced housing policies during last decade. Out of those strategies vertical housing development became the main feature for unsuitable housing in Colombo city. Currently, more than 15,000 high rise housing units have been built for low-income people. Through the introduction of high rise buildings, another question arose on its suitability for human settlement. This has become one of the most popular topics among policy makers and professionals all around the world. In this study, an attempt was made investigate factors affection to the failure and success of vertical low-income housing in Sri Lanka by selecting low-income housing apartments in Colombo.

With the independence in 1948, housing policies have been applied to the housing sector in Sri Lanka. Condominium Property Act No. 12 of 1970 is the first legislation related to vertical housing developments in Sri Lanka. With the introduction of the Apartment Ownership Law No. 11 of 1973, the creation of huge scale tall buildings in Sri Lanka commenced.

This rule made an opportunity to convert a multi-storied apartment into a number of individual residential units which would then continue to be under a single ownership. The apartment ownership law was applied through the Condominium Act No. 45 of 1982 (Samaratunga & O'Hare, 2013).

However, settlements provided to the public in accordance with these policies do not possess better living environments for them as expected while creating numerous social problems. Hence, the management needs efficient and experienced professionals for relevant institution and authorities. This research recommends professionals and policy makers on what to concentrate on when proving settlements to low-income receiving people.

DEDICATION

****

This Book is dedicated

To my Loving Daughter

and

To my Dearest Lecturers

****

ACKNOWLEDGEMENT

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LIST OF ABBREVIATIONS

LSE - London School of Economics

UDA - Urban Development Authority

URDA - Urban Redevelopment Authority

US - United States

CHAPTER ONE: INTRODUCTION

1.1. Introduction

Accommodation is a main human requirement alongside food, water and companionship. It is a building that keeps people from physical and natural elements and gives a place to live. Alternatively, we can say accommodation is a basic human right and has been recognized as one of the elements of a healthy and wealthy life. Due to rapid development of the cities in Asian countries, housing has become a global problem. The scarcity of adequate habitable housing is a major problem of the third world countries such as India and Sri Lanka. The main reasons for this is rapid urban growth complied with societal, racial and financial difficulties such as deficiency, unexpected urbanization, lack of finance and development policy. In Sri Lanka, Colombo city provide demonstrated evidence to that situation. There were nearly 68,812 families living in poor house within the Colombo city (Sri Lanka's Urban Regeneration Project continues unabated, 2020). It is projected that over 50% of inhabitants are living in low-cost housings in Colombo (A profile of underserved settlements in Colombo, 2016). According to the survey reports of Sevanatha, four categories of poor settlements have been identified which is shown in table one.

Categories	Percentage
Fully upgrade	39.3%
Upgrade	54.5%
Underserved	5.9%
Extremely poor	0.3%

Table 1: Distribution of poor housing categories
Source: (A profile of underserved settlements in Colombo, 2016)

After independence, most urban poor were aided by satisfactory housing policies and programs carried out by the Governments. However, those programs were temporary, and have not created stable impact to minimize underserved settlements in Colombo (Niriella, 2012). As an outcome of the vision of previous Government to change Colombo as the center of excellence in South Asia, it has been decided to recover all the urban low-income families by providing houses in high rise schemes. In the conventional terminology, Urban under Served Settlements were classified as low income settlements taking poor levels of income of their inhabitants. However, considerable percentages of occupants in these settlements are not remarkably poor and they earn substantial income through informal means. Lack of management skills,

poor attitudes towards savings and planning for future and behavioral patterns often push them towards poverty. Therefore, the crucial factor that separates there settlements from other urban settlements are the poor level of infrastructure services (Jagoda, n.d.)

According to the National Housing policy report of 2017, it was revealed that most of housing project is not financially and socially sustainable because, relevant agencies do not provide housing people with basic needs such as shelter that is healthy, safety, security and accessible and affordable main services. Further they said that there isn't any freedom free from any form of discrimination in apartment units. This policy revision emphasizes that housing interventions should promote equity with provisions that address discrimination, forced eviction and the needs of the homeless and people in vulnerable situations, enabling the participation and engagement of communities and stake-holders. Further, it is committed to promote increased security of tenure and to develop gender responsive solutions within a continuum of land and housing rights. Therefore, we should be discussed whether vertical housing is a worthy answer to the problem of underserved settlements and which factors objecting to the determination of outcome of low income vertical housing in Colombo city, because most countries have refused the idea of vertical apartments as solution to the problem of un-habitable housing. This clearly demonstrates that vertical housing is not a globally accepted solution and this research examines the vertical housing policies in Sri Lanka and studies their impact on housing insufficiency of low-income receiving people in Colombo city.
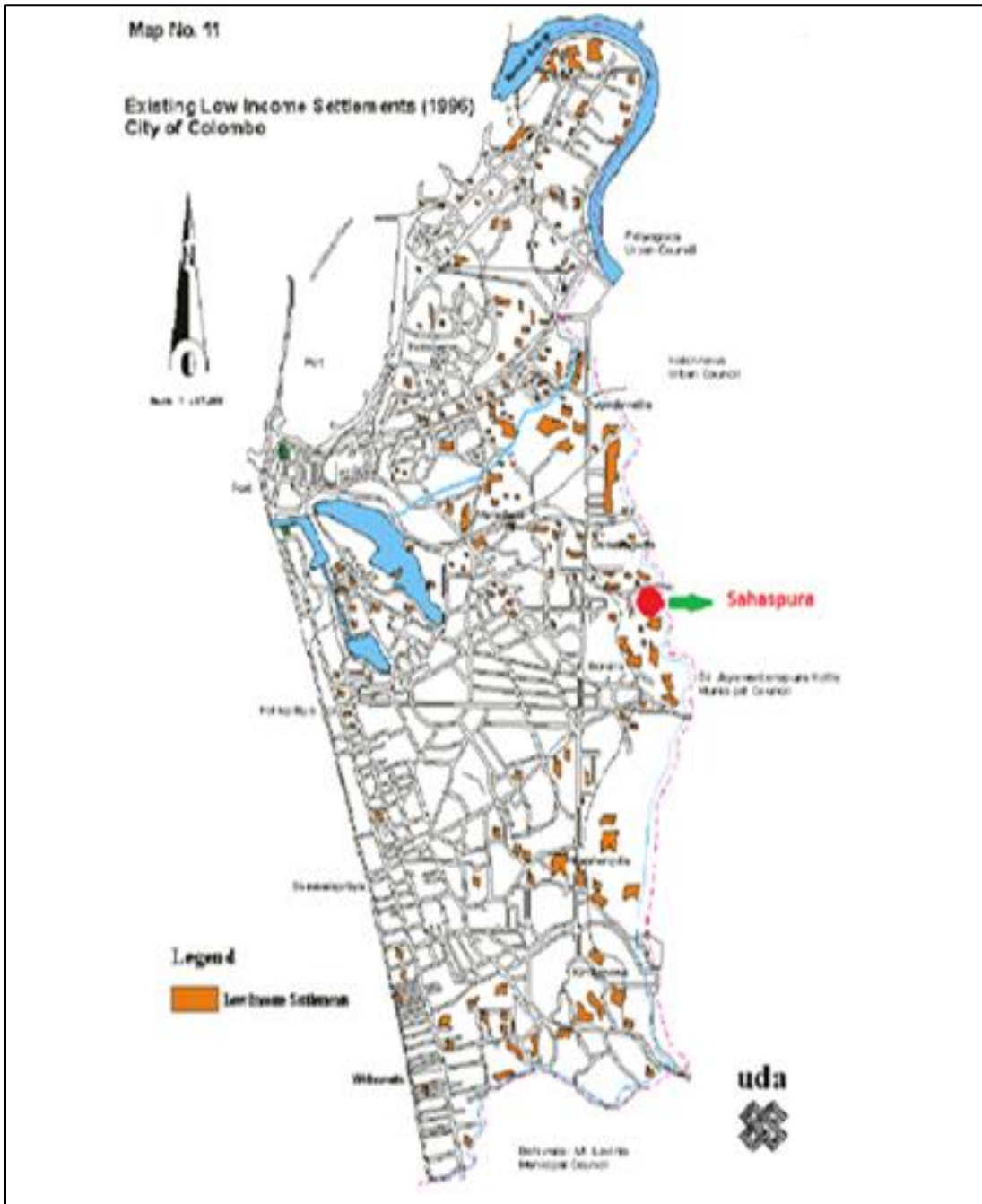
Figure 1: Location of low-income settlements in city of Colombo
Source: (Urban Development Authority, 2018)
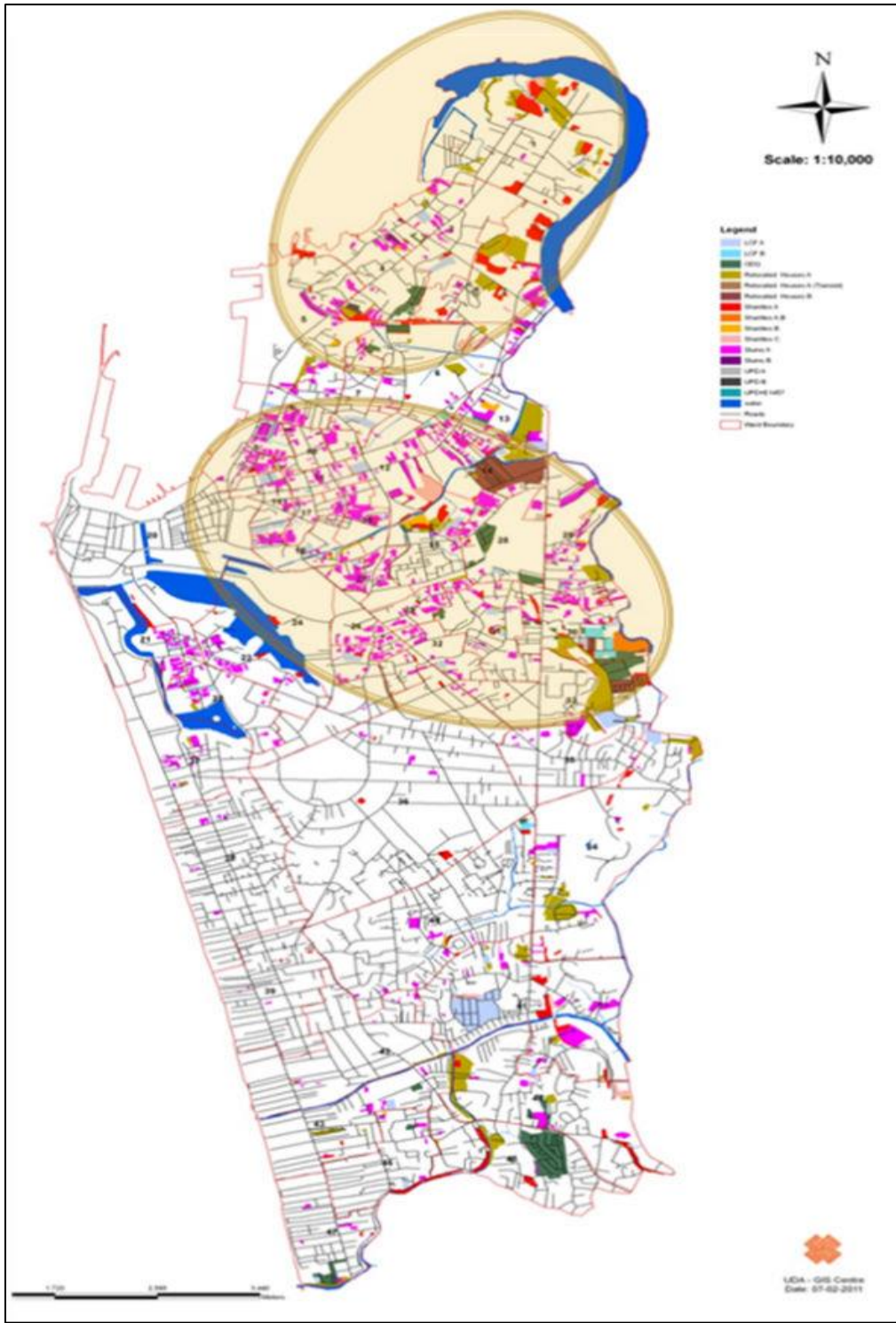
Figure 2: Distribution pattern of underserved settlements in Colombo
Source: (Urban Development Authority, 2018)

1.2. Background of the Research Area

The total land area of the Colombo metropolitan region is 3,731.28 hectares and total population is about one million, indicating nearly 4% of the national inhabitants. Moreover, there are 500,000 commuter population moves from provinces for business and other purposes (Jagoda, n.d.). A brief classification of various categories of land used in the region indicates 43% residential, 20% public roads, 13% water ways, 10% commercial and 14% other areas (Jagoda, n.d.). According to the Sevanatha survey reports 44.0% of urban poor population lives in Colombo city. When compared with the other cities, the city of Colombo has also verified the maximum urban poor. Initially, this study investigated low-income housing apartments of Mihindusenpura situated in Dematagoda, Colombo Central. It has been constructed under the Mahinda Chinthana future vision of the Ministry of Defence and Urban Development. It is a ten floored housing apartment developed in an area of more than five hectares. The Mihindusenpura housing complex comprises of 500 apartments under the first project of mass housing scheme. Range of the housing unit is 300 to 600 sqft.

Figure 3: Location of Mihindusenpura housing scheme
Source: Google Map, 2019

1.3. Research Question

The literature review has revealed that "vertical housing" is not a commonly accepted answer for the problem of low-income inhabitants. Most states fail in vertical low income housing projects due to many reasons such as Pruti-Igoe in United Kingdom (Samaratunga & O'Hare, 2013). Therefore the purpose of research to investigate on main factors which determine outcome of vertical low-cost housing in Colombo and the research questions of this research are therefore:

What are the main factors objecting to the determination of success or failure of low income vertical housing in Colombo?

1.4. Research Aim

The aim of this research is to identify residential satisfaction level of households in existing vertical housing apartments and to identify the alternatives strategies for low income vertical housing in Colombo Sri Lanka.

1.5. Research Objectives

1. To point out the socio-economic and cultural issues in existing vertical housing development.

2. To determine suitable policy implication to improve a satisfaction level of the resident in low income vertical housing in Colombo

3. To examine the alternative options (strategies) for vertical low- income housing in Colombo.

1.6. Scope of the Study

This study is limited to the vertical low-income apartments in Colombo city, and the sample is limited to the households live in low-income residential apartment of Mihindusenpura at Dematagoda. The study would investigate the residential satisfaction based on the physical and none physical variables related to the components of housing apartment.

1.7. Organization of the Dissertation

This dissertation consists of five sections. First one introduction describes the topic and aim of the study. Chapter two analyses the literature related to the thesis topic using key words that have an effect on the research and review the Sri Lankan Government's low-income vertical housing policies. In addition, it analyses the key terms related to vertical housing and examines the history of vertical housing of Sri Lanka also internationally. Section three describes the methodology of the research and Chapter four critically analyses the data which are gathered from primary and secondary sources related the Mihindusenpura low-income high rise apartment at Dematagoda. The last one gives the conclusion, policy implications and recommendation of the study.

1.8. Significance of the Study

This research has provided several significant beneficiations to the practice in the field of vertical low income housing. Specially, this research would be an influence for town planners in identifying the obstacles and limitations on the current planning guidelines for housing development. This would further be important for policymakers to identify the general weaknesses in this area and how these short comes can be overcome in future developments. Further, this study goes some way towards filling the gap on theoretical concept which will be helpful for future research in this sector.

1.9. Theoretical Background of the Research

There is no clear-cut housing theory for describing the suitability of vertical housing for urban poor in Colombo. According to the "theory" residential satisfaction can be defined as "the feeling of contentment one has or achieves what one needs or desires in a house. It is an important indicator for planners, architects, developers and policy makers use it in a number of ways. Indeed, theories of residential satisfaction all hinge upon the notion that residential satisfaction measures the differences between household actual and desired (or aspired to) housing and neighborhood situations" (Glaster & Hesser, 1981). From this theory, a model has been developed to assess residential satisfaction in view of the association among the objective and subjective characteristics on vertical housing background (Mohit & Azim, 2012). Otherwise residential satisfaction is one's perception that the community meets personal goals and needs, and how content that person is with the environment and whether there is a feeling of community connectedness. It is a multi-dimensional construct that focuses on the social environment, such as belongingness and acceptance, and the physical environment, such as availability of community services and housing quality (Smith,

2011). Satisfaction has been approached in various ways by different disciplines such as planning, sociology, psychology and geography; however, despite these differing approaches, the theoretical underpinnings have been similar (Smith, 2011).

Accordingly, residential satisfaction is one of the measures of influence to the achievement or failure of the vertical low-income housing. This research has selected five components and relevant variables under the physical and none physical factors, which are used to measure housing satisfaction of people who live in Mihindusenpura Housing Scheme at Dematagoda. The listed variables of the model demonstrated as follows.
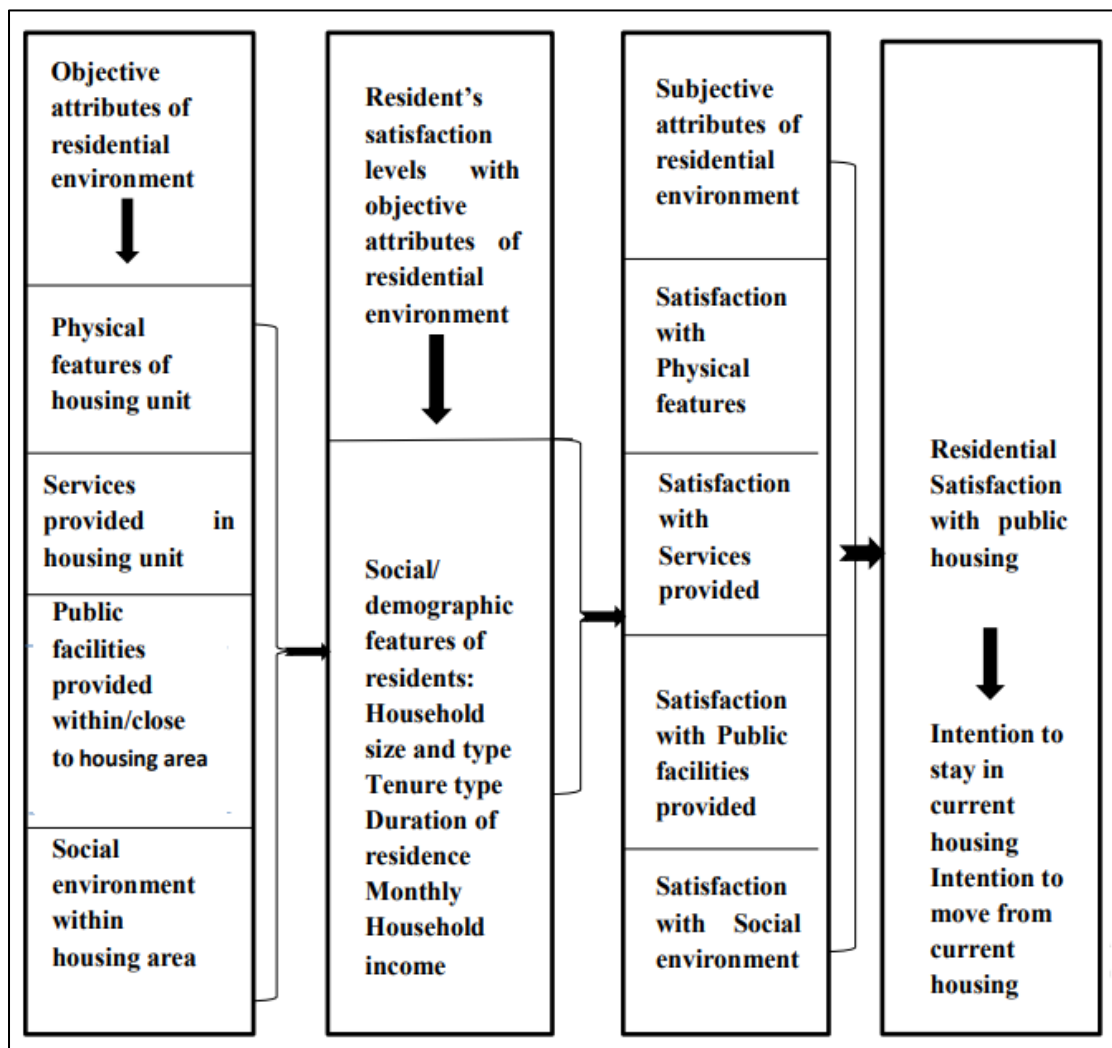
Figure 4: Conceptual model of residential satisfaction
Source: (Mohit & Azim, 2012)

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Accordingly, suitable variables were selected relevant to this research. The relationship of the model figure 06.

RESIDENTIAL SATISFACTION OF LOW COST HOUSING (SELECTED VARIABLES)	
Components	variables
Satisfaction of dwelling units features	Size of dining area, bed room, living area, Kitchen area, size of bath room, pray area and toilets area,
Satisfaction of dwelling units support services	Lightning inside the apartment, Maintenance and repair services, garbage disposal services, lift facilities, condition of the corridor
Satisfaction of public facilities	Play area, prayer hall, social places, community hall, children facilities and security, facilities of the elders.
Satisfaction of social environment	Community relationship, Noise level, Crime situation, Accident situation.
Neighbourhood facilities	Distance of work place, distance of school, hospital, market, religious place, railway station, bus station.

Figure 5: Component and variables related to residential satisfaction
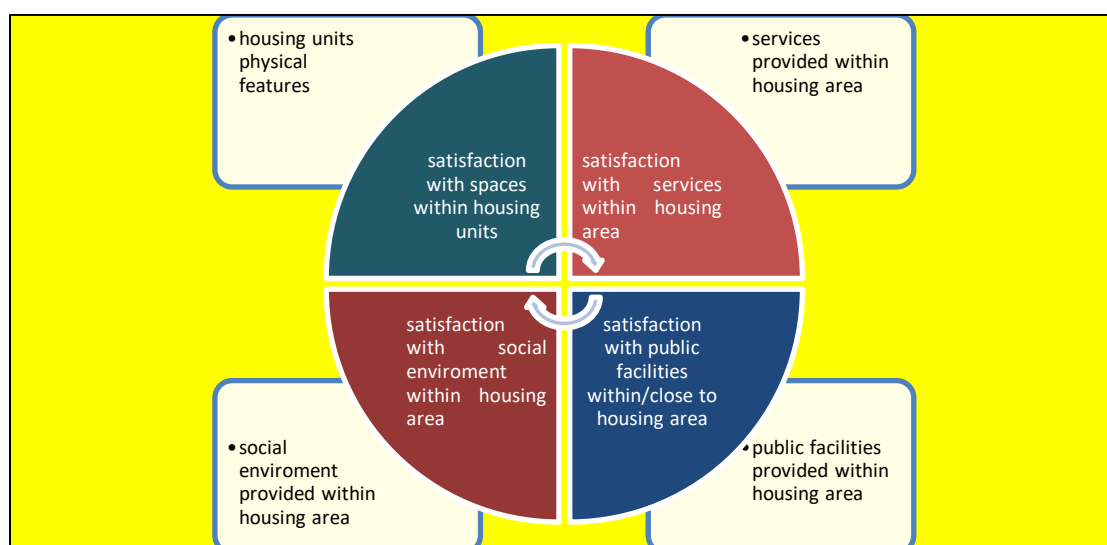
Figure 6: Estimation model of outcome in vertical low-income housing

By using the selected independent variables which are related of above mentioned physical and non-physical factors residential satisfaction level of residents in Mihindusenpura housing apartment can be measured. The residential satisfaction is one of the measurements of the scale of suitability of low-cost housing.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This section initially investigates the key words about research, secondly identifies the main problems in low-income housing, and discusses various used. Finally, clarifications that seemed useful for low-cost housing in the previous were revived. Further, this examines vertical housing as a method to treat the housing requirements of poor persons and observe past and modern movements in the direction of vertical housing for low-income receiving people. Hence, it deeply evaluates local and universal approaches of low-income housing and finding the practical problems regarding low-income receiving people in vertical buildings.

2.2. Literature Review of Key Themes of Research

2.2.1. Vertical Housing (High-Rise Housing)

High rise housing and vertical housing are same words used to identify tall buildings. There's no standard definition for "high rise". According to the Oxford English dictionary (2008), a high rise is "a building having many stories". The International Conference on Fire Safety defined a high rise as "any structure where the height can have as serious impact on evacuation" The building engineers, planners and construction profession define a high rise as a building that is at least 23 meter height. (Kalvikar & Patil, 2014). London and Everest state that it is not possible to define tall buildings using absolute measures. In Sri Lanka, "high- rise" described as a structure that has four or many layers (UDA 2008-2020). In 1986, any structure that was more than four floors was measured as high rise (UDA 2008-2020).

2.2.2 Low-Income Housing

Locally "low-income housing" is usually used instead of low-income resettlement housing. Examples for low-income housing are Sahaspura development housing, Mihindusenpura housing projects at Dematagoda scheme. Instead of using the term low-income housing, various other terms such as public housing, affordable housing, social housing and council housing are used globally. However, all these terms define shelters, which are developed for economically deprived people who live in the society and are funded by the Government.

2.2.3. Underserved Settlement

These settlements are not suitable for living due to inadequate facilities. For an example, there is no permanent housing structure, not sanitary facilities and no good, safe environment. These settlements do not facilitate a healthy lifestyle and there's also no legal coverage to live. Urban underserved settlements can be seen in strategic locations with high land value, such as government lands, canal reservation, and railway reservation and under river brigs. Locally, this term is commonly used to identify slum, shanties and other inhabitable settlement situated in city area.

2.2.4. Low-Income Receiving People

"Low-income receiving publics" are categorized as an under developed or developing nation with standards of living are below some cut-off points, such as income level condition in residence place. They are poor in income, as well as "ability" to work then usually live in slums. Peoples of this nature cannot meet the society's minimum standards for full utilization and employability on any normal basis reside (Stokes, 1962). There is no single definition for "low-income receiving people" but in the literature, there are several definitions. Most countries put a limit to the income level of people to define whether they are low-income receiving people or not, but the Sri Lankan Government has considered the other factors such as living places.

2.3. Vertical (High-Rise) Development

Introduction of vertical buildings to individuals and clusters are rapidly increasing in all major cities of developing and developed countries. Super tall building residences are being erected by Hong Kong and Shenzhen due to limited land areas, geographic and demographic conditions whereas North American and other Asian cities are following similar construction are as tall as 70-80 storied. Therefore, vertical housing has become a common residence building approach all around the world now and the city of Colombo is no difference. The main target of this dissertation is to crucial assessing the suitability of vertical housing especially for poor people in Colombo. The history of vertical housing development goes back many centuries. It has commenced in early Rome with four storied wooden residential buildings. Later, such residential buildings were built using bricks. In North America in the ninetieth century, the Monad Nock building in Chicago 1891 was built with sixteen storied using the bearing walls construction system.

Figure 7: Vertical buildings in New York   Source: (Farouk, 2011)

Around 1931 buildings were built up to the height of 60 stories along with the erection of the Woolworth building in New York initiating the advancement in modern construction technology. With the achievement of Empire State Building which is a 102 storied land mark of 381 meters height, began the golden age for high rise building.

Above are some of the early high rise buildings achievements as mentioned earlier. Throughout the ages high rise buildings have remained an attraction to builders due to its visual advantage of height and dominance above all other creation in the construction industry. High rise buildings of maximum seven storied height was see in Egypt and these building are accommodated hundreds of people. In 11th century most building raised up to fourteen layers accompanied by a roof top garden. By 16th century certain tall buildings were erected in Cairo where two floors were allocated for markets and storage purposes while the rest were rented out to tenants. In 16th century vertical residential buildings were erected in the Yemeni city of Shibam using mud bricks and five hundred of them were towers which were between five and sixteen stores high with each floor housing one or two flats. This practice was applied to protect residence from Bedouin attacks. Shibam has some of world tallest mud buildings some more than 30 meters high.
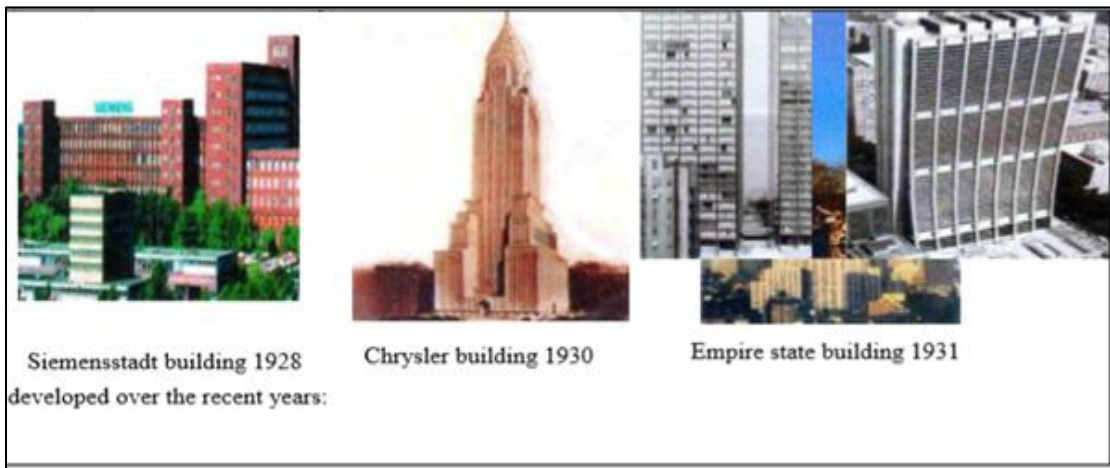
Figure 8: Recent high-rise building in Shibam Source: (Farouk, 2011)

Some of recent high rise building can be demonstrated as following.

Figure 9: Recent high-rise building in Shibam Source: (Farouk, 2011)

During the 17th century Paris has erected thousands of houses consisting five or seven stories. In the 1860s; tower buildings with iron skeletons started to be built followed by Sullivan's Wainwright Building. In 1885 William Le Baron Jenney constructed a ten storied building in Chicago. The Industrial Revolution of England in 18th century enabled the use of materials such as iron and glass in building construction. Subsequently, architecture got through its traditional context and gain a new extend. Some iconic constructions such as Chrystal Palace and Palm House are the products of this era that signed for architectural science. During the post-war years, cheap energy and gasoline caused cities to grow horizontally. Le-Corbusier's "Vertical Garden City" model substitutes communal home for the individual house and rejects low-density models. With the impact of economic crisis at 1970's, new terms as "sustainability" and "energy consumption" started to become a current issue. Especially, when thinking about "urban sprawl" in other words "horizontal urbanization" concerning transportation costs, high energy consumption and land prices, high rise and high-density cities seem to be as a preferable solution.

2.4. Vertical (High-Rise) Low-Income Housing in Western Countries and Sri Lanka

2.4.1. Vertical Low-Income Housing in Western Countries

After industrial revolution most of western countries used the multi storied house due to colonization of the laborers to urban areas. In the 19th century these housing were limited to the three or five story walk up apartment through lowest resources, but after the Second World War high rise public housing has been erected through out of the Europe. Most of these vertical building were erected according to the concept of Swiss architect le- Corbusier. That model can be appeared as tower block or deck or corridor access buildings taller than five stores with an elevator installed. Many vertical buildings constructed in those eras were social housing low-income receiving people. These buildings have been constricted by the Government or local authority or cooperative societies.

According to the survey report of London School of economics (LSE) 60% of the people reside in the high rise flats which are built for the low-income receiving persons in western world. Biggest public housing stock can be seen in the US and first housing project was started in 1935 in New York. Their main purposes were slum clearance (Samaratunga & O'Hare, 2013). The American council housing has been motivated on renovating slums and then providing housing facilities for poor people. Also it has allocated to work-class and middle class people. Otherwise the statement of the National Commission on severely worried council housing (1992) that the municipal housing has been observed as any of the major evident failure of social welfare policy.

During the1960 "Robert Tayler Home" largest urban housing project was built by the Chicago housing Authority. It was a redevelopment plan planned after largest failure of those plans. This housing project is not only for the failure one.

As reported by the US Department of housing and Urban development in 1990, about 186,000 apartment buildings were identified and accepted for destruction in Detroit, Atlanta, Philadelphia and seral other cities. Other failure public housing in America can be demonstrated such as St Louis Pruti-Igoe and Philadelphia's Schuylkill. Both of these apartments have been demolished due to reasons of many issues (Samaratunga & O'Hare, 2013). The Pruti-Igoe housing development had been most debated failure housing scheme in America due to the New York has been considered the high rise housing is most desirable place to live.

2.4.2. Vertical Low-Income Housing in Asian Countries

When we study the city development project in Asian countries, most cities such as Singapore, Hong Kong, Kuala Lumpur and Seoul, have had progressive involvements accompanied vertical public services both of management and the inhabitants. Singapore is a crowded city with most population living in vertical housing, because of scarcity of land resources. Hence Singapore is not normally measured living in high rise housing as poverty or lower standard of living. Also according to the survey reports of Singapore URDA, 1991 in the 1960s estimated about 300,000 peoples have being alive in short-term unclean dwelling in squatter areas with dissatisfaction. Water, health and other infrastructure facilities were needs to be provided to those living in uncleanliness settlement. Hence they happened to lead the city towards vertical development and currently in Singapore the most of people live in tower block (Samaratunga & O'Hare, 2013). Therefore, vertical housing is not restricted to only for low-income receiving people and every income people living in vertical houses. However, the Singapore high rise housing is mostly appreciated and their housing projects are some of the well planned in the Asian county.

Seoul, Korea is a further illustration of high rise housing which has being effectively applied to an Asian city. The 'Figureo' apartment was the first vertical apartment in Seoul city. As per the 2005 census report 54 percent of the total housing stock in Seoul consisted of tower apartment. In urban areas 100 percent of the housing was high rise.

Hence the major role of housing in Seoul was played by the high rise apartment and most of these high rise buildings fall within the category of social housing (Samaratunga & O'Hare, 2013). India initialized high rise for low-income receiving people under the British colonial rules. As a result of establishment of the industries, vast population migrated to Mumbai and other main cities and three or five storied buildings originated in India.

In addition to solutions to slums and shanty living dwellers that live in Indian cities, they have used several other systems to offer secure housing. Among those policies, slum improvement and upgrading has been the most popular and satisfactory ones because this program attempts to better the living conditions of the people. Accordingly, since the 1970s vertical housing development has been conducted as a main option of low-income receiving people in Asian countries, but only few countries have succeeded in high-rise while most have failed to succeed their aims due to several reasons. However, factors such as market position, environment of apartment and use of block of the existing and forthcoming has been decided that demolish or the failure of high-rise development in state of Netherland. The literature illustrates that, during post war most European countries have destroyed such buildings due to being uninhabitable for the occupants. According to the literature

review it is revealed that some land dealers agree that tall buildings are suitable for office, hotels, and delight apartment and business purposes. It is based on the land value and prime locations. A number of high rise apartment buildings in London have been changed to offices and commercial purposes. From estimating past success and failures it is clear that it does not depend on which country but on the individual housing project.

2.4.3. Vertical Low-Income Housing in Sri Lanka Perspective

The vertical housing experience came from the British to Sri Lanka since growth of urban population, movement, land rarity and trade and manufacturing, real state rate is increased and it was reasons to change the traditional living pattern of the Sri Lanka. Hence in Sri Lanka create a western culture and merged the new concept of high rise residential development and living. Before 1960 high-rise houses were constructed for the working class people in Colombo and couldn't get an opportunity for the high or low-income groups in the city.

High rise housing introduced in 1970s and 1980s consisted of four to five stories. Before 2000 it has increase up to five storied or thirty storied. As an example Sahaspura is a first such development in Colombo City. The Colombo Metropolitan structure plan has been formulate the sustainable housing program under the improving of quality of life in people who are living in underserved settlement. It is based on the administration policy and strategies of World Bank and other agencies. Under the urban regeneration project the urban Development Authority and Ministry of Megapolis has been build the high rise apartment as an answer to underserved settlements in Colombo city. In this thesis evaluate the existing urban housing policies for urban poor.

2.4.4. Review of the Sri Lankan Government Housing Policies for Vertical Housing

In the 1950s Sirimavo Bandaranayke's Government introduced the towering housing concept to Sri Lanka. It was of the opinion these kind of housing was relevant to the residents of low and working class families. A maximum height of five stories could be observed in almost all multi-storied houses at that time. However, it took time for people to adjust to this lifestyle mostly due to the lack of knowledge about such housing. Condominium Property Act No. 12 of 1970 is the first legislation related to high rise developments in Sri Lanka. With the introduction of the Apartment Ownership Law No. 11 of 1973, the creation of huge scale tall buildings in Sri Lanka commenced. This rule made an opportunity to convert a multi-storied apartment into a number of individual residential units which would then continue to be under single ownership. The apartment ownership law was studied through the Condominium Act No. 45 of 1982 (Samaratunga & O'Hare, 2013). In 2010, sixty-six thousand (66,000)

low-income receiving people were relocated in high rise housing which was under the policy of "Mahindachintana" future vision. It became a next and biggest high rise development in Colombo metropolitan area, later Sahaspura in 2001.

This project was complimented by the Ministry of Defence and Urban Development Authority. In 2011 the erection of 7,000 housing units began and after that 12,000 housing units were built. Accordingly, the government has selected high rise apartments as the main answer to provide housing for urban poor in Colombo. In accordance with the literature review, it was revealed that past housing policies were well motivated and practiced but sometimes they have fallen short of their objectives, perhaps may be due to the influence or unnecessary engagement of political or state authority. When the housing sector fails to function, it is often the poor that bear the burden of such failure. The housing sector is a major loser when housing policies fail, and eventually economy also takes a declining turn (Ministry of Housing and Construction, 2017).

CHAPTER THREE: METHODOLOGY

3.1. Introduction

This study is to analyze the issues which decide the outcome of vertical housing projects in Colombo city. A questionnaire was carried out to find factors affecting the success and failure of a low-income relocation project. Key factors which affected resident's satisfaction on relocation projects and positive and negative factors for the same were measured by analyzing their happiness, housing favorites and how households think and carry out activities in relation to their housing behavior. Housing quality is quantified by objective and subjective approaches. Objective measurements of the housing are generally used and they evaluate the physical features, amenities, services and environment. Subjective measurements that include perception, satisfaction, ambition and dissatisfaction are strictly connected to the emotional aspect of residence. Based upon the documentation review, created a residential satisfaction bundle to contain five shelter elements namely, satisfaction of dwelling unit features, supportive facilities, public facilities, social environment and neighborhood facilities.

3.1.1. Research Population, Sampling and Procedure

According to the method of random sampling I have selected 50 households, out of 500 households who were living in block A and D. Mihindusenpura housing scheme consists of ten floors and two blocks. Each floor has 25 housing units. According to the registered list of households two or three respondents were selected randomly in each floor. There are Tamil, Buddhist, Muslims and Christian people living in there.

3.1.2. Data Collection Methods

By using a questionnaire sheet data have been collected from respondents. The head of the household or housewife participated in the interviewed. The male households are cannot be contacted in during the day as they were away at work. Taking that into consideration visits were made during the weekend.

A questionnaire sheet was prepared for this investigation consisting with family and house unit information. It had three sections. Further, a method of observation used to gather data while conducting a filed survey. Secondly, information was collected through a face to face interview with officers and professionals in Urban Development Authority, and other relevant agencies. Further data collected from read the research papers, newspapers, official records, journals, relevant books and types of published material in the area were additionally used this survey.

3.1.3. Data Analysis

By using a statistical package for social sciences (SPSS version 17.0) the data collected was analyzed. The level of housing satisfaction was measured by using a five point Likert scale "1" for strongly unsatisfied, "2" for unsatisfied, "3" for neutral, "4" for satisfied, and "5" for strongly satisfied. The overall satisfaction for each feature of residential satisfaction was analyzed based on a mean score of 3.00 as positive indication of satisfaction and value below 3.00 indicating dissatisfaction. According to the research objective of the study, data presented in both the simple frequency table and cross tabulation table have been analyzed by the qualitative data. Further analysis was carried out using correlation analysis and regression analysis of variables. Standard deviations and means were also used to analyze variables for components of housing satisfaction. Using all results suitable housing policy implication has been determined. The results are represented using tables, pie charts and bar charts.

3.1.4. Research Design and Methodology
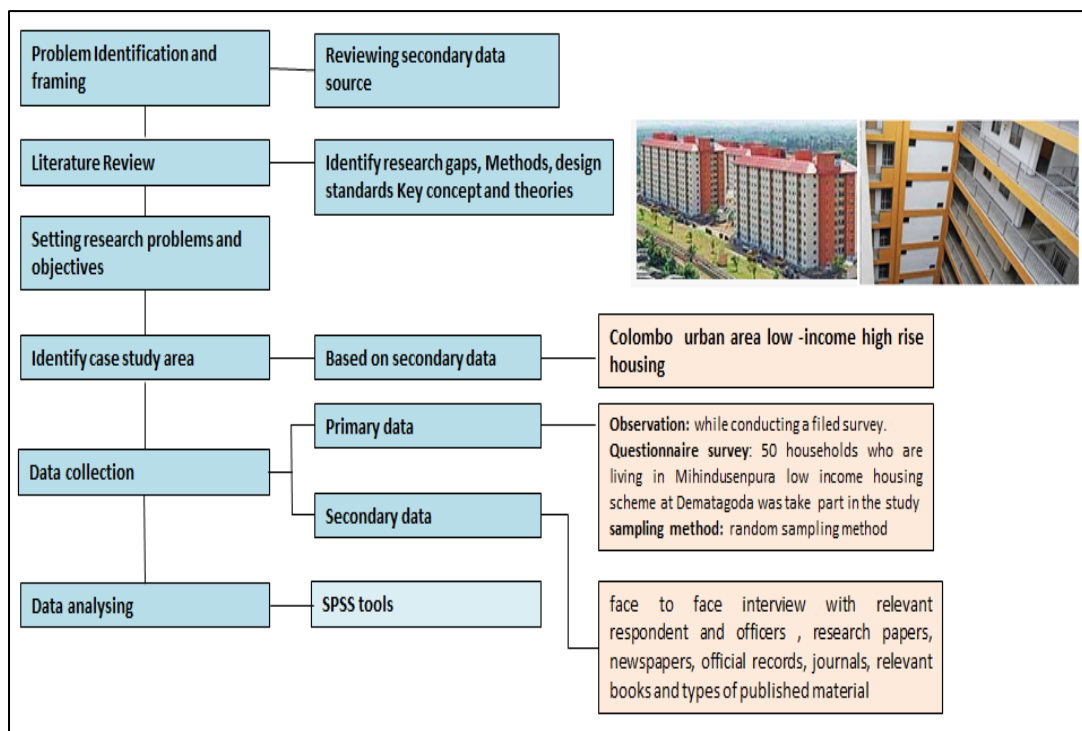
Figure 10: Research Design
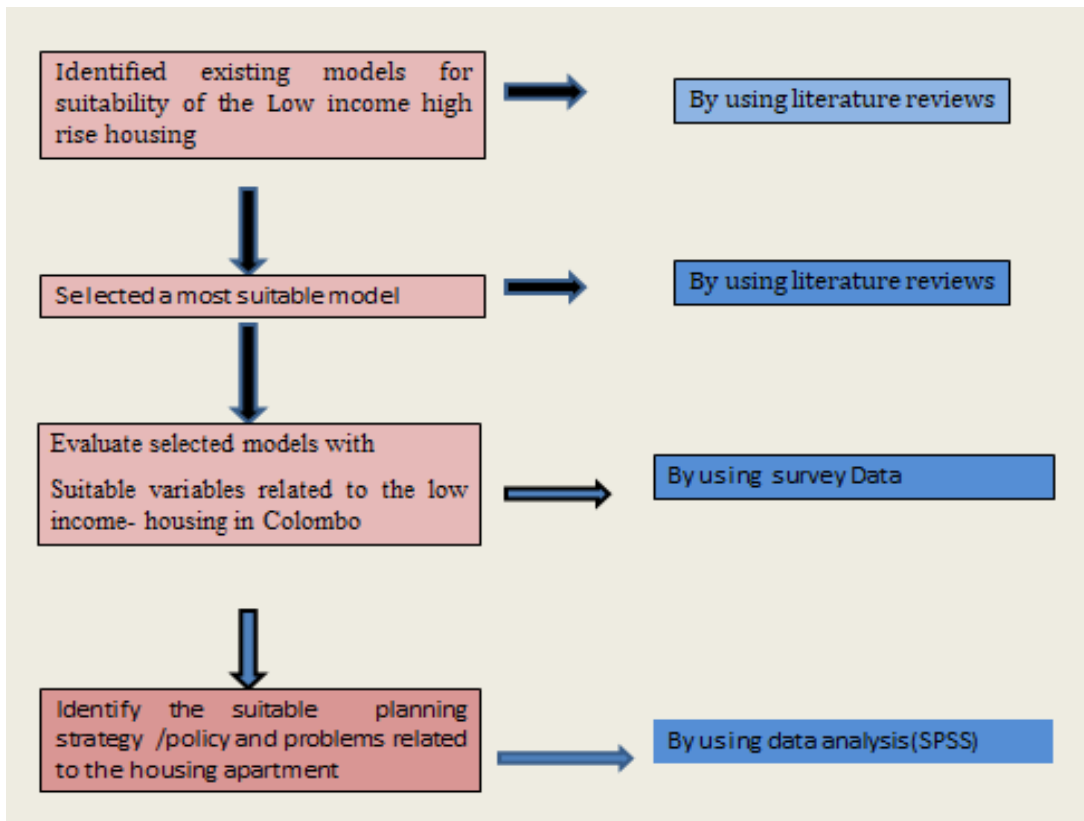
Figure 11: Research Methodology

CHAPTER FOUR: FINDINGS AND ANALYSIS

4.1. Analysis of Socio-Economic Characteristics

Results from the questionnaire survey the following mentioned socio-economic and demographic features of the respondents deserved particular consideration when doing data analysis. Public low cost housing residents of Mihindusenpura at Dematagoda consists mainly of 74% females compared to 26% of male (Table 2).

gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	13	21.3	26.0	26.0
	female	37	60.7	74.0	100.0
	Total	50	82.0	100.0	
Missing	System	11	18.0		
Total		61	100.0		

Table 2: Cumulative percentage of gender   Source: Surveyed Data

According to the above mentioned chart, most respondents were female because majority of male respondent were away at work while females ran the household.
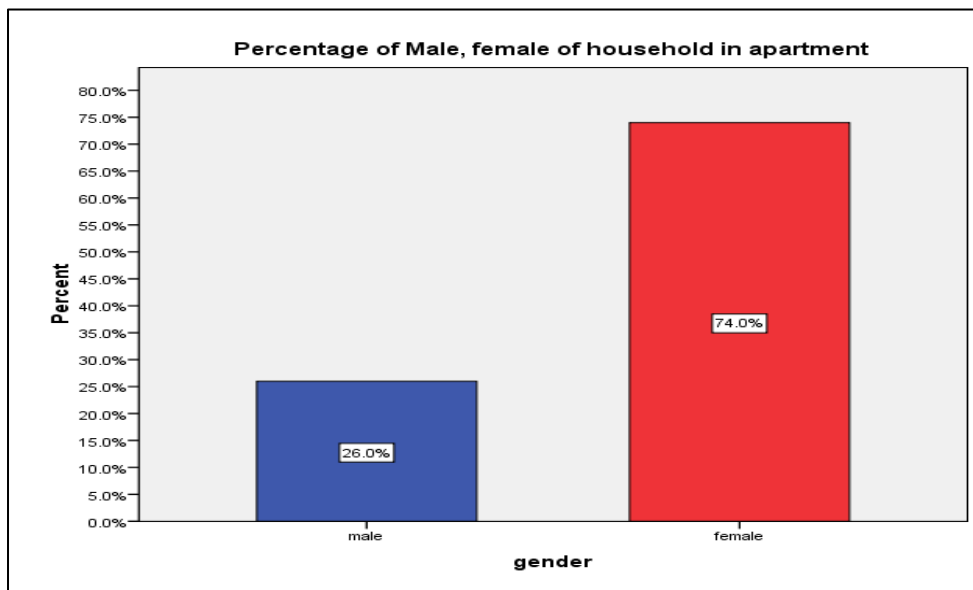
Figure 12: Percentage of males and females of households in the apartment
Source: Surveyed Data

CASE PROCESSING SUMMARY

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
age * gender	50	82.0%	11	18.0%	61	100.0%

Table 3: Cross tabulation of age and gender showing percentage with each gender
Source: Surveyed Data

According to the gender cross tabulation table six males and eleven females are falls within the age group of 31-40 and two males and sixteen females are belonging to the age category level of 41-50 while five males and ten female falls within the age limit of 51-60 as fallowing table four.

Age * Gender cross tabulation

Count

Age group		gender		Total
		male	female	
age	31-40	6	11	17
	41-50	2	16	18
	51-60	5	10	15
Total		13	37	50

Table 4: Age*gender cross tabulation
Source: Surveyed Data

The cumulative percentage column revealed that the most respondents' age fell between the age limit of 41-50 years (Table 7). Majority of the respondents (36%) were between age limit of 41-50, followed by the age group of 31-40 (34%) and the older persons (51-60) constituted of 30% in the representative sample.

AGE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	31-40	17	27.9	34.0	34.0
	41-50	18	29.5	36.0	70.0
	51-60	15	24.6	30.0	100.0
	Total	50	82.0	100.0	
Missing	System	11	18.0		
Total		61	100.0		

Table 5: Percentage of respondents according to the age group
Source: Surveyed Data

percentage of responded as age limit

- 31-40
- 41-50
- 51-61

51-61 24.6%
31-40 27.9%
41-50 29.5%
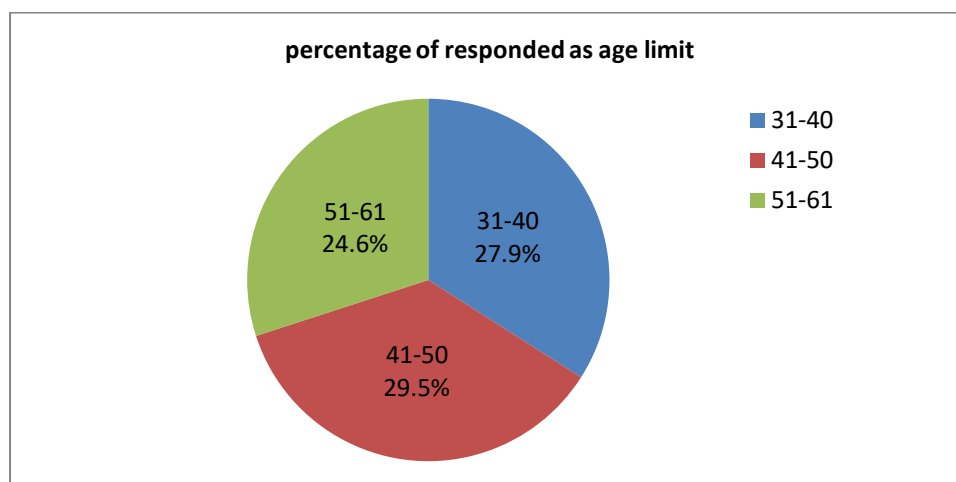
Figure 13: Frequency summary of the age group of households
Source: Surveyed Data

There were more than two members in their families who participated in the research; 42% had within one-three members, 56% reported households had within four-six members, 1.6% reported households were within seven-nine members and no household reported size more than nine members (Table 7 & Figure 13).

FAMILY MEMBER

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	one-three	21	33.3	42.0	42.0
	four- six	28	44.4	56.0	98.0
	seven-nine	1	1.6	2.0	100.0
	Total	50	79.4	100.0	
Missing	System	13	20.6		
Total		63	100.0		

Table 6: Percentage of family members   Source: Surveyed Data
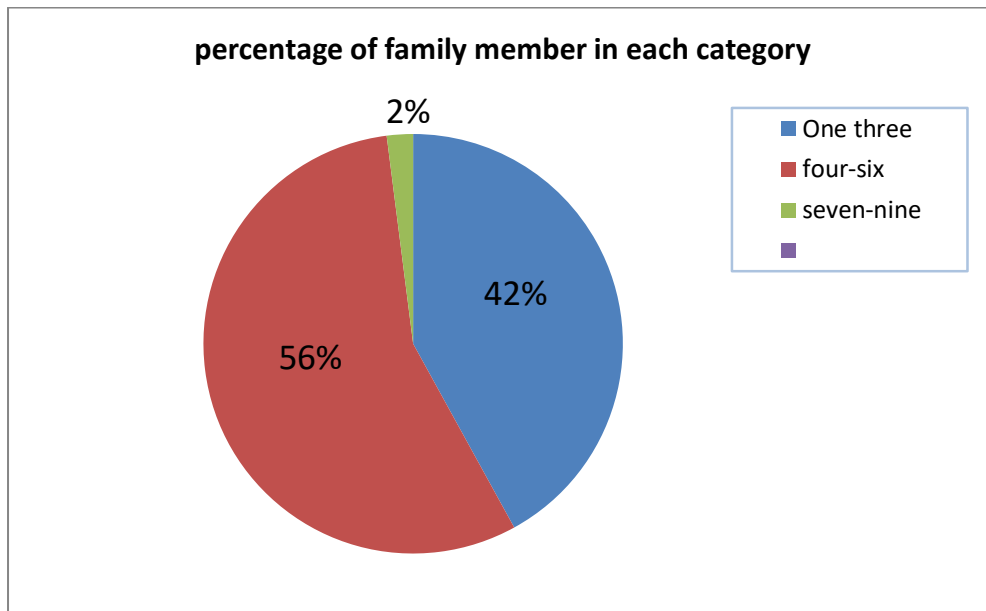
Figure 14: Percentage of family members   Source: Surveyed Data

The result of the analysis of the ethnic composition in apartment area revealed that 24% households are Buddhist, 48% are Muslims, 2% Tamil and Christian was 26% (Figure14 & table 8). Accordingly, it can be revealed that the majority of low-income receiving people are Muslims.

RACE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Buddhist	12	19.7	24.0	24.0
	Muslim	24	39.3	48.0	72.0
	Tamil	1	1.6	2.0	74.0
	Christian	13	21.3	26.0	100.0
	Total	50	82.0	100.0	
Missing	System	11	18.0		
Total		61	100.0		

Table 7: Ethnic composition of households   Source: Surveyed Data
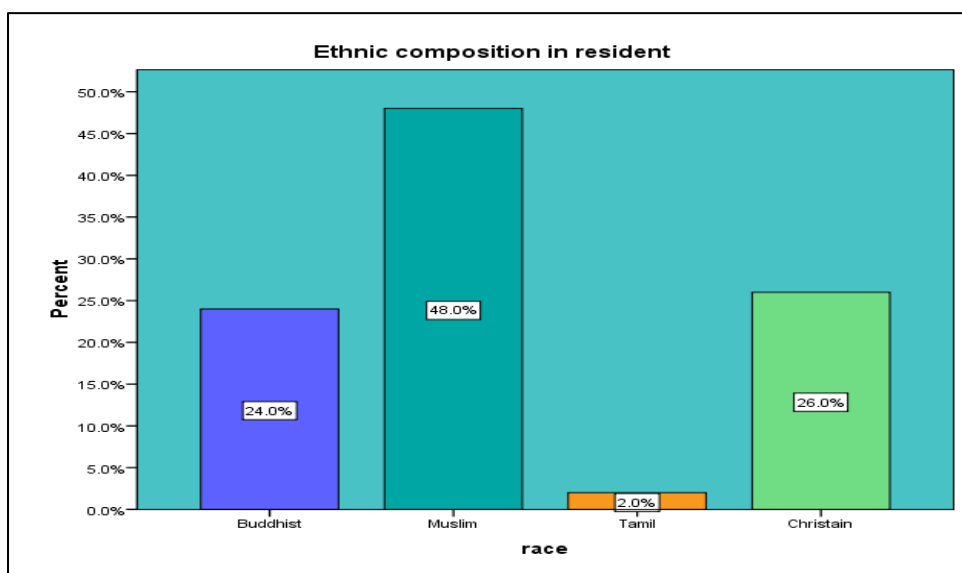
Figure 15: Percentage of ethnicities in the apartment   Source: Surveyed Data

The highest education level of the participants is Ordinary Level as in table nine and 14% attended a school up to Advance Level. Accordingly, 40% of respondents were employed in private sector and 16% were employed in Government sector while 36% were employed in other job areas. Most of the working forces living in slum and shanty houses were involved in many kinds of livelihoods in the trade, business and facility sectors based in the surrounding area.

As a result of resettlement, they are economically affected due to the loss of their informal sector income activities within the shanty area. Such informal sector employments can be categorized under other categories of the employment sector (figure 15 & table 10).

EDUCATION LEVEL

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	up to Ordinary level	31	50.8	60.0	60.0
	up to A//L	7	11.5	14.0	76.0
	other	12	19.7	24.0	100.0
	Total	50	82.0	100.0	
Missing	System	11	18.0		
Total		61	100.0		

Table 8: Educational level of residents in the apartment

EMPLOYMENT SECTOR

Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	government	8	13.1	16.0	16.0
	private	20	32.8	40.0	56.0
	own business	4	6.6	8.0	64.0
	other	18	29.5	36.0	100.0
	Total	50	82.0	100.0	
Missing	System	11	18.0		
Total		61	100.0		

Table 9: Frequency table of employment sectors   Source: Surveyed Data

EDUCATION * EMPLOYMENT CROSS TABULATION

Count

Category			employment				Total
			government	private	own business	other	
education	up to Ordinary level		3	12	3	13	31
	up to A//L		5	0	1	1	7
	other		0	8	0	4	12
Total			8	20	4	18	50

Table 10: Education level*Employment sector of households
Source: Surveyed Data
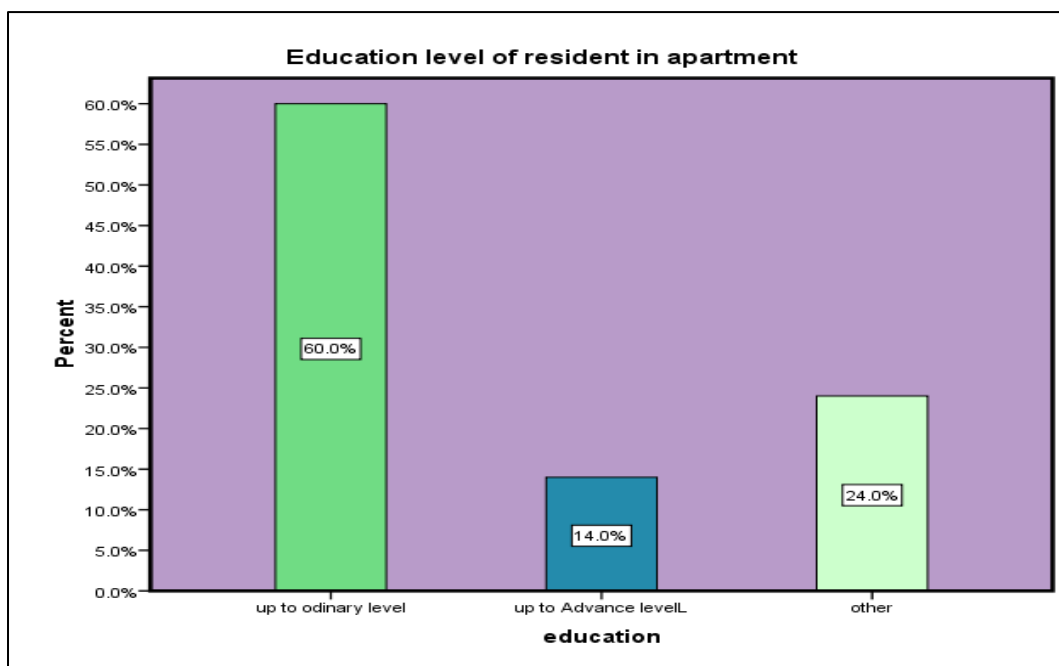
Figure 16: Education level of residents in the apartment
Source: Surveyed Data
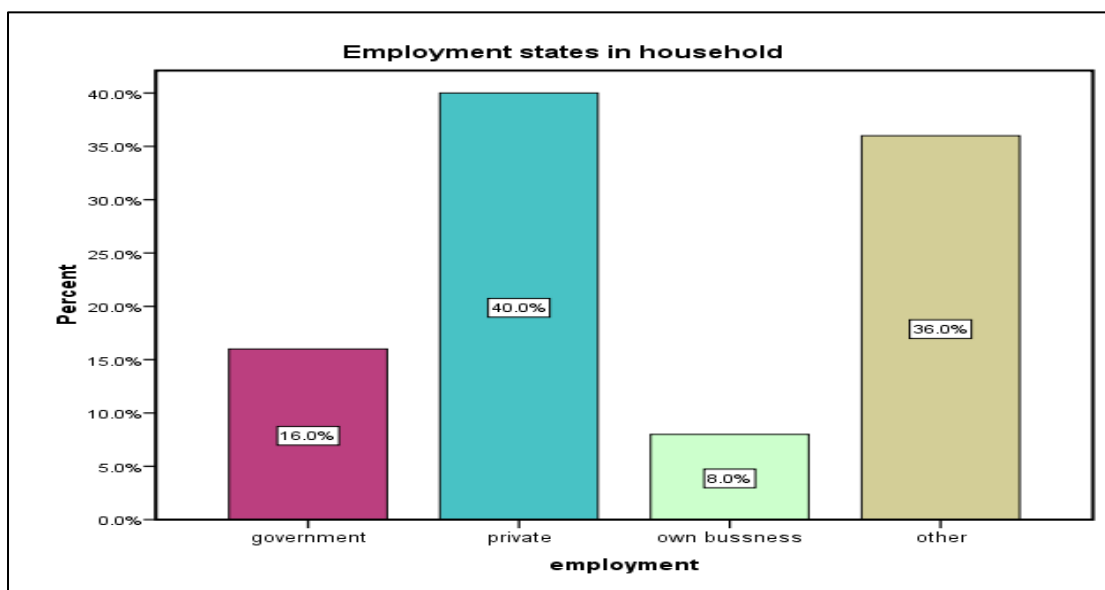
Figure 17: Employment states in households   Source: Surveyed Data

Finding from the questions concerning income level of the households had some variations, with most households earning more than 10,000 rupees per month. All households should pay monthly fees for water, electricity supply and tenant rent to UDA from this income. Since shifting to a new household the urban poor incur additional costs and their cost of living has increased.

INCOME LEVEL

Rupees		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	500-1000	27	32.1	40.9	40.9
	1000-1500	21	25.0	31.8	72.7
	1500-2000	5	6.0	7.6	80.3
	2500>	13	15.5	19.7	100.0
	Total	66	78.6	100.0	
Missing	System	18	21.4		
Total		84	100.0		

Table 11: Monthly income level of households   Source: Surveyed Data
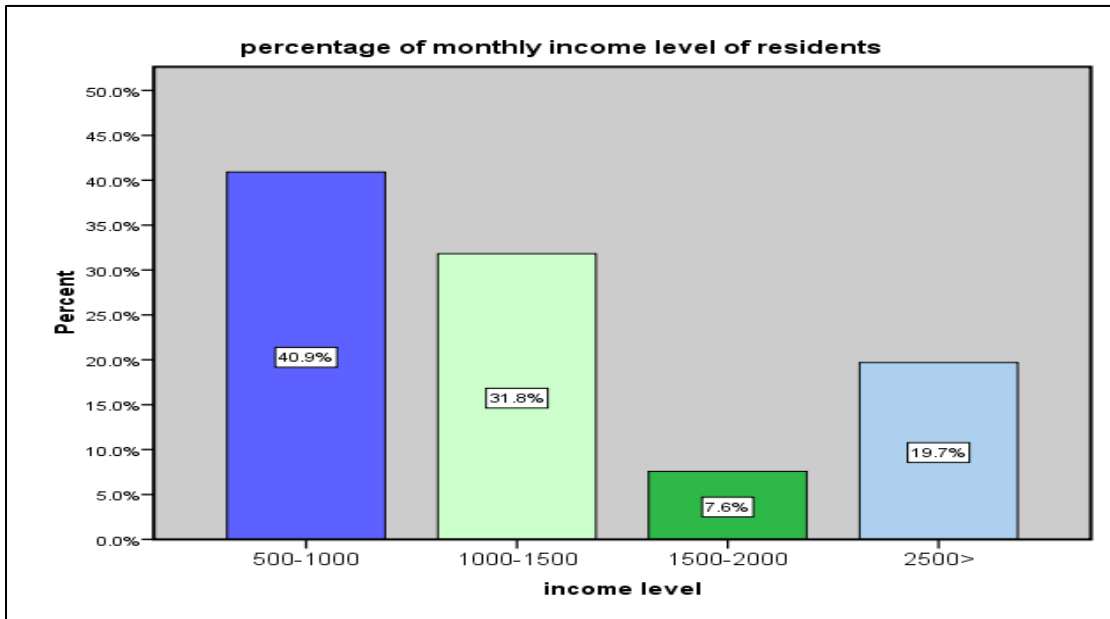
Figure 18: Percentage of monthly income level of residents   Source: Surveyed Data
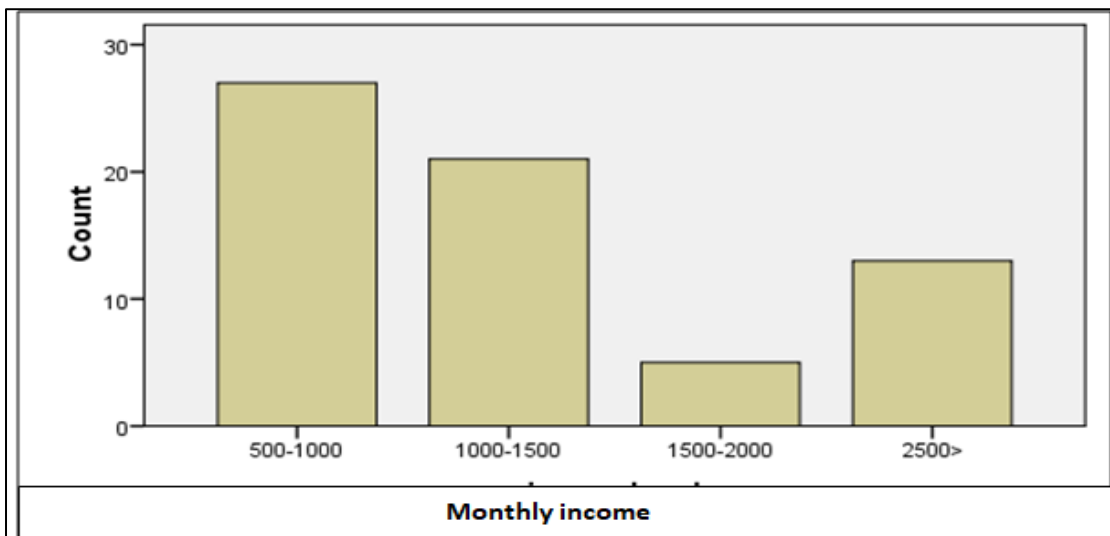
Figure 19: Number of respondents in each category of monthly income
Source: Surveyed Data

Under the data analyzed relevant to the socio economic and cultural issues around the apartment area special observation and comments are mentioned as following,

In addition to the house-owner's family members, there were one or two other families staying in the same residence. Hence housing unit is not adequate to two or three families.

Various religious groups live together in an apartment and the lack of space allocation based on religion has created social and cultural issues in the apartment. So it is proposed to allocate housing units according to ethnicity.

Majority of the people living in the apartment are elders and should be provided with elderly facilities within the apartment area.

Vocational employment should be provided within the apartment area to avoid the unemployment condition because most of residents do not have permanent jobs or good economy to facilitate their lifestyle

4.1.1. Satisfaction with Dwelling Units Features of the Housing Units

As a result of the analysis, from total respondents of 50 households that participated in the research, the analysis indicates that 44 % of residents are strongly unsatisfied with the size of bedrooms and 26 % respondents were unsatisfied with the bedroom size while 20 % respondentsare were satisfied with the bedroom size while 10 percent are neutraly in satisfaction level (See Table 12 & Figure 20).

Bed room size

Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly unsatisfied	22	26.2	44.0	44.0
	unsatisfied	13	15.5	26.0	70.0
	Neutral	5	6.0	10.0	80.0
	satisfied	10	11.9	20.0	100.0
	Total	50	59.5	100.0	
Missing	System	34	40.5		
Total		84	100.0		

Table 12: Percentage of residential satisfaction with bedroom size in apartment
Source: Surveyed Data
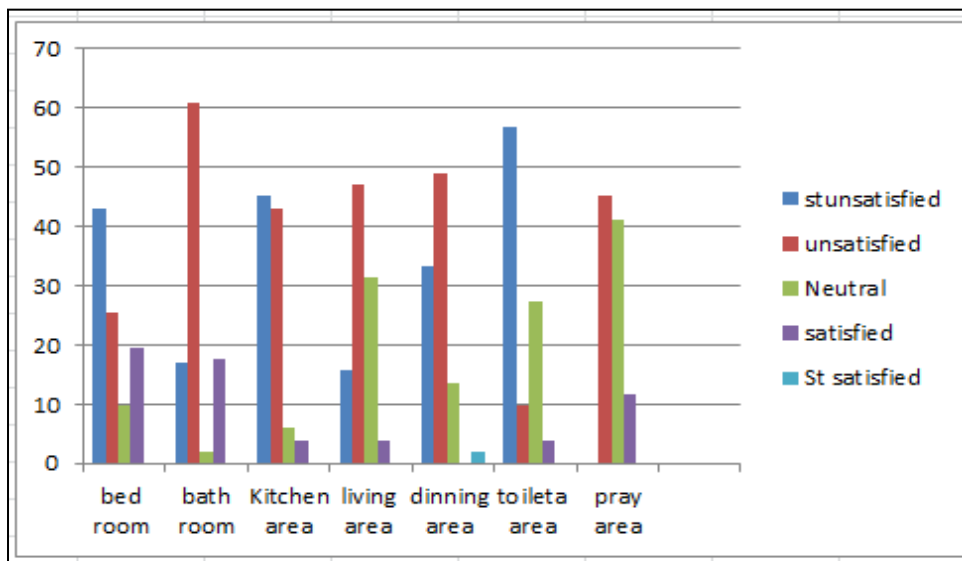
Figure 20: Satisfaction with dwelling units features of the housing units
Source: Surveyed Data

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Dining area	50	1.00	4.00	1.8200	.74751
Bed room	50	1.00	4.00	2.0600	1.16776
Living area	50	1.00	4.00	2.2200	.76372
Kitchen area	50	1.00	4.00	1.7200	.83397
Bathroom	50	1.00	4.00	2.2000	.94761
Pray area	50	1.00	4.0b	2.6400	.72168
Toilets area	50	1.00	4.00	1.7800	.99571
Valid N (list wise)	50				

Table 13: Satisfaction with dwelling units features in apartment
Source: Surveyed Data

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According to the mean value of variables related to the satisfaction of dwelling units' features is low. Highest mean satisfaction has been given to pray area (m 2.6) and secondly towards bathroom (M 2.2) and living area (2.2) and size of the bed room (2.0). Otherwise when compare the Likert scale commonly satisfaction level of dwelling units' features is low.
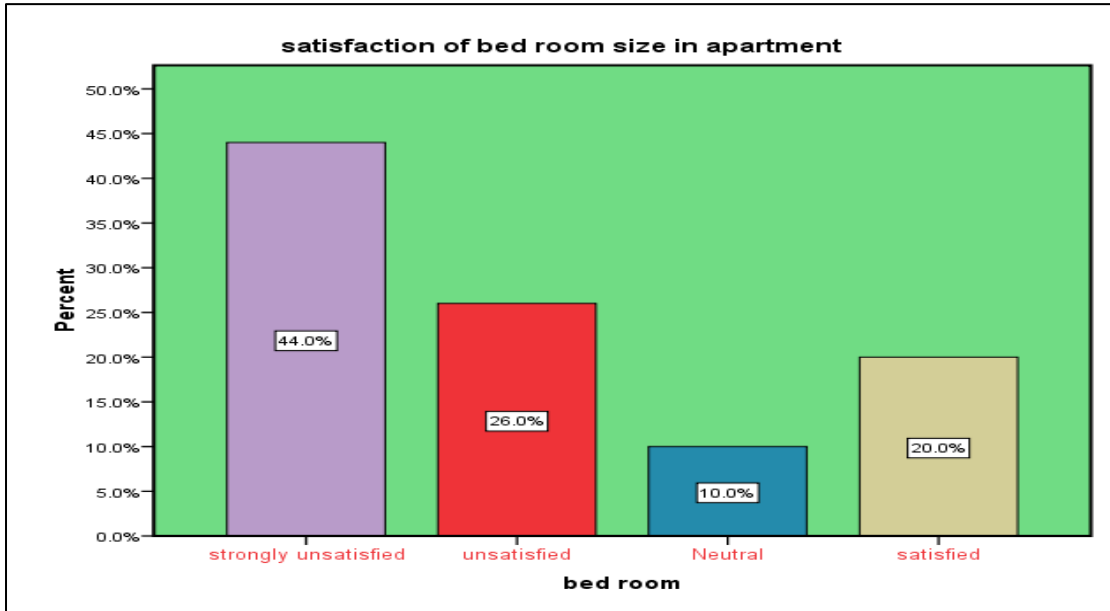
Figurer 21: Satisfaction level of bedroom size in apartment   Source: Surveyed Data

Findings related to the residential satisfaction of dwelling units features of the apartment area demostrate that 62 % were unsatisfied with the size of the bathroom because it wasn't adequate to the family where there were five or six members (Table 14 & figure 22).

BATH ROOM SIZE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly unsatisfied	9	17.6	18.0	18.0
	unsatisfied	31	80.8	62.0	80.0
	Neutral	1	2.0	2.0	82.0
	satisfied	9	17.6	18.0	100.0
	Total	50	98.0	100.0	
Missing	System	1	2.0		
Total		51	100.0		

Table 14: Satisfaction of bathroom size in apartment   Source: Surveyed Data
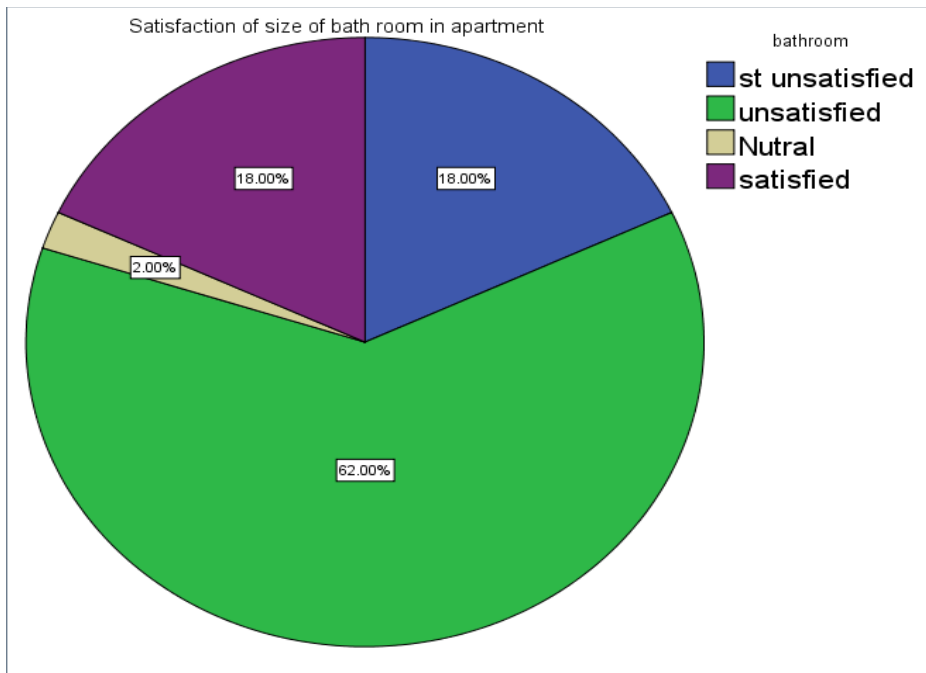
Figure 22: Satisfaction of size of bathroom in apartment　　　　Source: Surveyed Data
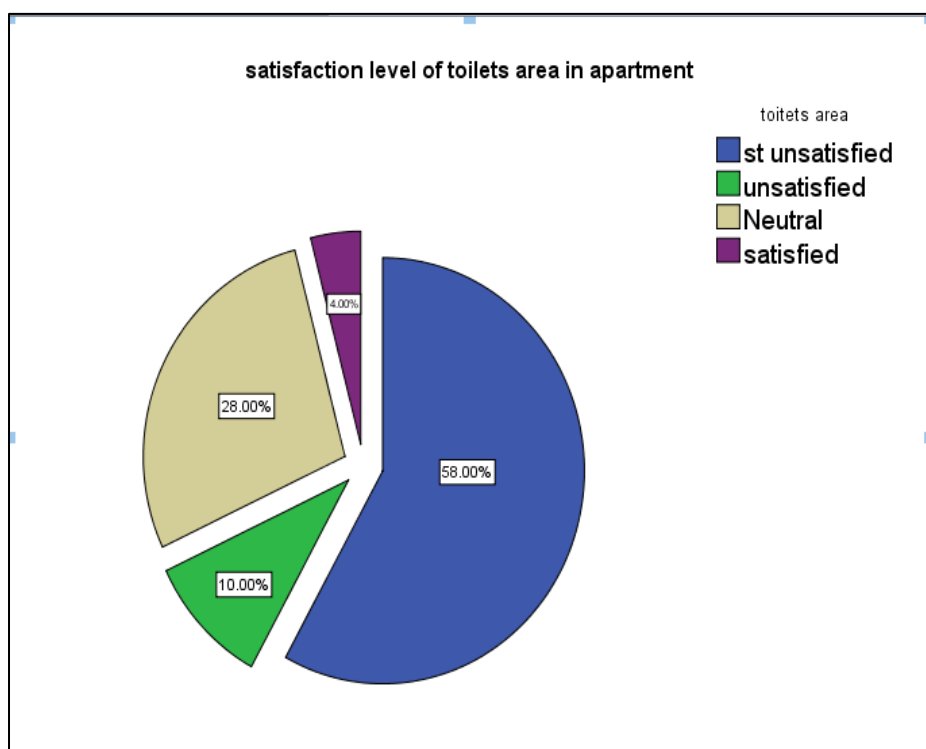
Figure 23: Satisfaction level of toilet area in apartment　　　　Source: Surveyed Data

According to the frequency analysis of the satisfaction of living area it was revealed that 16% are strongly unsatisfied and 48% of the respondents were unsatisfied with the living area (ms 2.2) while 32% households were normally satisfied with the condition of living area (Table 15 & Figure 24). Then the mean value is demostrade a low level satisfaction in living area of the housing units.

Living area

Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly unsatisfied	8	15.7	16.0	16.0
	unsatisfied	25	47.1	48.0	64.0
	Neutral	15	31.4	32.0	96.0
	Satisfied	2	3.9	4.0	100.0
	Total	50	98.0	100.0	
Missing	System	1	2.0		
Total		51	100.0		

Table 15: Satisfaction level of living area in the apartment   Source: Surveyed Data
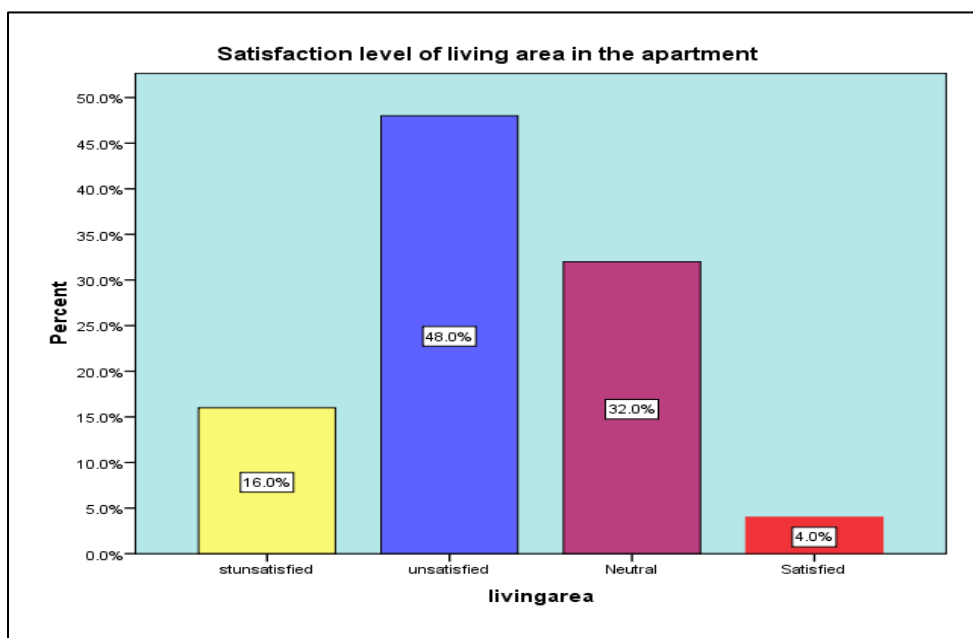
Figure 24: Satisfaction of living area in housing units   Source: Surveyed Data

When we consider the analysed data, 50% of the respondents were not satisfied with dinning area . It can be seen in following table.

Dining area

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly unsatisfied	17	33.5	34.0	34.0
	unsatisfied	25	49.0	50.0	84.0
	Neutral	7	13.7	14.0	98.0
	satisfied	1	2.0	2.0	100.0
	Total	50	98.0	100.0	
Missing	System	1	2.0		
Total		51	100.0		

Table 16: Satisfaction of dining area in apartment   Source: Surveyed Data
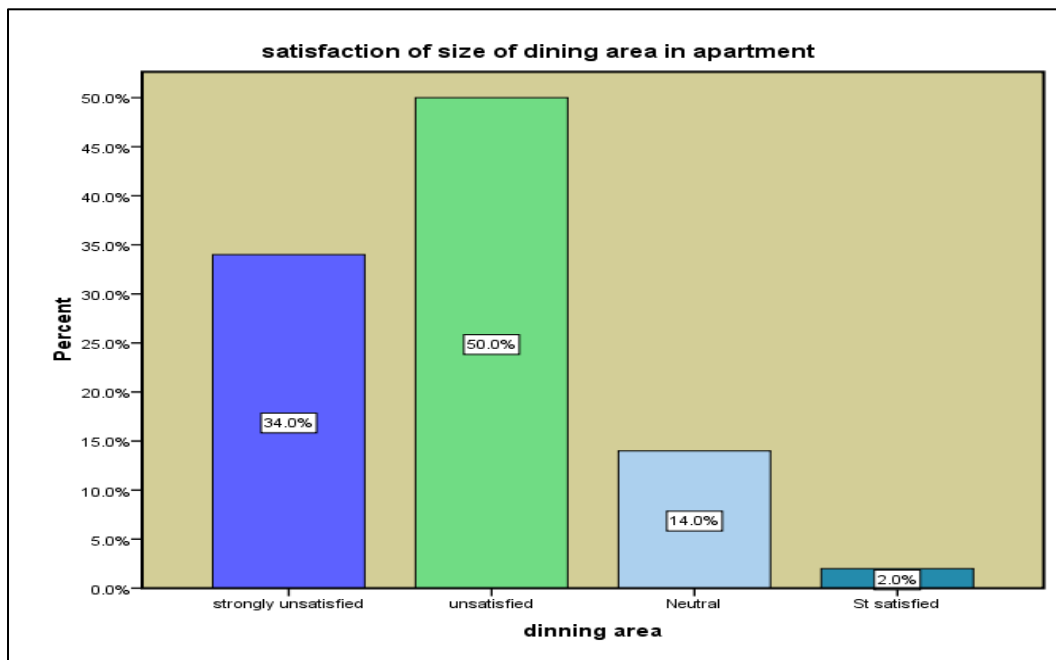
Figure 25: Satisfaction of size of dining area in apartment   Source: Surveyed Data

The percentage of people unsatisfied with the praying area is 46% (ms 2.6) and toilet area is 58% (ms 1.7) (Table 17 and see anixture 1 for further detail).

PRAY AREA

Category		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Un satisfied	23	27.4	46.0	46.0
	Neutral	21	25.0	42.0	88.0
	satisfied	6	7.1	12.0	100.0
	Total	50	59.5	100.0	
Missing	System	34	40.5		
Total		84	100.0		

Table 17: Satisfaction of pray area in apartment   Source: Surveyed Data
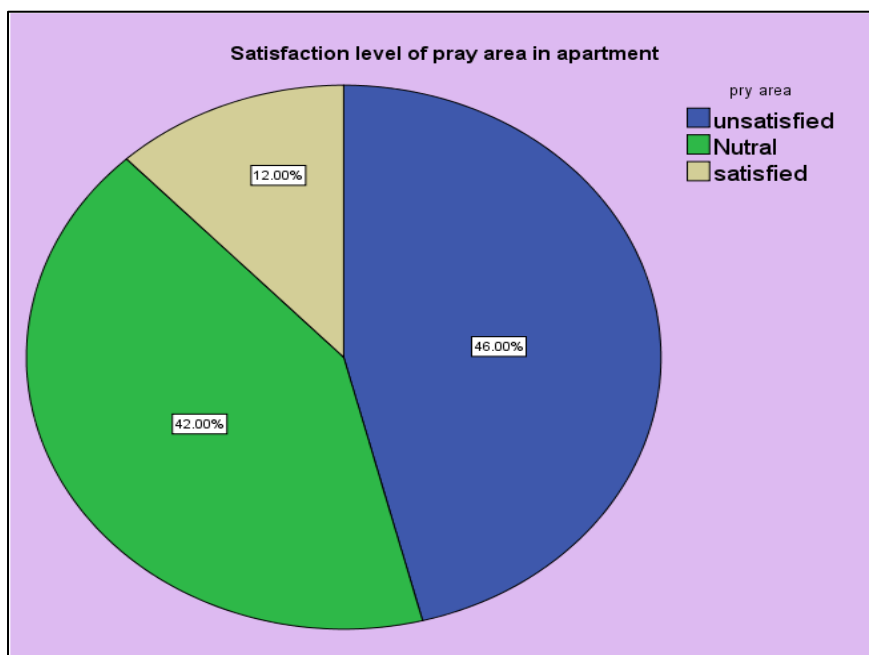
Figure 26: Satisfaction of size of praying area in apartment   Source: Surveyed Data

The research observation revealed that a 400sq feet accommodation unit with two bedrooms, a bathroom and living room can accommodate about four people, but in some houses it was found that there were about 2 to 3 families living in them. Analysis data show a satisfaction condition which is relevant to the size of kitchen area of apartment mentioned in following table.

KITCHEN AREA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	St; unsatisfied	23	45.1	46.0	46.0
	unsatisfied	22	43.1	44.0	90.0
	Neutral	3	5.9	6.0	96.0
	Satisfied	3	3.9	6.0	100.0
	Total	50	98.0	100.0	
Missing	System	21	2.0		
Total		51	100.0		

Table 18: Satisfaction of kitchen area   Source: Surveyed Data

Accordantly, 46 % of respondent were strongly unsatisfied with a size of kitchen area while 4% were satisfied with the kitchen area.

Further, according to variance analysis for the six elements of dwelling unit features of the residential housing units the F value was 53.814, and Sig was .000 (p<.01). One can see that the analyzed regression analysis is statistically significant at 1% level (Table 19). Therefore, research findings are emphasized a suitability of the improving of dwelling units features as optimized a residential satisfaction.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	266.686	7	38.098	53.814	.000[a]
	Residual	29.734	42	.708		
	Total	296.420	49			

a. Predictors: (Constant), Toilets area, Living area, Kitchen area, Bedrooms, Praying area, Bathroom, Dining area

b. Dependent Variable: Overall satisfaction

Table 19: Regression Model Variance Analysis of dwelling units features for residential satisfaction in apartment

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.739	.950		-.777	.441
Dining area	1.047	.187	.314	5.599	.000
bedroom	.876	.115	.416	7.638	.000
Living area	1.322	.168	.414	7.865	.000
Kitchen area	1.136	.166	.354	6.829	.000
bathroom	1.116	.141	.430	7.900	.000
Pray area	1.108	.190	.310	5.844	.000
Toilets area	.672	.136	.272	4.961	.000

a. Dependent Variable: Overall satisfaction   Source Surveyed data

Table 20: Regression Model variance Analysis of dwelling units features for residential satisfaction in apartment

According to the table 20 the standard beta coefficient of the dining area of the residential units is 0.314 and significant value is 0.000. As the significant value is less than 0.01 its shows that there is a significant relationship between the dining areas within the housing units. Similar findings have been found in the study relevant to the bed room size, living area, kitchen area, bath room and pray area in housing units. So that, outcomes of the analysis revealed that the dwelling units features of the apartment area has a significant relationship with the determinant of residential satisfaction.

4.1.2. Satisfaction with Dwelling Unit Support Services

With regard to the satisfaction level on the services provided (Table 21) within the housing area, 46% the participants were slightly unsatisfied with the maintenance and repair services (MS 2.9).

52% of the respondent was strongly unsatisfied with the garbage disposal (MS 2.5). 52% of respondent were satisfied condition of the corridors (MS 2.7), and lift services (MS 2.5) while they were slightly satisfied with postal services (MS 2.9).

Descriptive Statistics

Category	N	Minimum	Maximum	Mean	Std. Deviation
postal services	50	2.00	4.00	2.9800	.68482
lightning	50	3.00	4.00	3.5600	.50143
Repair services	50	2.00	4.00	2.9200	.63374
Garbage disposal	50	2.00	3.00	2.5000	.50508
Lift services	50	2.00	4.00	2.5200	.61412
Condition of corridor	50	1.00	4.00	2.7400	.85261
Valid N (list wise)	50				

Table 21: Descriptive analysis of satisfaction of dwelling unit support services

According to the mean value of variables relevant to the dwelling units support services residents are mostly satisfied with a lightning (M 3.5) in the inside of the apartment and other are low.
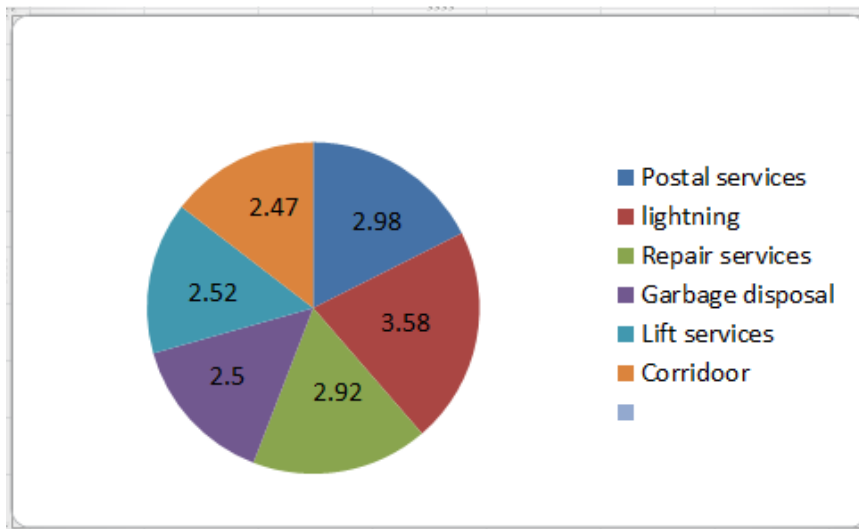
Figure 27: Mean value of satisfaction of dwelling unit support services

POSTAL SERVICES

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	unsatisfied	12	14.3	24.0	24.0
	Neutral	27	32.1	54.0	78.0
	Satisfied	11	13.1	22.0	100.0
	Total	50	59.5	100.0	
Missing	System	34	40.5		
Total		84	100.0		

Table 22: Satisfaction of postal services
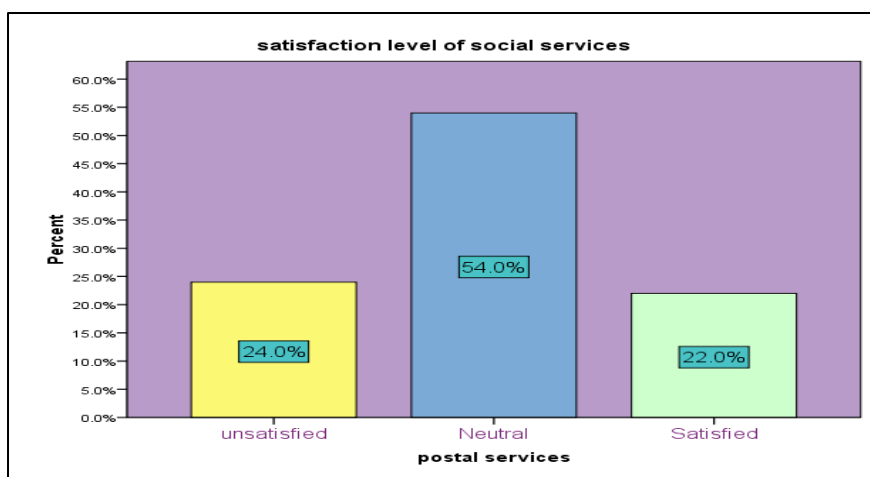
Figure 28: Percentages of satisfaction of postal services

LIGHTING

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	22	26.2	44.0	44.0
	Satisfied	28	33.3	55.0	100.0
	Total	50	59.5	100.0	
Missing	System	34	40.5		
Total		84	100.0		

Table 23: Satisfaction level of lighting inside apartment
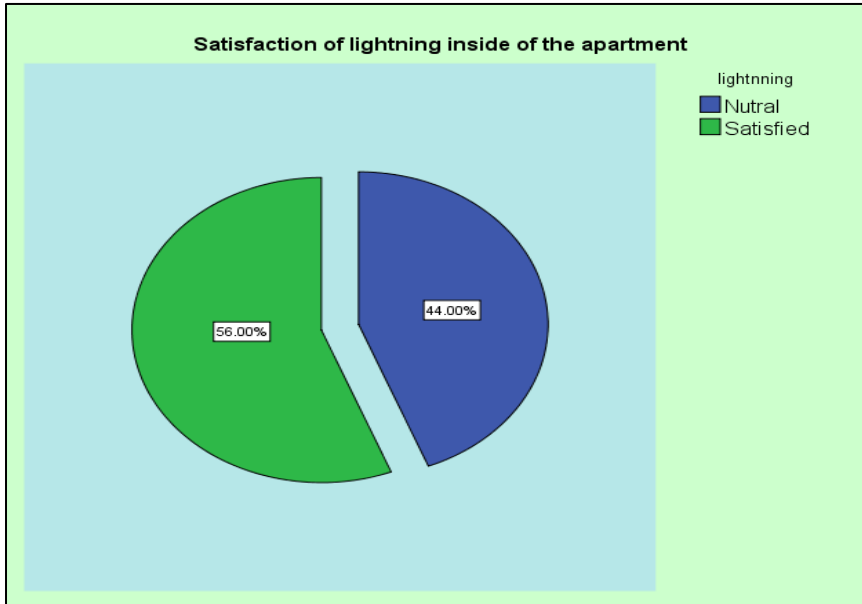
Figure 29: Satisfaction of lighting inside the apartment

REPAIR SERVICES

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	unsatisfied	12	14.3	24.0	24.0
	Neutral	30	35.7	60.0	84.0
	Satisfied	8	9.5	16.0	100.0
	Total	50	59.5	100.0	
Missing	System	34	40.5		
Total		84	100.0		

Table 24: Satisfaction level of repair services in apartment
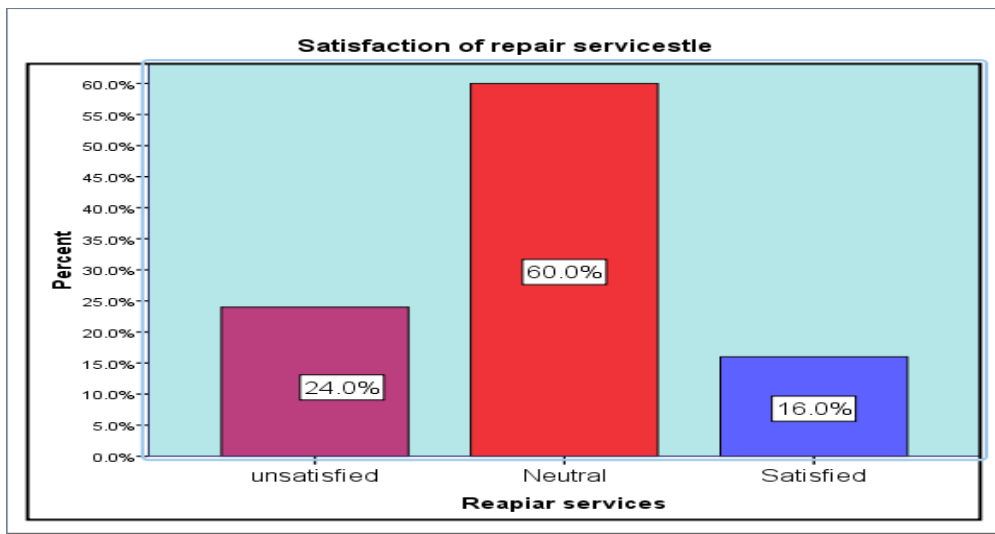
Figure 30: Satisfaction of maintenance & repair services   Source: Surveyed Data
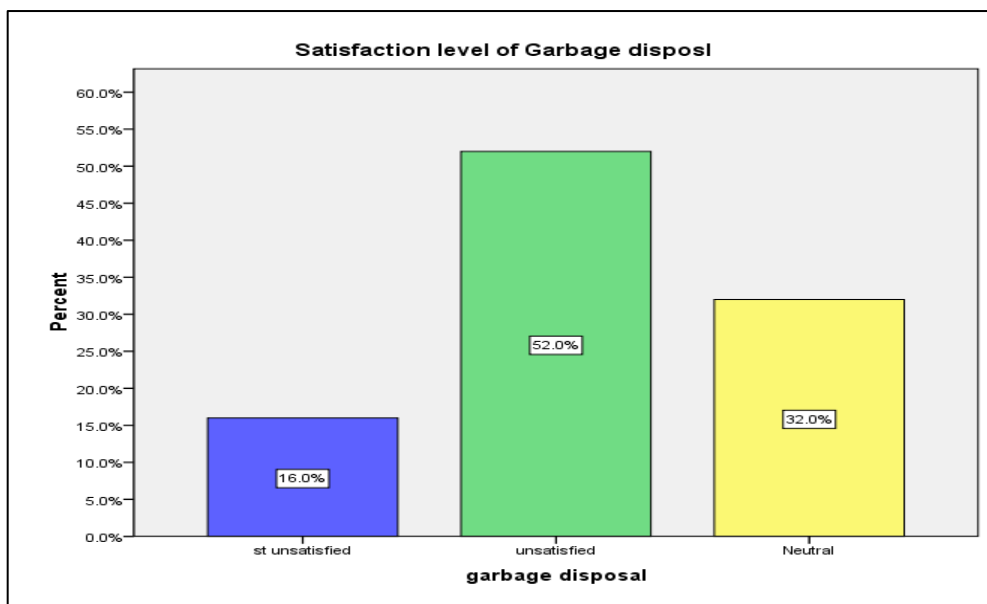
Figure 31: Satisfaction of garbage disposal   Source: Surveyed Data
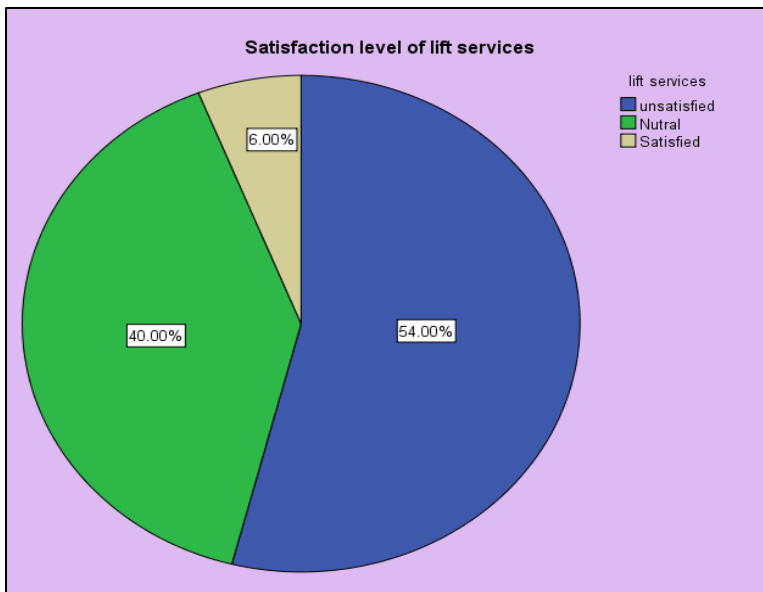
Figure 32:`Satisfaction level of lift services in housing units

There is no garbage disposal place and garbage is tossed everywhere. Lift facility is not in good condition. It was very dirty and did not function well. Repair services are not functioning in good manner. The apartment interior was unsuitable for living. Pigeon feces could be seen everywhere. There was a bad smell and some walls were cracked.

The corridors are not in good condition. Dust was everywhere. Many illegal activities are conducted in corridors and lift area. Balcony area is used as clothing dry place. Hence we can say dwelling unit support services are not functioning properly in the apartment area.

Further, according to the model of variance analysis of six factors of dwelling units support services, the F value was 1.052, and Sig was 0.406 (p>.01). It can be seen that the regression analysis is statistically not significant at even at 10% level (Table 25). Thus research findings revealed that the suitability of the enhancing of dwelling units support services within the apartment area.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.955	6	6.326	1.052	.406[a]
	Residual	258.465	43	6.011		
	Total	296.420	49			

a. Predictors: (Constant), Condition of corridor, Repair services, Lift services, Garbage disposal, Postal services, Lighting

b. Dependent Variable: Overall satisfaction

Table 25: Regression Model Variance Analysis of dwelling unit support services

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	7.426	4.615		1.609	.115
Postal services	-.283	.563	.079	-.503	.618
lightning	.839	.785	.171	1.068	.291
Repair services	1.203	.639	.310	1.882	.067
Garbage disposal	.261	.730	.054	.357	.723
Lift services	-.266	.596	.067	-.447	.657
Condition of corridor	.511	.440	.177	1.161	.252

a. Dependent Variable: Overall satisfaction

Table 26: Regression analysis of dwelling units support services   Source: Surveyed Data

Analyzing from the table 26, the standard coefficient of the postal service is 0.079 and significant value is 0.618. Its shows significant value is higher than even 0.10 (10%). Therefore, there is no significant relationship between the postal services and residential satisfaction. Such same findings are shown related to the lightning, repair services, garbage disposal and lift services of the housing units.

4.1.3. Satisfaction with Public Facilities Provided Within and Close to the Apartment Area

Residential satisfaction with public facilities within the apartment area shows that the residents are strongly unsatisfied with play area 35%. The satisfaction percentage for the condition of community hall was 45% (St: unsatisfied & unsatisfied) and children's facilities and security was 43% and for elder's facilities it was 40%. Overall most participants are neutrally satisfied with the public facilities within the apartment and close to the apartment area (Figure 33).

Further, compared with the satisfaction level of social places and prayer hall mean value is 3.0, satisfaction level of play area, is 2.4, parking area is 2.6 and community hall is 2.0, Children security is 1.9 and elder facilities 2.4 is low.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Play area	50	2.00	4.00	2.5200	.70682
Parking facilities	50	2.00	4.00	2.7400	.69429
Prayer hall	50	2.00	4.00	3.2000	.69985
Social places	50	2.00	4.00	3.1800	.77433
Community hall	50	1.00	4.00	2.0400	.72731
Children security	50	1.00	4.00	2.0000	.83299
Elder facilities	50	1.00	4.00	2.1600	.88893
Valid N (list wise)	50				

Table 27: Satisfaction of public facilities   Source: Surveyed Data
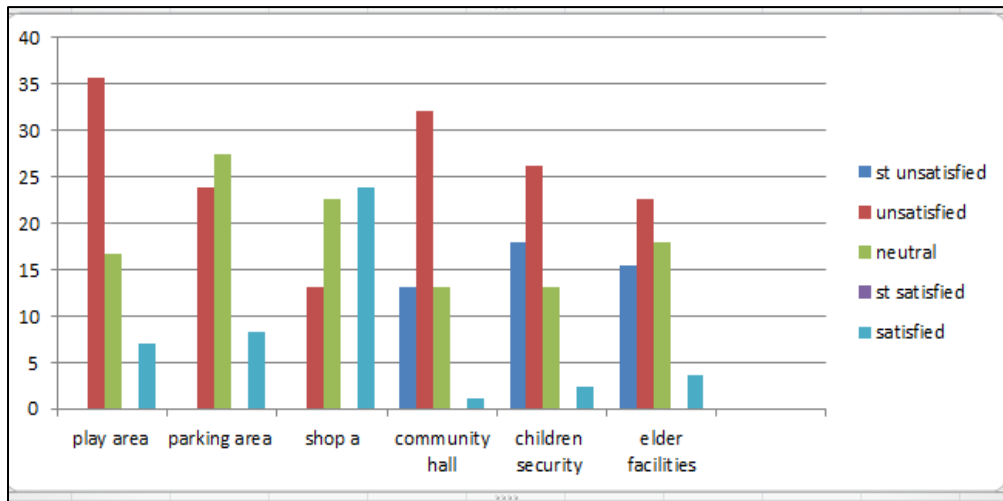
Figure 33: Percentage of satisfaction of public facilities   Source: Surveyed Data

Specially, as there was no playground or any other play area for children to play and they have gotten used to using staircases and corridors to play. Child security is lost due illegal activities like drug addiction and no safety barriers were there to prevent accidents. Respondents were not satisfied with elders' facilities provided within the apartment area. There is no secure, pleasant, joyful, healthy, efficient, self-sustain breathing environment within the apartment area. Another observation was that there is no proper community hall and existing hall gets flooded during heavy rain.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	176.151	7	25.164	243.002	.000[a]
	Residual	4.349	42	.104		
	Total	180.500	49			

a. Predictors: (Constant), Elder facilities, Shops, Play area, Community hall, Prayer hall, Parking facilities, Children security

b. Dependent Variable: Overall satisfaction

Table 28: Regression Model Variance Analysis public facilities provided within apartment area

Source: Surveyed Data

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.509	.470		-1.084	.284
	Play area	1.055	.071	.389	14.918	.000
	Parking facilities	.980	.074	.354	13.175	.000
	Prayer hall	1.057	.073	.385	14.559	.000
	shops	.998	.062	.403	16.081	.000
	Community hall	.972	.067	.369	14.505	.000
	Children security	1.095	.063	.475	17.432	.000
	Elder facilities	1.082	.057	.501	19.044	.000

a. Dependent Variable: Overall satisfaction

Table 29: Coefficient chart of public facilities   Source: Surveyed Data

According to the analysis of variance for the seven factors for the public facilities within the housing area, the F value was 243.002, and Sig was .000a   (P<.01). Therefore, the model is statistically significant at 1% level as 0.000<0.01 indicates that all variables are significant at 1% levels. Since significance values are 0.000< 0.01 (Table 28). The "t" test analysis of variables related to the public facilities shown a negative contributes to the overall satisfaction. Due to significant values are smaller than 0.01 (Table 30). Further, all beta values are positive indicates that they have positive contribution to overall satisfaction.

4.1.4. Satisfaction with Social Environment Within the Housing Area

According to the result of the analysis revealed that the 42% of the repliers are strongly unsatisfied and 30% unsatisfied with security services. Its mean is 1.7 and 34% are unsatisfied with community relationships. Its mean is also 1.7 and it was revealed that the low satisfaction level of the community relationship within the apartment. Further 48% households are strongly unsatisfied with the security conditions while only 5% are satisfied.

The crime situation (52%) and accident situation (50%) in the apartment area is high. More than 5o% percent of the respondents are strongly unsatisfied with the social environment with the apartment area. The noise level is very high because this apartment is located in a highly urban area. It is not good for the mental and physical health of the residents.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
security	50	1.00	4.00	1.7600	.84660
Valid N (listwise)	50				

Table 30: Residential Satisfaction of security services within apartment area
Source: Surveyed Data
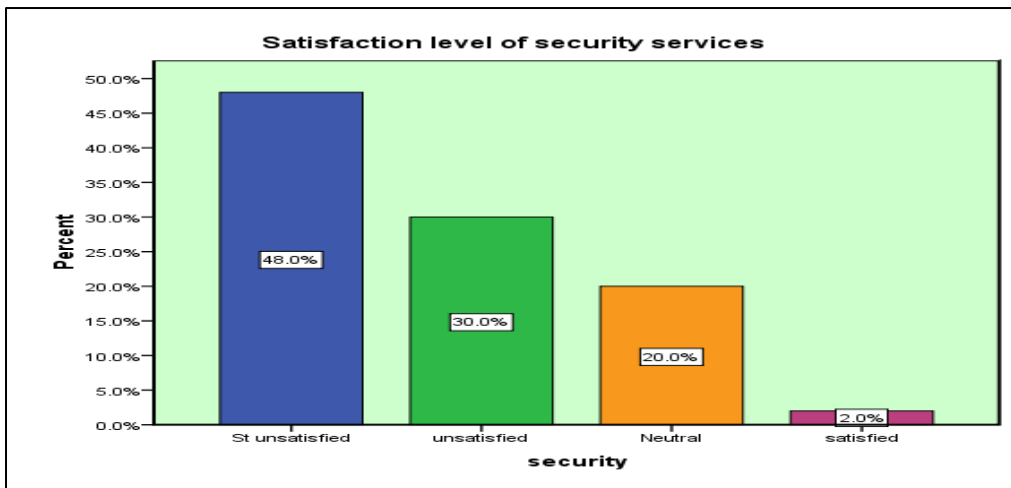
Figure 34: Residential satisfaction with security services in apartment area
 Source: Surveyed Data

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
community relationship	50	1.00	4.00	1.7800	.84007
noice level	50	1.00	4.00	1.9400	.84298
crime situation	50	2.00	4.00	2.5800	.67279
accident situation	50	2.00	4.00	2.8400	.71027
Valid N (listwise)	50				

Table 31: Residential satisfaction with social environment   Source: Surveyed Data

 According to the regression model summary of factors for satisfaction of residential environment F value was 214.111 and Sig was 0.000 (p<.01). Then can see that the

analysed regression analysis is statistically significant 1% level (Table 32). There for its reviled that the important of improve a factors related to the residential environment within the Mihindusenpura low-income apartment.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	192.315	4	48.079	214.111	.000[a]
	Residual	10.105	45	.225		
	Total	202.420	49			

a. Predictors: (Constant), Accident situation, Crime situation, Noise level, Community relationship

b. Dependent Variable: Overall satisfaction

Table 32: Mean square of social environment (F value)   Source: Surveyed Data

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.068	.447		-2.388	.021
	Community relationship	1.081	.092	.448	11.729	.000
	Noise level	1.276	.089	.529	14.280	.000
	Crime situation	.997	.111	.330	8.978	.000
	Accident situation	1.145	.100	.400	11.434	.000

a. Dependent Variable: Overall satisfaction

Table 33: Coefficient chart of social environment

The variables of the estimated model can be described using "t" test results. All variables are significant at 1% levels as those sig values are smaller than 0.01. All variables negatively contribute towards the overall satisfaction.
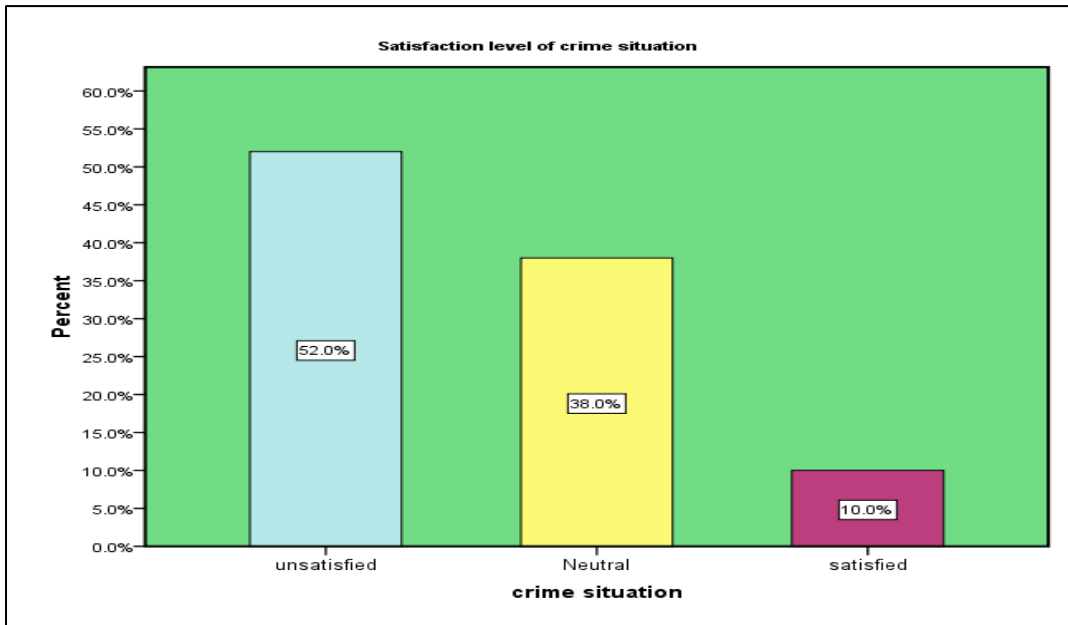
Figure 35: Percentage of satisfaction with crime situation   Source: Surveyed Data

community relationship		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	St unsatisfied	21	34.4	42.0	42.0
	unsatisfied	15	24.6	30.0	72.0
	Neutral	12	19.7	24.0	96.0
	satisfied	2	3.3	4.0	100.0
	Total	50	82.0	100.0	
Missing	System	11	18.0		
Total		61	100.0		.0

Table 34: Satisfaction level of community relationships
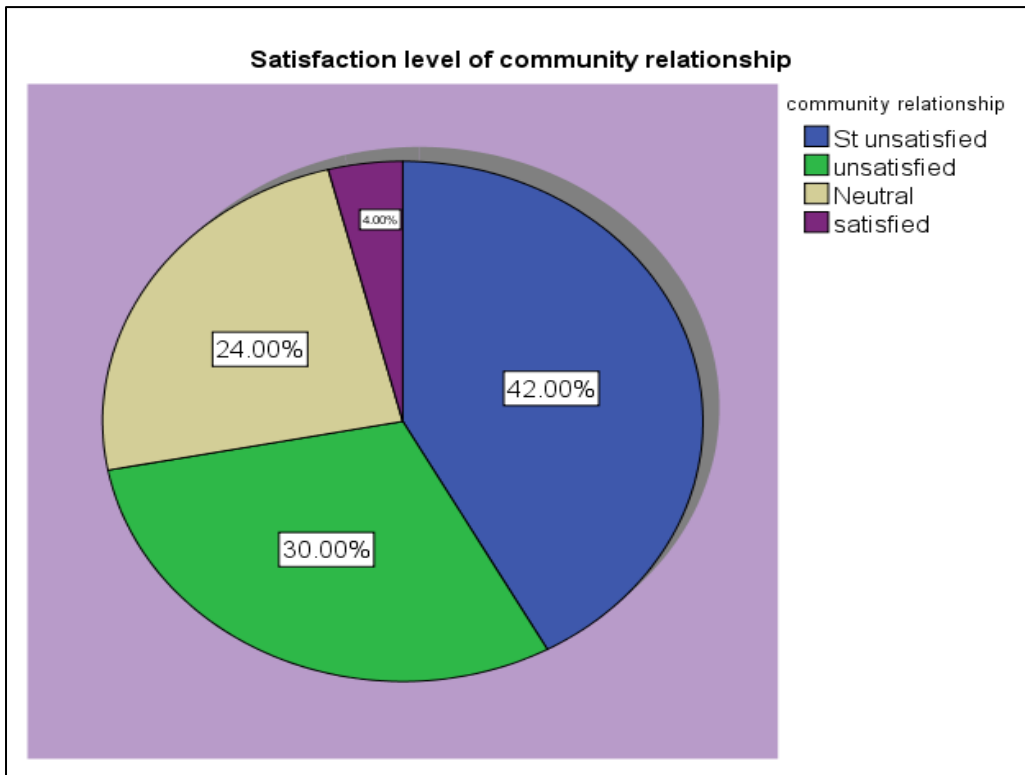
Figure 36: Percentage of satisfaction with community relationships
Source: Surveyed Data
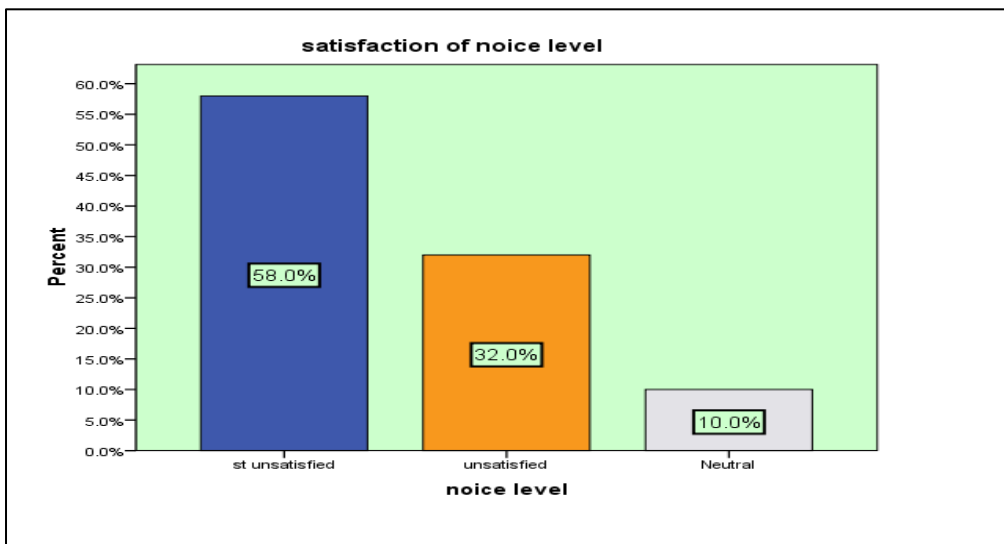
Figure 37: Percentage of satisfaction with noise level   Source: Surveyed Data
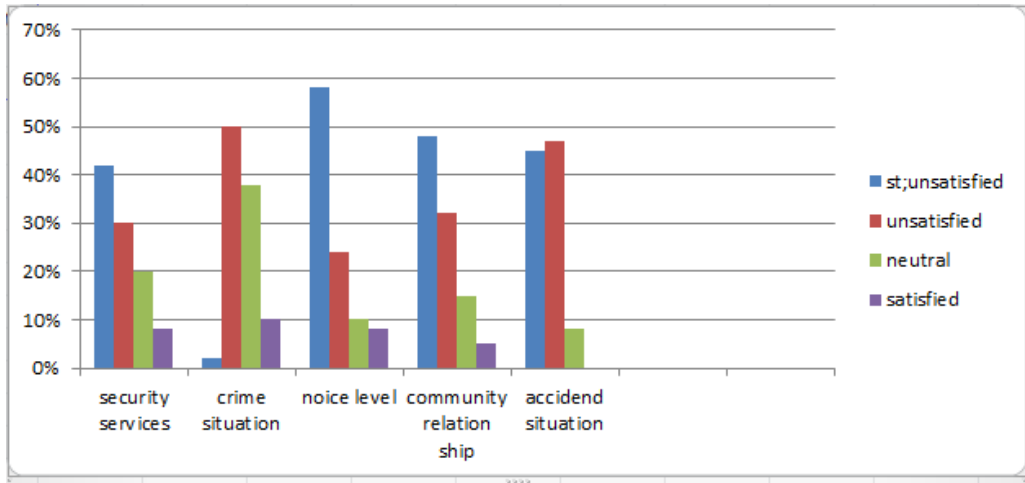
Figure 38: Percentage of satisfaction with social environment   Source: Surveyed Data

According to the above diagram residents conveyed low satisfaction of social environment inside the apartment area due to happenings as house break-ins and drug addiction/dealing selling indicating the need to improve security within the apartment area.

4.1.5. Satisfaction with Neighborhood Facilities

According to the data analysis inhabitants are very satisfied with distance to police station mean value is 4.2, market place mean value is M 3.6, railway station mean value is M 4.1 and religious place while they were unsatisfied with distance to school and work places. Accordingly, the residents have conveyed (Table 35) hundred percent satisfactions with neighborhood facilities.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Dis: of workplace	50	2.00	4.00	2.2800	.53605
Dis: of school	50	1.00	5.00	2.4800	.97499
Dis; of hospital	50	1.00	4.00	3.7400	.69429
Dis: of market	50	3.00	4.00	3.6400	.48487
Dis: of religious place	50	2.00	4.00	3.4000	.60609
Dis: of Police station	50	3.00	5.00	4.2200	.67883
Valid N (list wise)	50				

Table 35: Satisfaction with neighborhood facilities   Source: Surveyed Data
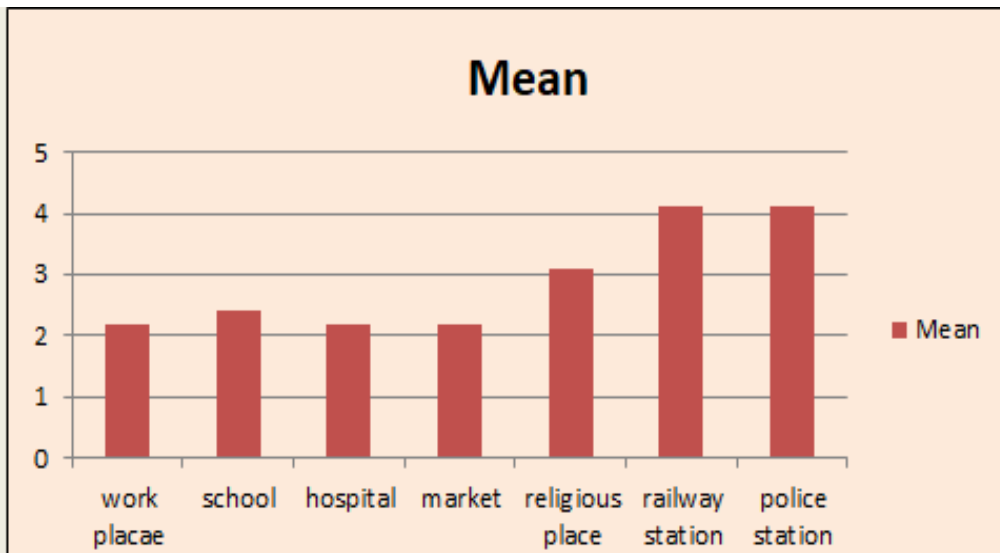
Figure 39: Mean value of satisfaction of neighbourhood facilities   Source: Surveyed Data
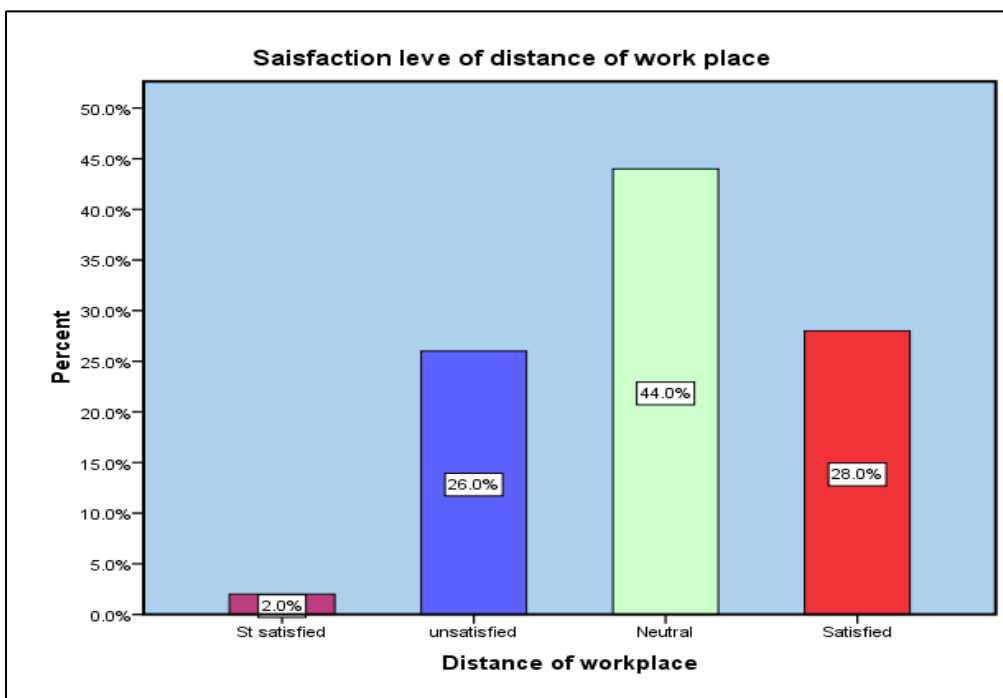
Figure 40: Satisfaction of distance to work place   Source: Surveyed Data
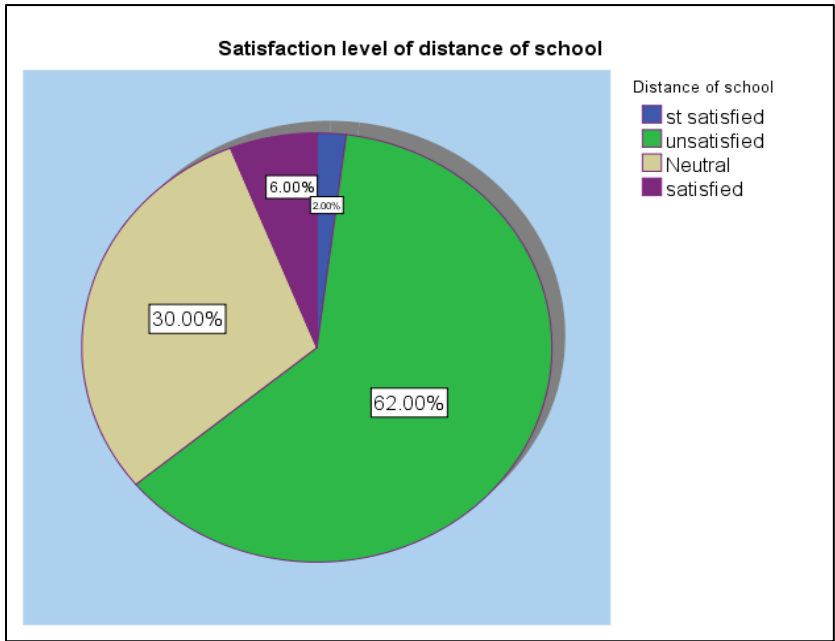
Figure 41: Percentage of satisfaction with distance to school   Source: Surveyed Data

According to the regression model summary of factors for satisfaction with neighbourhood facilities F value was 12.39 and Sig was 0.000 (p<.01). The regression analysis indicated that the model is statistically significant at 1% level. Variables of the estimated model can be described using "t" test results. For example, "Did of workplace" is not significant even at 10% level as the sig value of 0.180>0.10. Next, the variable "Police station" is significant at 5% level as sig value of 0.019<0.05. All other variables are significant at 1% levels as those sig values are smaller than 0.01. All variables are positively contributed towards the overall satisfaction.

ANOVA[b]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	144.581	7	20.654	12.393	.000[a]
	Residual	69.999	42	1.667		
	Total	214.580	49			

a. Predictors: (Constant), Dis: police station, Dis: of hospital, Dis: of religious place, Did: of workplace, railway station, Dis of market, Dis of school

b. Dependent Variable: overall satisfaction

Table 36: Satisfaction with neighborhood facilities

Finally, the regression analysis revealed that the overall satisfaction levels are determined by increasing satisfaction on bedroom area, bathroom size, dining area, kitchen area, toilet area, repair services, garbage disposal, and condition of corridors and internal lighting of apartments, because overall satisfaction of variables negatively contribute and it demonstrate a dissatisfaction level of the dwelling units features of Mihindusenpura residential apartment at Dematagoda.

Thus, it is significant to review and re-value the appearance of the current residential units to regulate ways to increase the plan of the housing units and re-evaluate the provision of residential services inside the apartment. This will fund to increasing overall satisfaction with low-income housing in future housing improvements in Sri Lanka. Entirely the fundamentals show significant correlation in overall satisfaction with physical features of housing units such as bath room is .566**, living area is .326**, toilet area is 579** and Bedroom size is .564**. It is mentioned in following (table.36).

		dinningarea	bedroom	livingarea	Kitchenarea	Bathroom	prayarea	toyletsarea	overallsatisfac
dinningarea	Pearson Correlation	1	-.291*	.214	-.148	-.063	-.198	.220	.197
	Sig. (2-tailed)		.040	.136	.305	.662	.168	.125	.170
	N	50	50	50	50	50	50	50	50
bedroom	Pearson Correlation	-.291*	1	-.107	.143	.192	.026	.170	.564**
	Sig. (2-tailed)	.040		.461	.321	.182	.857	.239	.000
	N	50	50	50	50	50	50	50	50
livingarea	Pearson Correlation	.214	-.107	1	-.029	.164	-.224	.011	.326*
	Sig. (2-tailed)	.136	.461		.839	.256	.118	.938	.021
	N	50	50	50	50	50	50	50	50
Kitchenarea	Pearson Correlation	-.148	.143	-.029	1	-.238	-.137	-.076	.200
	Sig. (2-tailed)	.305	.321	.839		.097	.343	.601	.163
	N	50	50	50	50	50	50	50	50
Bathroom	Pearson Correlation	-.063	.192	.164	-.238	1	.018	.242	.566**
	Sig. (2-tailed)	.662	.182	.256	.097		.902	.090	.000
	N	50	50	50	50	50	50	50	50
prayarea	Pearson Correlation	-.198	.026	-.224	-.137	.018	1	-.254	.027
	Sig. (2-tailed)	.168	.857	.118	.343	.902		.075	.852
	N	50	50	50	50	50	50	50	50
toyletsarea	Pearson Correlation	.220	.170	.011	-.076	.242	-.254	1	.579**
	Sig. (2-tailed)	.125	.239	.938	.601	.090	.075		.000
	N	50	50	50	50	50	50	50	50
overallsatisfac	Pearson Correlation	.197	.564**	.326*	.200	.566**	.027	.579**	1
	Sig. (2-tailed)	.170	.000	.021	.163	.000	.852	.000	
	N	50	50	50	50	50	50	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 37: Correlation analysis of satisfaction of physical features of housing units

Source: Surveyed Data

The correlation between social environment and physical features shows that the residents are unsatisfied along with the elements as regards of the social environment. Thus community relationship is .602**, noise level is .449** and crime situation is .696*. Hence, this correlation shows the need for social environment improvement of low-income housing apartments.

Correlations

		communityrel ationship	noicelevel	crimesituation	accidentsituat ion	overallsatisf
communityrelationship	Pearson Correlation	1	.319*	.415**	-.113	.602**
	Sig. (2-tailed)		.024	.003	.434	.000
	N	50	50	50	50	50
noicelevel	Pearson Correlation	.319*	1	.207	-.289*	.449**
	Sig. (2-tailed)	.024		.150	.042	.001
	N	50	50	50	50	50
crimesituation	Pearson Correlation	.415**	.207	1	.027	.696**
	Sig. (2-tailed)	.003	.150		.851	.000
	N	50	50	50	50	50
accidentsituation	Pearson Correlation	-.113	-.289*	.027	1	.184
	Sig. (2-tailed)	.434	.042	.851		.200
	N	50	50	50	50	50
overallsatisf	Pearson Correlation	.602**	.449**	.696**	.184	1
	Sig. (2-tailed)	.000	.001	.000	.200	
	N	50	50	50	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 38: Correlation analysis of satisfaction of social environment of housing units

The correlations between dwelling units support services and public facilities shows that the residents are unsatisfied with the elements of the dwelling units support services.

Correlations

		playarea	prayerhall	shopssocial	communityhal l	childredsecuri ty	elderfacility	overallsatisfat in
playarea	Pearson Correlation	1	.145	.068	.152	-.246	-.079	.068
	Sig. (2-tailed)		.315	.639	.291	.085	.587	.639
	N	50	50	50	50	50	50	50
prayerhall	Pearson Correlation	.145	1	.350*	.110	-.184	.057	.623**
	Sig. (2-tailed)	.315		.013	.448	.200	.695	.000
	N	50	50	50	50	50	50	50
shopssocial	Pearson Correlation	.068	.350*	1	.000	-.320*	.138	.538**
	Sig. (2-tailed)	.639	.013		1.000	.023	.338	.000
	N	50	50	50	50	50	50	50
communityhall	Pearson Correlation	.152	.110	.000	1	-.232	-.191	.326*
	Sig. (2-tailed)	.291	.448	1.000		.105	.184	.021
	N	50	50	50	50	50	50	50
childredsecurity	Pearson Correlation	-.246	-.184	-.320*	-.232	1	-.133	.066
	Sig. (2-tailed)	.085	.200	.023	.105		.356	.647
	N	50	50	50	50	50	50	50
elderfacility	Pearson Correlation	-.079	.057	.138	-.191	-.133	1	.449**
	Sig. (2-tailed)	.587	.695	.338	.184	.356		.001
	N	50	50	50	50	50	50	50
overallsatisfatin	Pearson Correlation	.068	.623**	.538**	.326*	.066	.449**	1
	Sig. (2-tailed)	.639	.000	.000	.021	.647	.001	
	N	50	50	50	50	50	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 39: Correlations analysis of satisfaction of dwelling units support services of housing units

Source: Surveyed Data

Correlations

		postalservice	lightning	repairservices	garbagedisposal	corrido	overallsatis
postalservice	Pearson Correlation	1	.125	.240	-.142	-.085	.473**
	Sig. (2-tailed)		.386	.094	.327	.559	.001
	N	50	50	50	50	50	50
lightning	Pearson Correlation	.125	1	-.100	.093	.165	.484**
	Sig. (2-tailed)	.386		.491	.521	.253	.000
	N	50	50	50	50	50	50
repairservices	Pearson Correlation	.240	-.100	1	.053	.146	.524**
	Sig. (2-tailed)	.094	.491		.716	.310	.000
	N	50	50	50	50	50	50
garbagedisposal	Pearson Correlation	-.142	.093	.053	1	.365**	.461**
	Sig. (2-tailed)	.327	.521	.716		.009	.001
	N	50	50	50	50	50	50
corrido	Pearson Correlation	-.085	.165	.146	.365**	1	.583**
	Sig. (2-tailed)	.559	.253	.310	.009		.000
	N	50	50	50	50	50	50
overallsatis	Pearson Correlation	.473**	.484**	.524**	.461**	.583**	1
	Sig. (2-tailed)	.001	.000	.000	.001	.000	
	N	50	50	50	50	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

Table 40: Correlation analysis of satisfaction of public facilities of housing units
Source: Surveyed Data

Hence, this correlation shows the need for social environment and dwelling units support services improvement of low-cost housing apartments in Colombo.

In accordance with findings of the research, 68% of residents are relocated by the decision of the Government and it is defined as involuntary resettlement (Table 41). As per research observations, most respondents have lived in large land plots under their ownership. Therefore, apart from people who were transferred from CGR, most respondents are unsatisfied with their new residence due to inadequacy of space. Hence they happened to face the challenges such as loss of valuable land; loss of good schools for children, payment of monthly rent and questions about land ownership and loss of livelihoods (Table 42). Therefore, it is recommended to improve the onside upgrading settlement due to increase the residential satisfaction level of the residents.

MOTIVATIONS FACTORS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	need for house	16	22.2	32.0	32.0
	government decision	34	47.2	68.0	100.0
	Total	50	69.4	100.0	
Missing	System	22	30.6		
Total		72	100.0		

Table 41: Motivations factors of relocation   Source: Surveyed Data

challenges

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	loss of livelihood	18	25.0	36.0	36.0
	loss of good school	2	2.8	4.0	40.0
	loss of large land	17	23.6	34.0	74.0
	obligation pay to rent	1	1.4	2.0	76.0
	obligation to pay monthly income	7	9.7	14.0	90.0
	Ownership of housing unit	5	6.9	10.0	100.0
	Total	50	69.4	100.0	
Missing	System	22	30.6		
Total		72	100.0		

Table 42: Challenges happened to face after relocation   Source: Surveyed Data

4.2. Discussion

This study aims to identify residential satisfaction level of households in existing vertical housing apartments and to identify the alternatives strategies for low income vertical housing in Colombo Sri Lanka. Physical and non-physical factors have been evaluated in order to meet these aims. The result of the evaluation has been used to identify the alternative strategies and improve residential satisfaction factors in future low-income housing. The details of the analysis can be discussed as follows.

Dwelling units features can be defined as internal space within the housing units of the apartment and it is includes the living, dinning, bedroom, kitchen area, and bathroom and toilet area of the housing unit. To start with, regarding the satisfaction with dwelling units features of the housing units (Table 12), the apartment residents show a low level satisfaction (size of bed room, bathroom, living area, kitchen area and pray area). The said level of housing satisfaction was measured by using a five point Likert Scale; "1" for strongly unsatisfied, "2" for unsatisfied, "3" for neutral, "4" for satisfied, and "5" for strongly satisfied. The overall satisfaction for each feature of the housing units was analyzed based on a mean score of 3.00 as a positive indication of satisfaction, and values below 3.00 indicating dissatisfaction. Highest mean satisfaction has been given to pray area (M 2.6) and secondly towards bathroom (M 2.2) and living area (2.2) and size of the bed room (2.0). The analysis indicates that 44% of the residents are strongly unsatisfied with the size of bedrooms, while 10% were neutrally satisfied (See Table 12 & figure 20). The results demonstrated that 62% were unsatisfied with the size of the bathroom and the living area. 50% of the respondents were not satisfied with dinning area (Table 14). The percentage of people unsatisfied with the other areas are as follows.

Praying area   46% (MS 2.6)

Toilet area   58%

Kitchen area   46%.

According to variance analysis of the six factors of dwelling unit features of the residential housing is statistically significant at 1% level (Table 22). These findings indicate that this is an important problem which needs immediate attention. This problem can be addressed by conducting ground level social surveys and plans.

Dwelling units support services can be described as the external space or support space of outside the dwelling units. The selected variables included are lighting, lift services, postal services, garbage disposal and repair services. The results showed that 24% of the participants were slightly unsatisfied with the maintenance and repair services (ms 2.9). 52% of the respondents were strongly unsatisfied with the method of garbage disposal (ms 2.5). 52% of respondent were satisfied with the condition of the corridors (ms 2.7), and lift services (ms 2.5), with a slight satisfaction with the

postal services (ms 2.9). There is no significant correlation between the postal services and residential satisfaction.These findings revealed that improved dwelling units support services should be taken into consideration when designing future housing projects.

Public facilities are another important component that is relevant to the residential satisfaction of the apartment. The variables contained within this component are play area, parking facilities, prayer hall, social places, community hall, and children's facilities and elders' facilities. These facilities are providing an important role in quality of the apartment and it is directly affect to the residential satisfaction. As a result, the study revealed that the residents are strongly unsatisfied with play area 35%. The satisfaction percentage for the condition of community hall was 45% and for the children's facilities and security was 43%, whereas for elders' facilities it was 40%. Overall most participants are neutrally satisfied with the public facilities within the apartment and close to the apartment area (Figure 28). Lack of above mentioned facilities reduced the sense of place and decreases the level of household satisfaction.

The factors of social environment directly impact the housing satisfaction and the included variables are noise level, crime situation, accidents, and security condition and community relations. Majority of the respondents showed dissatisfaction with the level of noise, crime situation and accident situation. The crime situation (52%) and accident situation (50%) in the apartment area is high. More than 50% percent of the respondents are strongly unsatisfied with the social environment with the apartment area. Hence, the result indicates that low level satisfaction indicates a high occurrence of criminal activities in the apartment and low corruption in the community show a high level of residential satisfaction, leading the statistics to represent that criminal status has a strong influence on residential satisfaction. The noise pollution is very high because this apartment is located in a highly urban area. It is not good for the mental condition and physical health of the residents. Therefore, the dissatisfaction rate from majority of respondent indicates that this is an important issue that needs to be solved. In future development projects soundproofing systems can be used to minimize sound pollution within apartment areas. Further, the safety factor shows the highest dissatisfaction level. According to the Broken Windows Theory by Wilson and Kelling, cleanliness or noise in the neighborhood may also affect the occurrence of crime (Gidong, 2018). According to the "t" test results, all environmental variables negatively contribute towards the overall satisfaction (table 32). The correlation between social environment and physical features shows that the residents are unsatisfied with the elements of the social environment. Thus community relationship is .602**, noise level is .449** and crime situation is .696*. From this perspective, safety factor is a key factor of residential satisfaction of the low income vertical housing, and safety can be improved by establishing a police post within the site or entrance and by installing CCTV cameras or alarm systems. Environmental condition

can be approached more easily to improve the apartment physical environment. Functions such as heating, soundproofing and lightning can be installed right when erecting an apartment.

Neighbourhood effects residential satisfaction in many ways, because residents consider the condition or position of the housing area with respect to work place and other facilities such as distance to school, market place, hospital, shopping center, police station, bus stations, and railway stations. The data analysis revealed that the inhabitants are very satisfied with distance to police station with a mean value of 4.2, while they were unsatisfied with distance to school and work places. One of the objectives of research is to investigate the contribution of sense of community, sense of belonging and sense of place to the development of residential satisfaction in the planned community of Housing Scheme at Dematagoda. According to findings of the research, 68% of residents were relocated by the decision of the Government (Table 41). As per research observations, most respondents have lived in larger land plots under their ownership. Therefore, apart from people who were transferred from CGR, most respondents are unsatisfied with their new residence due to inadequacy of space. Hence they happen to face the challenges such as loss of valuable land, loss of good schools for children, a cost on payment of monthly rent and questions about land ownership and loss of livelihoods (Table 43). Therefore, it is recommended to improve the onside upgrading settlement to increase the residential satisfaction level of the residents and voluntary resettlement should be approached to minimise to social problems which are relevant to the resettlement.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

This research aims to study the residential satisfaction level of existing high rise apartment of Mihindusenpura housing scheme at Dematagoda with the research question being, "What are the factors objecting to the determination of success or failure of low-income vertical housing in Colombo?". I have taken this study under two perspectives; physical and non-physical factors and socio-economic factors. The key findings of physical and non-physical aspect of the research are based on the five components relevant to the housing units and housing environment namely,

1. Satisfaction of housing unit features
2. Satisfaction of housing unit support services   Physical
3. Satisfaction of public facilities
4. Satisfaction of social environment   Non-physical
5. Neighbourhood facilities

Accordingly, the study found that majority of the respondents are satisfied with neighborhood facilities, compared to satisfaction for dwelling units features, dwelling unit support services, public facilities and social environment inside the housing area. The study showed that the main issue with regard to physical factors is the lack of room in residential units. The main complaint circulating among the residents were the inadequate size of bedrooms, bathroom and kitchen area as most of them were sharing the living space with their extended families. A further lower level of residential satisfaction was recorded for lift facilities, garbage disposal, conditions of the corridor, security level, and noise level inside the housing area. Therefore, the analysis recommended improving the following mentioned "physical" and "non-physical" factors when building a low-income housing apartment.

Increase number of bathrooms, bedrooms and kitchen and/or floor area

According to field observations and research findings it was revealed that one small toilet area is attached to the housing units and it is not sufficient considering the size of families. For instance, most Muslims live together with more than six family members in a housing unit. It is their culture. Hence before designing an apartment designer should consider the size of the family.

Improve garbage collection and disposal methods inside the apartment area

Findings of the research demonstrate a low level residential satisfaction regarding solid waste management. There is no space for garbage collection and waste has been collected everywhere emitting a strong stench across the area. Also, a garbage disposal service is not conducted within the apartment area. Therefore, it is suggested

to provide proper space for garbage collection along with waste collection services provided by the Municipal Council of the area.

Improve children's facilities and elders' facilities within the apartment area

There is no play area or walking path facilities and it's creating mental and behavioral issues relevant to the children and aged people. Many children play in railway reservation area and it creates a problem about the security of children. Most elders said that they become isolated due to living in sky level units. Further, sound level of other apartments would disturb education at home after schools. Therefore, it is recommended to build recreational and community gathering areas suitable for both children and elders in close proximity to the apartment. Further, sound proof building strategies should be incorporated when constructing vertical housing such as this.

Improve the security condition and handle the crime situation within the apartment area

The research findings revealed that there's a low satisfaction level regarding the security condition and crime situation within the area. The residents said that the staircase and lift area is used for the drug delivery purposes. Therefore, they should be provided with a suitable security system such as fixing CCTV cameras or establishing a police post to combat theft and drugs issues in apartment area. Further government should be generating a sense of property among residents by providing them with their deeds and securing their ownership of the relevant unit, because residents are more inclined to look after and maintain properties for which they've property rights to.

In order to arrive at the answer for this question, I have also delved into the research in the standpoint of socio-economic factors such as Gender, Age, Ethnicity, Number of family members, Income level, and Education Level. According to the results I've arrived at, Age, Gender and Education level do not have a large impact on residential satisfaction. Hence, they do not happen to affect the success or failure of vertical housing either. However, Income level and Ethnicity do play a role in determining residential satisfaction. When a residence is situated in an area where employment opportunities are flourishing, their purchasing power will increase which resultantly tends to increase their community involvement. In ethnicity's point of view, it was revealed that the Mihindusenpura apartment comprise of 24% Buddhists, 2% Tamils, 26% Christians and 48% Muslims. As per these results, it was observed that due to the mixed composition of the community, contradicting cultural practices and ideas have led to a certain level of residential dissatisfaction in the complex. In light of these issues following measures of mitigation are suggested.

- In addition to housing units, spacing for shops and business areas can be built within the apartment complex (preferably a allocating an entire floor), so that entrepreneurs have the liberty and ease of access of starting their own businesses while creating more employment opportunities for other residents as well.
- When allocating housing units, ethnicity of the residents should be considered and areas of the apartment should be divided accordingly.

Policy implication

One of the objectives of this study is to determine suitable policy implication to improve the satisfaction level of the residents in low income vertical apartments in Colombo. The policy implication of the study suggests that the residential satisfaction can be raised through implementing and upgrading proper administration methods. This will improve residents' living environment and further studies are required to determine a suitable management method which should involve both the relevant agencies and inhabitants. Further study is suggested in the form of a social survey prior to beginning a settlement, because it supports in building a more suitable housing for the low-income receiving people in the urban areas.

Further, planners and architectures should upgrade and improve the housing regulations and design with regard to developing housing satisfaction and needs as well as according to the family size of the target residents. When we critically evaluate the failure of low-income housing apartment with regard to the key variables, all problems have a connection with educational and proficient facts and practical experience. The result of this study can also assist urban planner policy and decision makers as it provides information to assist them in developing new apartments and communities. Planners and decision makers could promote these constructs in all future residential developments to avoid or minimise the issues faced by low-income communities. This study highlights that a well-designed apartment that encourages aspects such as community participation, feelings of belonging, community attachment and feelings of safety, leads to residential satisfaction and thereby contributes to the health and wellbeing of residents.

Alternative strategies and recommendation for further research

Another objective of this research is to examine the alternative strategies for low-income housing in Colombo. Under this objective it is proposed to consider low-rise housing methods such as medium density apartments, semi-detached town-houses and terrace houses in suburban areas. Most European counties have successfully applied these types of housing instead of a vertical housing.

Finally, this study recommends further research in examining the most capable and effective management of vertical housing in cities. Rural housing is also a debatable topic and more research is needed in rural housing sector.

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ANNEXURE

Annexure 1: Case summary of satisfaction level of physical features of housing area

dinningarea	stunsatisfied	17	34.0%
	unsatisfied	25	50.0%
	Nutral	7	14.0%
	St satisfied	1	2.0%
bedroom	stunsatisfied	22	44.0%
	unsatisfied	13	26.0%
	Nutral	5	10.0%
	satisfied	10	20.0%
livingarea	stunsatisfied	8	16.0%
	unsatisfied	24	48.0%
	Nutral	16	32.0%
	Satisfied	2	4.0%
Kitchenarea	stunsatisfied	23	46.0%
	unsatisfied	22	44.0%
	Nutral	3	6.0%
	satisfied	2	4.0%
bathroom	st unsatisfied	9	18.0%
	unsatisfied	31	62.0%
	Nutral	1	2.0%
	satisfied	9	18.0%
pryarea	unsatisfied	23	46.0%
	Nutral	21	42.0%
	satisfied	6	12.0%
toitetsarea	st unsatisfied	29	58.0%
	unsatisfied	5	10.0%
	Nutral	14	28.0%
	satisfied	2	4.0%
Valid		50	100.0%
Missing		1	
Total		51	

Source: Surveyed Data

Annexure 2: Case summary of satisfaction with dwelling units support services

Case Processing Summary

		N	Marginal Percentage
overallstfacofservices	12.00	1	2.0%
	14.00	4	8.0%
	15.00	4	8.0%
	16.00	7	14.0%
	17.00	9	18.0%
	18.00	14	28.0%
	19.00	4	8.0%
	20.00	6	12.0%
	21.00	1	2.0%
pspostalservices	unsatisfied	12	24.0%
	Neutral	27	54.0%
	Satisfied	11	22.0%
lightnning	Nutral	22	44.0%
	Satisfied	28	56.0%
reapiarservices	unsatisfied	12	24.0%
	Nutral	30	60.0%
	Satisfied	8	16.0%
garbagedisposal	unsatisfied	25	50.0%
	Nutral	25	50.0%
liftservices	unsatisfied	27	54.0%
	Nutral	20	40.0%
	Satisfied	3	6.0%
conditionofcorridoor	t unsatisfied	1	2.0%
	unsatisfied	23	46.0%
	Nutral	14	28.0%
	satisfied	12	24.0%
Valid		50	100.0%
Missing		34	
Total		84	

Source: Surveyed Data

Annexure 3: Case summary of satisfaction of public facilities

playarea	un satisfied	30	60.0%
	Neutral	14	28.0%
	Satisfied	6	12.0%
parkingfaciliteis	unsatisfied	20	40.0%
	Nutral	23	46.0%
	satisfied	7	14.0%
prayerhall	unsatisfied	8	16.0%
	Neutral	24	48.0%
	satisfied	18	36.0%
shops	unsatisfied	11	22.0%
	neutral	19	38.0%
	satisfied	20	40.0%
communityhall	stunsatisfied	11	22.0%
	unsatisfied	27	54.0%
	Nutral	11	22.0%
	satisfied	1	2.0%
chidrensecurity	st unsatisfied	15	30.0%
	unsatisfied	22	44.0%
	Neutral	11	22.0%
	satisfied	2	4.0%
elderfacilities	st unsatisfied	13	26.0%
	unsatisfied	19	38.0%
	Neutral	15	30.0%
	Satisfied	3	6.0%
Valid		50	100.0%
Missing		34	
Total		84	

Source: Surveyed Data

Annexure 4: Case summary of satisfaction of neighbourhood facilities

Didofworkplace	unsatisfied	38	76.0%
	Neutral	10	20.0%
	Satisfied	2	4.0%
Disofschool	st satisfied	1	2.0%
	unsatisfied	22	44.0%
	Neutral	19	38.0%
	satisfied	3	6.0%
	St satisfied	5	10.0%
Disofhospital	st unsatisfied	1	2.0%
	unsatisfied	4	8.0%
	Neutral	2	4.0%
	satisfied	43	86.0%
Disofmarket	Neutral	18	36.0%
	Satisfied	32	64.0%
Disofreligiousplace	unsatisfied	3	6.0%
	Neutral	24	48.0%
	Satisfied	23	46.0%
raiwaystation	Neutral	9	18.0%
	satisfied	25	50.0%
	st satisfied	16	32.0%
policestation	Neutral	7	14.0%
	Satisfied	25	50.0%
	st satisfied	18	36.0%
Valid		50	100.0%
Missing		11	
Total		61	

Source: Surveyed Data

Annexure 5: Case summary of correlation of physical features of housing units

Correlations

		dinningarea	bedroom	livingarea	Kitchenarea	bathroom	pryarea	toitetsarea	overallstfa
dinningarea	Pearson Correlation	1	-.296*	.248	-.092	-.070	-.270	.229	.210
	Sig. (2-tailed)		.037	.082	.524	.629	.058	.110	.143
	N	50	50	50	50	50	50	50	50
bedroom	Pearson Correlation	-.296*	1	-.084	.158	.192	.026	.170	.480**
	Sig. (2-tailed)	.037		.560	.272	.182	.858	.239	.000
	N	50	50	50	50	50	50	50	50
livingarea	Pearson Correlation	.248	-.084	1	-.109	.184	-.228	.070	.446**
	Sig. (2-tailed)	.082	.560		.451	.200	.112	.628	.001
	N	50	50	50	50	50	50	50	50
Kitchenarea	Pearson Correlation	-.092	.158	-.109	1	-.247	-.017	-.094	.209
	Sig. (2-tailed)	.524	.272	.451		.084	.907	.516	.145
	N	50	50	50	50	50	50	50	50
bathroom	Pearson Correlation	-.070	.192	.184	-.247	1	.013	.242	.546**
	Sig. (2-tailed)	.629	.182	.200	.084		.931	.090	.000
	N	50	50	50	50	50	50	50	50
pryarea	Pearson Correlation	-.270	.026	-.228	-.017	.013	1	-.260	.070
	Sig. (2-tailed)	.058	.858	.112	.907	.931		.068	.628
	N	50	50	50	50	50	50	50	50
toitetsarea	Pearson Correlation	.229	.170	.070	-.094	.242	-.260	1	.434**
	Sig. (2-tailed)	.110	.239	.628	.516	.090	.068		.002
	N	50	50	50	50	50	50	50	50
overallstfa	Pearson Correlation	.210	.480**	.446**	.209	.546**	.070	.434**	1
	Sig. (2-tailed)	.143	.000	.001	.145	.000	.628	.002	
	N	50	50	50	50	50	50	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Surveyed Data

Annexure 6: Case summary of correlation of public facilities within the aprtment area

Correlations

		playarea	parkingfacilite is	prayerhall	shops	communityhal l	chidrensecurit y	elderfacilities	overall
playarea	Pearson Correlation	1	-.086	.137	.101	.078	-.312*	-.038	.220
	Sig. (1-tailed)		.242	.132	.206	.296	.014	.398	.063
	N	68	68	68	68	50	50	50	50
parkingfaciliteis	Pearson Correlation	-.086	1	.312**	.034	.061	-.071	-.328*	.286*
	Sig. (1-tailed)	.242		.005	.392	.336	.313	.010	.022
	N	68	68	68	68	50	50	50	50
prayerhall	Pearson Correlation	.137	.312**	1	.207*	.024	-.105	-.217	.456**
	Sig. (1-tailed)	.132	.005		.045	.434	.234	.065	.000
	N	68	68	68	68	50	50	50	50
shops	Pearson Correlation	.101	.034	.207*	1	-.122	.032	.017	.479**
	Sig. (1-tailed)	.206	.392	.045		.200	.414	.454	.000
	N	68	68	68	68	50	50	50	50
communityhall	Pearson Correlation	.078	.061	.024	-.122	1	.236*	-.073	.456**
	Sig. (1-tailed)	.296	.336	.434	.200		.050	.307	.000
	N	50	50	50	50	50	50	50	50
chidrensecurity	Pearson Correlation	-.312*	-.071	-.105	.032	.236*	1	-.138	.319*
	Sig. (1-tailed)	.014	.313	.234	.414	.050		.170	.012
	N	50	50	50	50	50	50	50	50
elderfacilities	Pearson Correlation	-.038	-.328*	-.217	.017	-.073	-.138	1	.201
	Sig. (1-tailed)	.398	.010	.065	.454	.307	.170		.081
	N	50	50	50	50	50	50	50	50
overall	Pearson Correlation	.220	.286*	.456**	.479**	.456**	.319*	.201	1
	Sig. (1-tailed)	.063	.022	.000	.000	.000	.012	.081	
	N	50	50	50	50	50	50	50	50

*. Correlation is significant at the 0.05 level (1-tailed).

**. Correlation is significant at the 0.01 level (1-tailed).

Source: Surveyed Data

Annexure 7: Case summary of correlation analysis of dwelling units support services

Correlations

		pspostalservices	lightnning	reapiarservices	garbagedisposal	liftservices	conditionofcorridoor	overallstfacofservices
pspostalservices	Pearson Correlation	1	-.086	.372**	-.148	-.072	.131	.500**
	Sig. (1-tailed)		.277	.004	.153	.310	.183	.000
	N	50	50	50	50	50	50	50
lightnning	Pearson Correlation	-.086	1	-.306*	-.161	-.103	.300*	.302*
	Sig. (1-tailed)	.277		.015	.132	.237	.017	.016
	N	50	50	50	50	50	50	50
reapiarservices	Pearson Correlation	.372**	-.306*	1	-.064	.162	.036	.452**
	Sig. (1-tailed)	.004	.015		.330	.131	.401	.000
	N	50	50	50	50	50	50	50
garbagedisposal	Pearson Correlation	-.148	-.161	-.064	1	.197	-.166	.084
	Sig. (1-tailed)	.153	.132	.330		.085	.125	.281
	N	50	50	50	50	50	50	50
liftservices	Pearson Correlation	-.072	-.103	.162	.197	1	-.048	.411**
	Sig. (1-tailed)	.310	.237	.131	.085		.369	.002
	N	50	50	50	50	50	50	50
conditionofcorridoor	Pearson Correlation	.131	.300*	.036	-.166	-.048	1	.549**
	Sig. (1-tailed)	.183	.017	.401	.125	.369		.000
	N	50	50	50	50	50	50	50
overallstfacofservices	Pearson Correlation	.500**	.302*	.452**	.084	.411**	.549**	1
	Sig. (1-tailed)	.000	.016	.000	.281	.002	.000	
	N	50	50	50	50	50	50	50

**. Correlation is significant at the 0.01 level (1-tailed).

*. Correlation is significant at the 0.05 level (1-tailed).

Source: Surveyed data

Annexure 8:   The Questionnaire

Suitability of Vertical low-income housing for urban poor in Colombo - A case study of Mihindusenpura vertical low income housing at Dematagoda

Introduction

This survey is only used for my dissertation which is relevant to the Spatial Planning, Management and Designing course (MSc.) conducted by the University of Moratuwa and all information are completely used for my educational purposes.

SECTION ONE

Personal Information

This information is for statistical purposes only and is completely secret (please circle your answer where two or more options are given to choose).

1. What is your gender?

1. Male
2. Female

2. What is your marital status?

1. Single
2. Married
3. Divorced

3. What is your ethnicity?

1. Buddhist
2. Muslim
3. Tamil
4. Christian
5. Other

4. What is your education level?

1. Ordinary Level
2. Advanced Level
3. University
4. Other

5. What is your employment status?

1. Government
2. Private
3. Own business
4. Other

6. How much is your average monthly income?

1. LKR 10,000-15,000
2. LKR 15,000- 20,000
3. LKR 20,000- 25,000
4. More than LKR 25,000

7. Compared to the residence you are living in now, how was the residence you lived in before?

1. Strongly unsatisfied
2. Unsatisfied
3. Neutral
4. Satisfied
5. Strongly satisfied

8. What was the condition of the previous house you lived?

1. Permanent
2. Temporary
3. Other

9. What was the condition of the ownership of the previous residence/land?

1. Private
2. Government
3. Other

10. How many family members live in this residence including you?

1. One-Three
2. Four-Six
3. Seven-Nine
4. More than Eight

SECTION TWO

Please consider your satisfaction with the provided facilities of the apartment building and fill out the following. On a scale of 1 (strongly unsatisfied) to 5 (strongly satisfied) please rank your perception (please circle your answer).

Component 01 - Satisfaction of dwelling unit features

Questions	Strongly unsatisfied	Unsatisfied	Neutral	Satisfied	Strongly satisfied
a. Size of dining area	1	2	3	4	5
b. Size of bedrooms	1	2	3	4	5
c. Size of living area	1	2	3	4	5
d. Size of kitchen area	1	2	3	4	5
e. Size of bathroom	1	2	3	4	5
f. Size of praying area	1	2	3	4	5
g. Size of toilets	1	2	3	4	5

Component 02 - Satisfaction of dwelling unit support services

Questions	Strongly unsatisfied	Unsatisfied	Neutral	Satisfied	Strongly satisfied
a. Postal service	1	2	3	4	5
b. Lighting inside the apartment building	1	2	3	4	5
c. Maintenance and repair services	1	2	3	4	5
d. Garbage disposal methods	1	2	3	4	5
e Lift facilities	1	2	3	4	5
f. Condition of corridors	1	2	3	4	5

Component 03 - **Satisfaction of public facilities**

Question	Strongly unsatisfied	Unsatisfied	Neutral	Satisfied	Strongly satisfied
a. Play area	1	2	3	4	5
b. Parking facilities	1	2	3	4	5
c. Prayer hall	1	2	3	4	5
d. Shops and social places	1	2	3	4	5
e. Community hall	1	2	3	4	5
f. Children's facilities and security	1	2	3	4	5
g. Facilities for the elderly	1	2	3	4	5

Component 04 - Satisfaction of social environment

Questions	Strongly unsatisfied	unsatisfied	Neutral	satisfied	Strongly satisfied
a. Security services	1	2	3	4	5
b. Community relation ships	1	2	3	4	5
c. Noise level	1	2	3	4	5
d. Crime situation	1	2	3	4	5
e. Accidents	1	2	3	4	5

Component 05 - Neighbourhood Facilities

Questions	Strongly unsatisfied	Unsatisfied	Neutral	Satisfied	Strongly satisfied
a. Distance to work place	1	2	3	4	5
b. Distance to school	1	2	3	4	5
c. Distance to hospital	1	2	3	4	5
d. Distance to market	1	2	3	4	5
e. Distance to the religious places	1	2	3	4	5
f. Distance to railway station and bus stations	1	2	3	4	5

SECTION THREE

01. Motivation factor for settling in the low-income housing.

What is/are your reason/s for settling in a high rise house?

Factors	Reason
a. Need for an own house	
b. Closer to work place	
c. Attractive location	
d. Attractive facilities	
e. Social security	
f. Attractive price	
g. Government decision	
h. Other reasons	

02. Challenges (Problems) faced when changing from the previous residence.

1. Dismissal of neighbourhood facilities.
2. Loss of livelihood.
3. Loss of educational institutions.
4. Loss of valuable and large land.
5. Loss of favourable environment.
6. Obligation to pay a monthly installment to UDA to claim ownership of the house.
7. The ownership of housing units.