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# **An Investigation of the User Satisfaction and Quality of Residential Environment in the Public Housing for the Urban Poor in Madurai**

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**Abstract:** This paper aims to identify the various parameters of the housing environment that contribute to user satisfaction in the quality of public housing for the urban poor. The study on the qualitative aspects of the built environment in public housing projects have revealed that the planning and design of the housing development should satisfy the user not just in the objective aspects of location, carpet area, construction and infrastructure services but also in the subjective aspects of functional efficiency of the built environment, safety, degree of flexibility, healthy social interaction, image, sense of belonging, reputation of the community, environmental quality etc. The study conducted in 5 mass housing projects for the urban poor in Madurai indicated the user satisfaction was higher in low rise housing even though they were located on the outskirts of the city than the medium rise housing situated within the city. The design of open spaces has a significant impact on determining the quality of the built environment. Hence it is necessary to compare the benefits w.r.t user satisfaction and cost in both low rise and medium rise housing. This would help derive strategies for providing social housing that is qualitatively and quantitatively satisfying for the urban poor.

**Keywords:** *Public housing, Urban Poor, User satisfaction, Quality of Built environment*

## **1. Introduction**

The World Health organization defines Quality of life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, values and concerns incorporating physical health, psychological state, level of independence, social relations, personal beliefs and their relationship to salient features of the environment (World Health Organization Quality of Life Group, 1995).

There are various factors that decide quality of life. American psychologist Abraham Maslow's hierarchy of needs lists shelter as one of the basic physiological needs in his theory of human motivation. The quality of a person's residential environment influences their well-being in aspects of physical and mental health, security, social relationship etc. Good quality housing resulting from sensitive design contributes to the well-being of its users while poorly designed and built housing become barriers for an individual to move beyond the basic physiological needs. This is more relevant to the marginalised sections like the urban poor for whom achieving the basic needs of Abraham Maslow's hierarchy is much more critical. This paper explores the factors that influence the quality of residential environments in the public housing for the urban poor

through case studies of five public housing projects in the city of Madurai.

## **2. Indicators of Quality of life**

One can measure quality of life using objective and subjective indicators. The objective indicators are those that are easily quantifiable (e.g. health, education, economic standards) used in scales such as the human development index. Determinants of subjective indicators are only by opinions, evaluations and appreciation of life and living conditions by the individual citizens such as measures of satisfaction or happiness. The result of the gap between people's goals and perceived resources, of their environment, culture, values, and experiences can be defined by the individuals measured through surveys [1].

One of the components that determine the well-being of a person is his or her physical environment in which shelter plays a significant role. However the mere provision of shelter does not ensure successful housing development [2]. A shelter only provides the occupants protection from the elements of nature apart from giving basic safety and privacy. The dwelling forms an important part a person's physical environment since it is his most personal space and spends more time in it. The quality of a house can be measured through tangible indicators like building materials and construction, built up area, services and infrastructure

etc as well as several intangible spatial design qualities of the built environment like functional efficiency, adaptability, safety, identity, sense of belonging, healthy social interaction etc. These qualitative aspects of the dwelling play a significant role in determining the well-being of the users.

**Table 1:** Overview of the 5 public housing developments chosen for the study

| Housing project at                | Vilacheri     | Thanakankulam | Melavasal | Athikulam | Ellis Nagar |
|-----------------------------------|---------------|---------------|-----------|-----------|-------------|
| <b>Location</b>                   | Outskirts     | Outskirts     | Near CBD  | City      | Near CBD    |
| <b>Building type</b>              | Single storey | Single storey | 4 storey  | 4 storey  | 4 storey    |
| <b>No. of Units</b>               | 84            | 48            | 480       | 304       | 640         |
| <b>Site area in sq.m</b>          | 9390          | 2122          | 11880     | 9310      | 13575       |
| <b>Unit - carpet area in sq.m</b> | 14.3          | 14.8          | 15        | 10        | 17          |
| <b>Total Cost in Rs.</b>          | 63lakhs       | 127.5 lakhs   | 720 lakhs | 720 lakhs | 2459 lakhs  |

### 3. The context of study

In India, not much focus is given to the subjective or intangible aspects of the quality of dwelling for the urban poor. The mere provision of a roof is in itself considered sufficient in most developing countries. Hence there is a need to understand the various qualitative aspects of the residential environment of the urban poor and the degree of influence of each of these components on user satisfaction.

The context of this study is limited to the residential environment of the urban poor in the public housing projects in the city of Madurai in India. The city is the third largest city in Tamil Nadu.

There has been a threefold increase in the slum dwellers population in the last 5 decades in the city and now about 40,000 families in the city reside in slums (Source: Madurai Corporation – Slum free city plan of action report, 2013). The Tamil Nadu Slum Clearance Board (TNSCB) and the Tamil Nadu Housing Board (TNHB) rehabilitate various slum dwellers through a number of development programs and schemes.

The strategies of interventions can be classified into slum improvement, slum up gradation and slum redevelopment. In slum improvement only the public infrastructure of the existing slum is developed, whereas in slum up gradation the public infrastructure is developed along with the improvement in the dwelling units and in the third category of slum rehabilitation the entire slum is removed and redeveloped in the same site in case of tenable slums or in a relocated site in case of untenable slums.

The user groups are families belonging to the Economically Weaker Section (EWS) and Low Income Group (LIG) who were living in slums and have been rehabilitated in these social housing developments by the government. These housing projects vary from individual low – rise (single storey units) buildings to medium rise (four storey) buildings and in their site planning w.r.t arrangements of dwelling units and distribution of open spaces.

### 4. Method of Study

The study was carried out in the form mixed methods of data collection in the form of questionnaire survey, open ended interviews and observations. 5 public housing projects for the urban poor in Madurai were selected based on the criteria of housing typology (number of floors), location (within the city and the outskirts), site planning and open spaces (varying shape, size and location/ownership), density etc [Table 1]. A sample size consisting of 20% of the total number of dwellings in each project were selected and studied. This sample was uniformly distributed across the site and on all floors in case of multi storied buildings. The survey covered questions pertaining to general household data on occupants to the user satisfaction in various aspects of the residential environment ranging from spatial quality built environment, open spaces at the unit level, safety, services and infrastructure, location, environmental comfort etc. The aim of the survey was to identify and prioritize key spatial aspects of residential environments that the user valued most and subsequently influenced the well-being of the residents.

### 5. User Satisfaction

User satisfaction in housing is the measure of the difference between peoples desired needs and the actual housing situation. User satisfaction in housing has been in use since the early 1960s as the basis for optimizing the architectural design of large housing developments, where feedback is collected from residents of housing projects with regard to resident’s views on the physical features of the housing developments and then feeding those views back into the design process [3].

The user satisfaction in residential buildings can be classified into tangible and intangible aspects of the quality of the built environment. The tangible aspects include the area of the dwelling, quality of construction, infrastructure and services etc which can be estimated objectively. The intangible aspects of the quality of the dwelling include functional efficiency, social relevance of the built environment, identity, personalization, flexibility, social interaction etc.

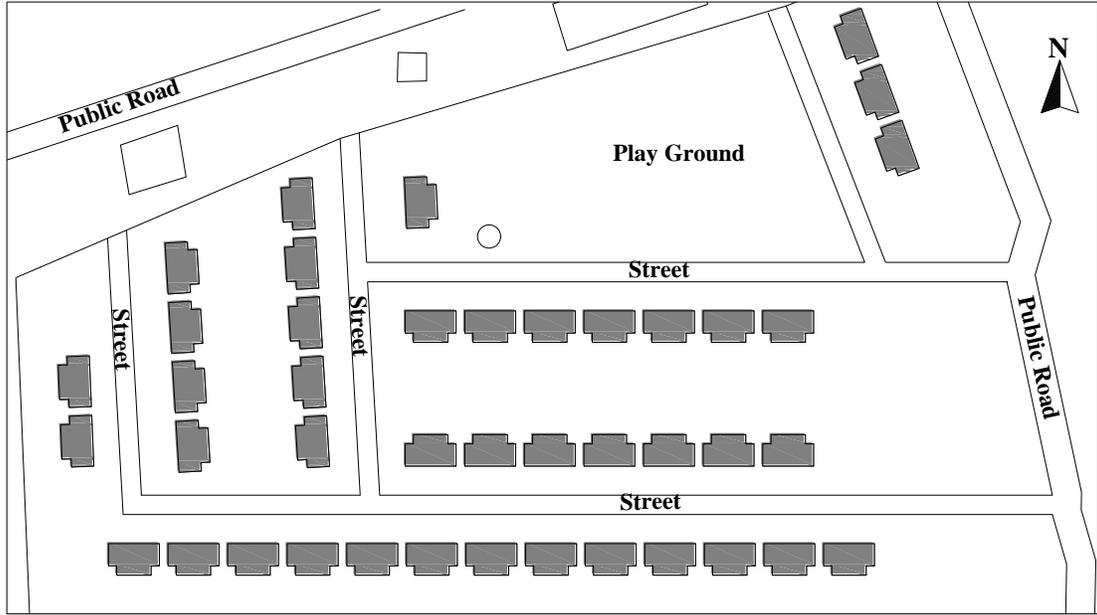


Figure1. Site layout of Public housing at Vilacheri, Madurai

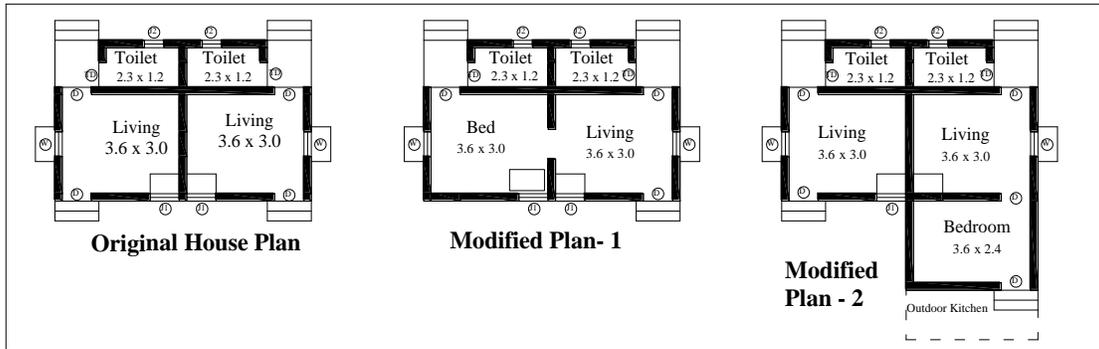


Figure2. Plan of typical house and modified houses at Vilacheri, Madurai

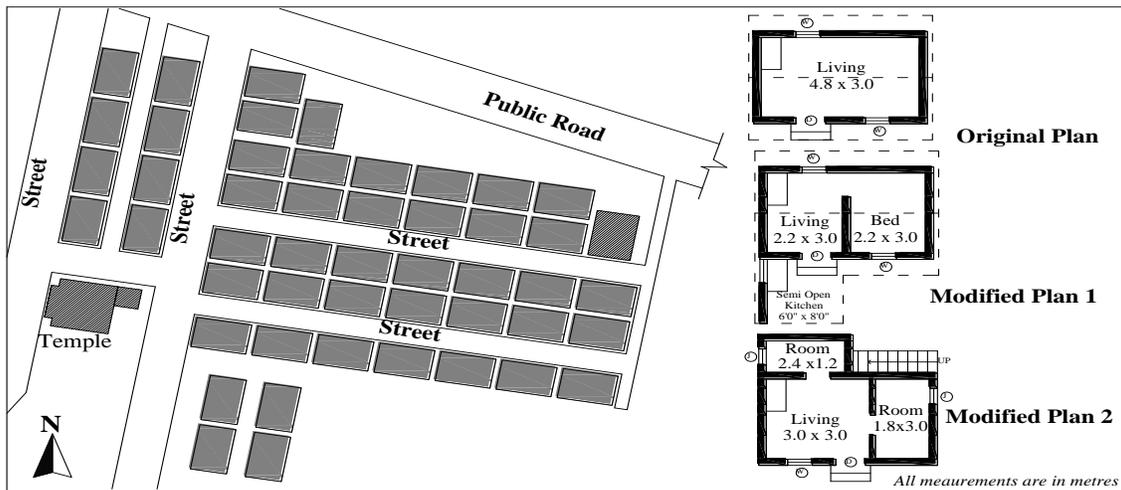


Figure 3 Site Layout and original /modified unit plans of Public housing at Thanakankulam, Madurai

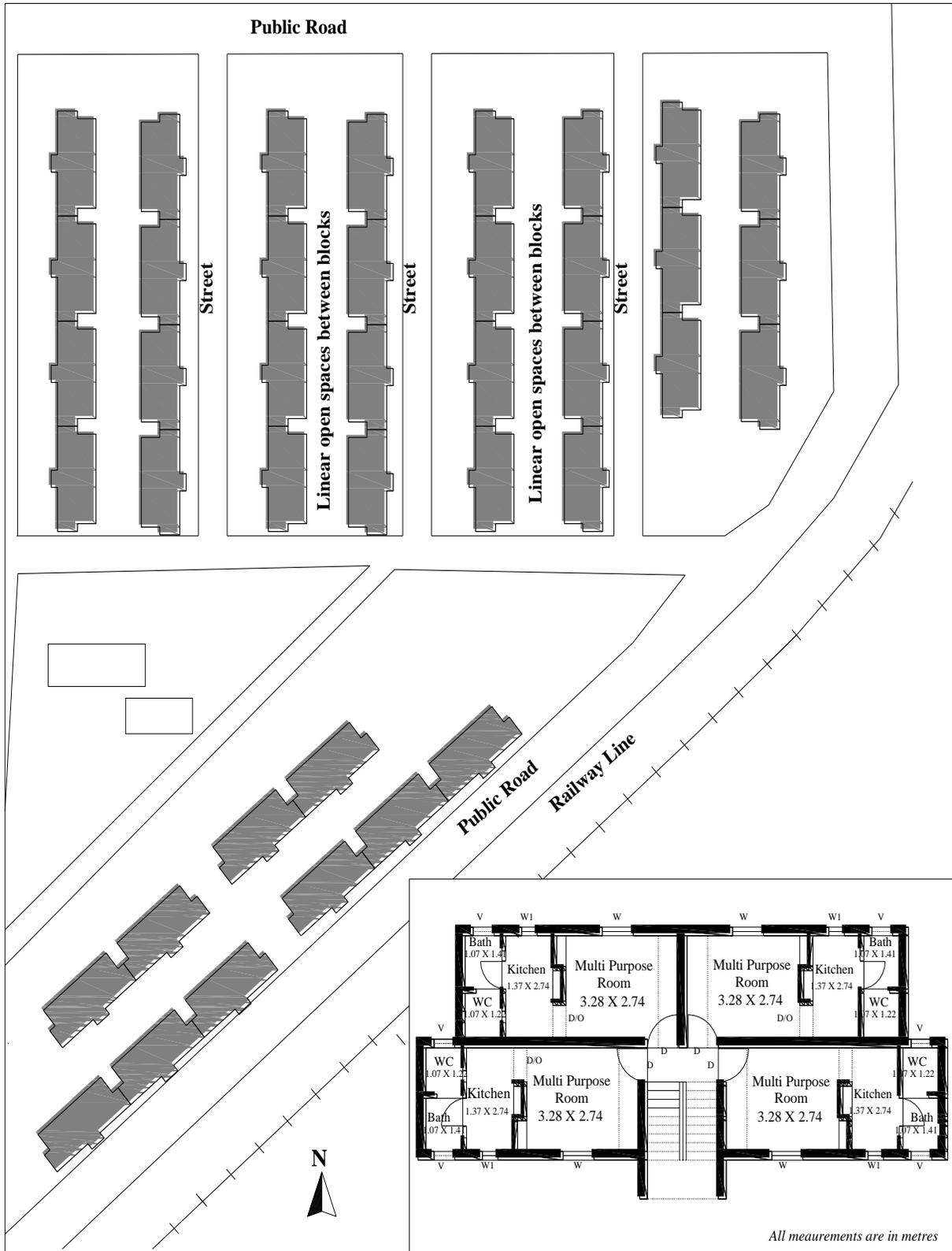
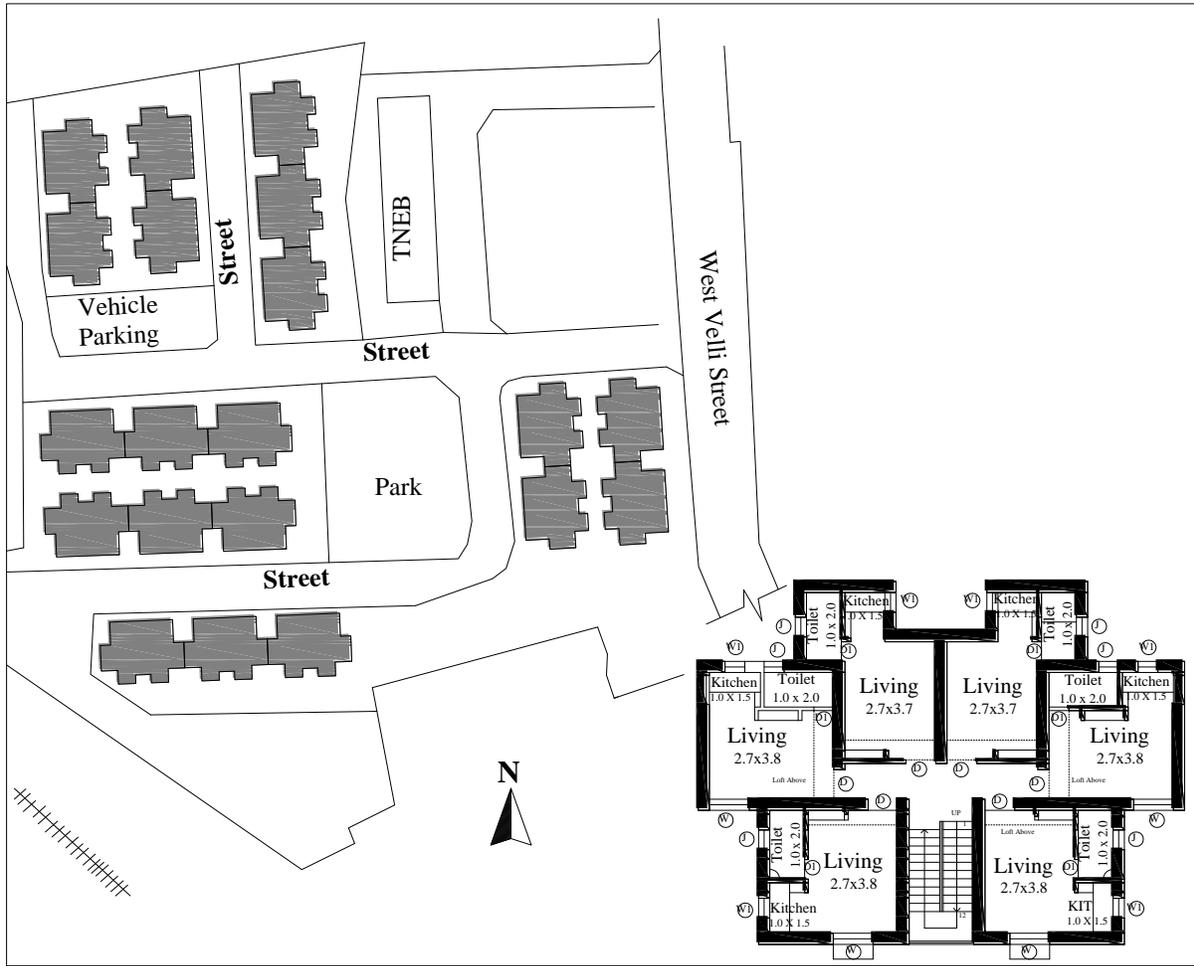
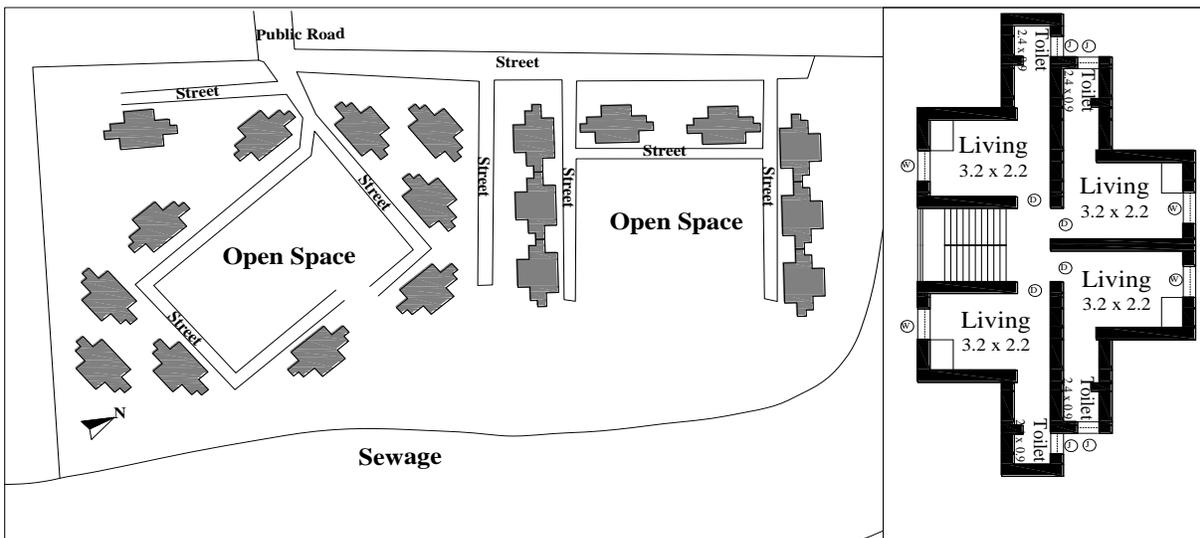


Figure 4 Site Layout of Public housing at EllisNagar, Madurai and Figure 5. Typical Floor Plan – Ellis nagar Housing



**Figure 6** Site layout of Public housing at Melavasal, Madurai and **Figure 7** Typical Floor Plan - Melavasal Housing



**Figure 8** Site layout and typical floor plan of Public housing at Athikulam, Madurai

The user satisfaction relating to the components of the location, density, building typology, site planning and open spaces, carpet area and spatial layout, quality of construction and infrastructure were taken into consideration.

Data collection was through questionnaire survey on overall user satisfaction and the satisfaction w.r.t various individual components and qualities of the built environment. The users in low rise low density (Vilacheri) housing rated highest overall satisfaction while the users in multi storey, high density housing were less satisfied in the overall quality [Figure 9.]. This overall satisfaction rating is compared with the individual rating of various components of the built environment to determine the key factors that influence user satisfaction in housing.

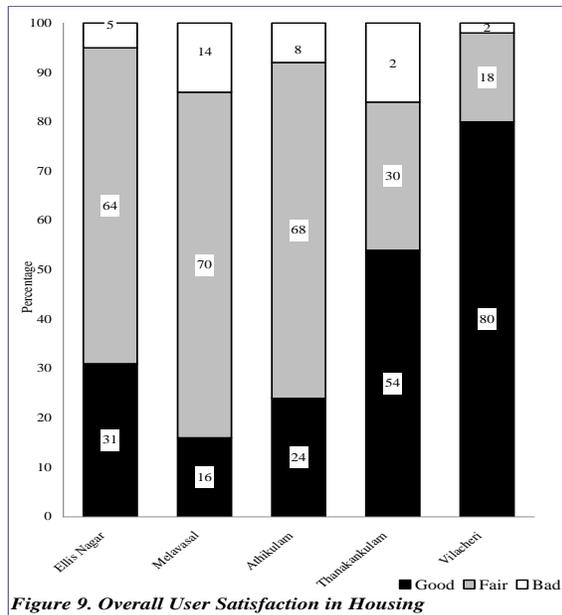


Figure 9. Overall User Satisfaction in Housing

**6. Factors influencing the user satisfaction in residential environment**

The primary purpose of buildings is to provide occupants with conducive, safe, comfortable, healthy and secured indoor environment to carry out different kinds of activities ranging from work, study, leisure and family life to social interactions [4]. The evaluation of user satisfaction of buildings helps understand the factors influencing the quality of the built environment and in evolving strategies for spatial design. The factors influencing user satisfaction in a residential environment are complex. Residential satisfaction evaluation is underpinned by three related sets of factors: objective characteristics of the environment, objective characteristics of the residents and subjective beliefs, perceptions and aspirations of the residents [5]. This study aims to understand the factors of the

residential environment and the characteristics that influence the quality of the built environment. This in turn helps identify the factors and qualities that have greater impact on the user satisfaction and their well-being.

The physical dimension of housing satisfaction includes the house type, physical quality, size, functionality, aesthetic aspects and location of housing layout and housing environment. The house type naturally affects physical and social life quality of residents [6].

**6.1. Location**

Location of a person’s house is a measure of the quality of his life [7]. The user satisfaction w.r.t housing location depends on two major reasons – commuting distance to work and other basic facilities and the environmental aspects. These two factors are in conflict in most urban scenarios. Easy accessibility to work and other basic facilities are possible when the housing is located within the city. Location with good environmental quality i.e., relatively less polluted and with more greenery is possible mostly in the outskirts of the city. For the study the location the three of the multistorey public housing was within or close to the core city. The location of the two single storey housing projects was on the outskirts of the city. 71 % of the users in the multi storey housing developments preferred living within the city even if it meant living in multistorey buildings. 96 % of the respondents in the public housing with individual houses preferred living in the outskirts in single storey units. Most users in both cases preferred their current location due to the following reasons – within city location was preferred predominantly for easy transportation to work while the outskirts of the city was preferred due to good environmental quality and health reasons. The only demand of the residents living in the outskirts was a good public transport system to commute to work etc. The good environmental quality had a greater impact directly and indirectly on the user satisfaction.

**6.2. Site planning and open spaces**

Open spaces play a major role in the quality of the housing and impact the living standards. The influence of open spaces is many folds greater in the housing for the urban poor. The limited built up area of the housing unit results in the spillover of many daily activities of the inhabitants into these open spaces. However the mere provision of open spaces according to the building rules in quantitative standards like area alone will not improve the quality and use of these open spaces [8]. The open spaces need to respond to the needs of the users and needs to better integrate with the residences [9].

Site planning is the primary determinant of the quality of open spaces and its integration with the built spaces. The site planning defines the ratio, size, shape, accessibility, distribution and ownership of open spaces and therefore the efficient use of these spaces. In the 5 case studies of public housing the ratio, size, shape and distribution of open spaces vary and therefore the accessibility, utility and ownership of these spaces defer [Table 2.].

**Table 2: Ratio of Open space to build up space in the Housing Case studies at Madurai**

| Housing development | Open Space | Built Space |
|---------------------|------------|-------------|
| Vilacheri           | 88 %       | 12 %        |
| Thanakankulam       | 62 %       | 38 %        |
| Melavasal           | 77 %       | 23 %        |
| Athikulam           | 89 %       | 11 %        |
| Ellis Nagar         | 77 %       | 23 %        |

In Vilacheri housing the open spaces were most effectively used. The ratio of open spaces is high, with 4.5m in the front and 6m in the rear of each house. Based on their distribution the open spaces classify as the common open spaces in the front of each house unit and private open spaces in the rear of each house. The low-rise building typology also gave equal access to these spaces for all housing units. This allowed the residents to use the front open space for cooking, work activities etc. The adjoining open spaces belonging to the housing units helped expansion in the form of additional rooms and personalization of the house in the form of gardens. In the Thanakankulam housing project the percentage of open spaces is less and reflected in the lack of possibility for expansion of the housing units and the resulting unsatisfactory response of the users. The personalizations of houses were by rebuilding the existing houses. The choices of expansion possible were vertically by adding floors and construction of small toilets in the 0.6 m. space between units.

In the Melavasal housing the open spaces are spread in the form of small parcels of land between the multistorey buildings. It was noted that these open spaces had many unwanted encroachments in the form of shops and storage spaces. Some of these open spaces are used to dump garbage. The lack of sense of ownership neither as larger common spaces nor as smaller private open spaces because of the multistorey nature of the housing resulted in misuse and under-utilization of open spaces. In the Athikulam housing the open spaces are in the form of 3 huge parcels of land around which the buildings are arranged. Under-utilization of such spaces even though accessibly located was because of the size and multistorey nature of the housing especially since this project has housing units with least carpet area in all 5 case studies. The use

of these open spaces was only for socialising. However the use of open spaces for outdoor cooking, washing or even gardening was minimal as neighbours objected to such uses leading to quarrels. In the Ellis nagar housing the open space distribution are in the form of linear narrow strips between the front and rear of the multistorey buildings. There was moderate use of front open spaces for socialising, cooking etc. There is a total neglect of rear open spaces because of lack of visual connectivity and easy accessibility. A waste of such valuable open spaces is due to the lack of proper site planning [Figure 11].



*Vilacheri Housing*



*Thanakankulam housing*



*Melavasal Housing*



Athikulam Housing



Ellis Nagar Housing

Figure 10 Open Spaces in the Housing developments

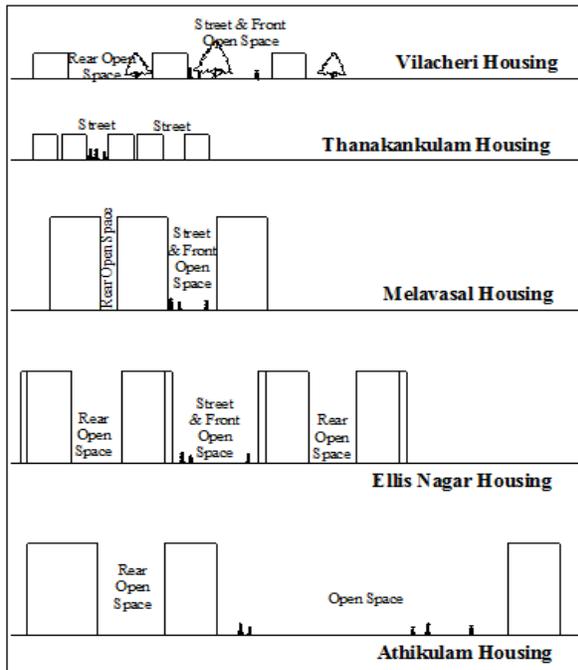


Figure 11 Section showing relationship between Building and adjacent open space

The study showed that well planned sites with open spaces that cater to various needs have a greater impact on the quality of the housing. The site planning should allow variety of open spaces based on size, location, distribution and provide accessibility, sense of community, ownership and effective use of open spaces. Housing developments that failed to provide this variety and varying degrees of accessibility to open spaces performed poor in user satisfaction rating.

6.3. Density and Number of Floors

According to various studies on housing density and user satisfaction, the housing satisfaction has an inverse association with size of the neighborhood and density of the population [10]. Increased housing density is achieved by reducing the amount open space in the housing layout and the carpet area of individual units. Also the density is increased by adding more floors. This has a negative effect on the use of open spaces adjacent to the houses. The territorial character of the open spaces is lost with increase in the height of the buildings limiting the flexibility and use of the open space [11]. The scarcity of land availability in higher density housing gives rise to many problems. The use of common spaces is often restricted by neighbors out of fear of encroachment. Even if used the common spaces has to be shared among many residents and loses its characteristic as an extended outdoor dwelling. Increased density often led to clash of activities among residents and resulted in fights.

In the case studies, reduction in level of safety and sense of security was observed as the density of the housing increased. The familiarity among residents decreased as the density increased in multi storey buildings giving rise to a feeling of lack of safety. The quality of natural surveillance is lost as the number of occupants and floors increases [12]. Of the 5 case studies, though the 3 medium rise housing projects were located within the city, they had a reputation of being unsafe both by the residents and outsiders. While in the low rise housing were the residents felt much safer even though these 2 sites are located on the outskirts of the city [Table.3].





**Figure 12** Use of open space to dump garbage at the Melavasal and Athikulam Public Housing

**Table 3** Percentage of residents who felt that the housing development was safe/ unsafe

| Housing development | No Issues with Safety | Concerned about Safety |
|---------------------|-----------------------|------------------------|
| Vilacheri           | 98 %                  | 2%                     |
| Thanakankulam       | 93 %                  | 7 %                    |
| Melavasal           | 37 %                  | 63 %                   |
| Athikulam           | 55 %                  | 45 %                   |
| Ellis Nagar         | 73 %                  | 27 %                   |

Many residents of the housing at Vilachery felt that the low density housing contributed to better health and hygiene than the higher density housing.

**6.4. Built Up Area and Spatial Layout**

Most residents of the public housing rated the inadequacy of space within the dwelling as the most critical problem. However in the housing projects were the site planning did not provide usable open spaces, the impact was more. In the low rise housing the open spaces adjacent to the house compensated for the insufficient of indoor space. The issue of area was highest in the Athikulam and Melavasal housing projects were residents had no space for circulation within the house as most of the floor area was taken up for storage and furniture.

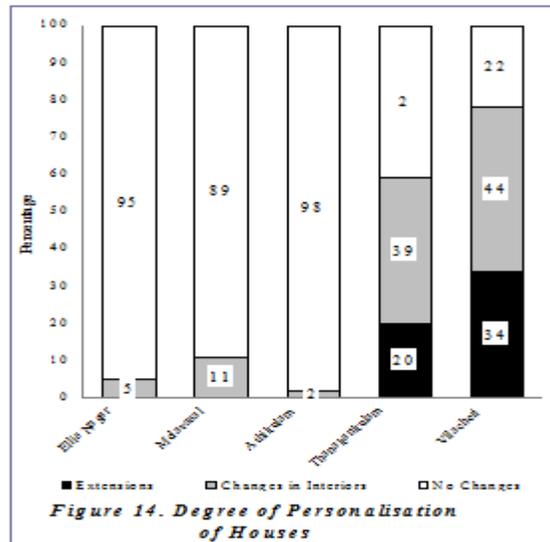


**Figure 13** Indoor space in the public housing

In all the multistorey housing many families occupied 2 to 3 houses in the same building to accommodate the entire family and also for storage and work related spatial requirements. This was a burden for both the residents and the agencies providing housing. In the low rise housing the space needed with growth in family size, work and storage were taken care by the residents themselves by extending the house horizontally or vertically. Adaptability and flexibility are important characteristics of a space w.r.t user satisfaction. Users achieve satisfaction by changing the physical characteristics of their environments to create more adaptable and flexible spaces [14].

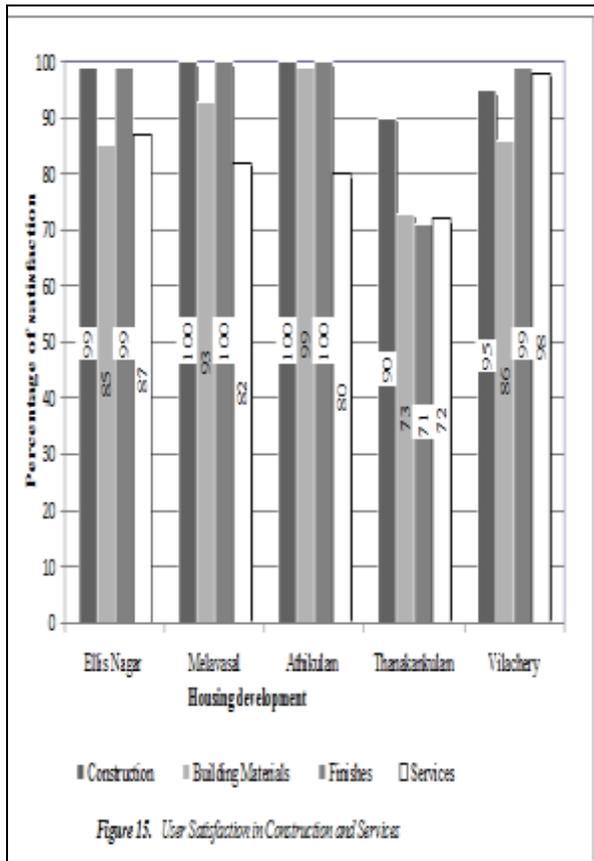
**6.5. Services and construction**

The built up area, services and construction quality of the house are the important factors in to evaluate housing. This measure of its adequacy and habitability is narrow and misleading. [15]. In the study of the 5 public housing projects the users of the multistorey projects rated it satisfactory in quality of building materials, construction, finishes and services than the single storey individual units housing [ Figure.15]. However this rating of the multistorey houses did not reflect in the overall satisfaction of the housing suggesting that other characteristics like density, flexibility, personalisation etc play an important role in user satisfaction. Besides the low-rise housing allowed users to solve the issues, maintenance and improvements in construction on their own whereas the multistorey building users had to depend on the THSCB and TNHB for maintenance and improvements. The agencies have to demolish the entire housing development in multistorey buildings and rebuild it every 25 to 30 years for the safety of the buildings. This is a recurring expense which does not arise in low rise individual housing developments.



**7. Conclusion**

User satisfaction in housing depends on objective and subjective qualities of the built environment. The evaluation of public housing is primarily done based on the objective qualities of area, construction quality and services area. The subjective qualities like functional efficiency, flexibility, adaptability, safety, healthy social interaction, image, sense of belonging etc are often neglected. The study conducted on 5 housing projects for the urban poor indicated the user satisfaction was higher in low rise housing even though they were located on the outskirts of the city than the medium rise housing within the city.



The housing agencies prefer medium rise housing than the low rise housing. This is because the medium rise buildings accommodate more people and are considered more economical. However the cost of construction of multi storey structures, their maintenance, its inability to cater to the expansion with growth of family size etc are not considered against that of low rise housing where the initial cost of land alone is high but in the longer perspective the recurring costs of maintenance and expansion are taken care by the residents themselves. The design of open spaces in such low rise housing, their accessibility, distribution and variety play an

important role in determining the quality of the built environment.

Hence it is necessary to compare the benefits w.r.t user satisfaction and cost of the housing in low rise housing and medium rise housing. The cost of land in the outskirts of the city that are of relatively less can be used for construction of low rise public housing. The major issue in locating mass housing on the outskirts of the city is the lack of transportation system. The provision of an efficient transportation system connecting these areas to the city would be a better solution than intensive use of land inside the city for housing that lack the quality of a good residential environment. Further study on the comparisons of cost and benefit of low rise and medium rise housing for the urban poor can help derive strategies for providing social housing that are both qualitatively and quantitatively satisfying for the urban poor.

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