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BEHAVIOURAL ADAPTATIONS AND HOUSING MODIFICATION: A CASE STUDY OF A LOW-INCOME HIGH-RISE HOUSING ESTATE IN SRI LANKA

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ABSTRACT

Rapid urbanisation and population growth have intensified housing challenges in Sri Lanka. In response, the government initiated Urban Regeneration Projects (URPs) to create a slum-free Colombo. These projects involved constructing high-rise housing blocks for relocating low-income settlements and freeing up land for urban development. Unfortunately, several initiatives encountered failures due to inadequate services, limited employment access, substandard living conditions, poor maintenance, and unforeseen social consequences. This research delves into the adaptive behaviours of relocated low-income families in high-rise housing. It examines the challenges they face in daily life and explores the measures they take to overcome these obstacles. The study employs a case study approach, utilising interviews, surveys, and observations within a selected low-income high-rise housing block. Basic housing needs such as sufficient indoor and outdoor space, privacy, social interaction, community living, physical comfort (light & ventilation), safety, and security, are crucial for residents. To meet these needs, inhabitants adapt through behavioural changes, including multifunctional use of space, shared space, family activity organisation, and extending domestic activities into semi-public zones. Privacy emerges as the most critical requirement, often prioritised over social interaction and physical comforts. Residents primarily address these needs through behavioural adjustments rather than extensive modifications, given the challenges posed by mass housing.

Keywords: Adaptations; Behaviours; High-rise housing; Low-income; Modifications.

1. INTRODUCTION

Despite some economic stabilisation, Sri Lanka continues to grapple with high levels of poverty and income inequality (World Bank, 2024). The UNDP's 2023 Multidimensional Vulnerability Index highlights persistent socio-economic challenges in various districts, including Colombo, emphasising the need for targeted, evidence-based policy

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interventions to support vulnerable populations (United Nations Development Programme [UNDP], 2024).

The latest report on low-income settlements reveals that 68,000 families in Colombo's low-income settlements (LIS) cannot be classified as underserved. Approximately 98.8% of the housing in these settlements has access to water and electricity, and the structures are built using permanent materials. Unlike LIS in other parts of the world, Colombo's settlements exhibit vertical growth, forming small clusters of 10-20 houses or even larger groups of 200 houses. This incremental density and quality of housing are unique to Colombo's LIS (Centre for Policy Alternatives, 2024). Currently, the Sri Lankan government's strategic plan involves constructing 66,000 high-rise housing units within Colombo. This ambitious initiative aims to relocate inhabitants from underserved urban areas, with a projected budget of Rs 2.5 million per unit (World Bank, 2024). The Urban Regeneration Projects initiated by the Urban Development Authority in 2010 propose relocating 68,000 families residing on 9% of Colombo's land to mid-rise and high-rise apartments. However, despite these efforts, several unaddressed issues persist, resulting in deteriorated living conditions for residents ("Sri Lanka should build pandemic prevention", 2024).

While the government's focus has primarily been on enhancing tangible living spaces, Samaratunga and O'Hare (2015) identifies critical issues related to high-rise public housing. These include inadequate maintenance, frequent elevator breakdowns, cost-effective yet less durable designs, insufficient insulation to regulate extreme temperature variations, a lack of open spaces and landscaping, and social isolation due to the absence of communal areas. There is a lack of user engagement during the design phase, responsiveness to local climatic conditions, optimal orientation, privacy provisions, identity integration, adaptability, and aesthetic considerations. The prevailing design paradigms often exhibit homogeneity, reflecting a limited pool of designs (Dolapihilla, 2013). The limited space within dwelling units, typically around 400 sq. ft., comprising a living area, kitchen, two bedrooms, and a bathroom poses additional challenges (Perera, 2015).

Mass housing, particularly high-rise options, provides affordability and accessibility across income levels. However, it often clashes with traditional lifestyles and cultural contexts. Within these contexts, behavioural adaptations reveal a discord between housing design and cultural realities. This challenge is particularly pronounced for low-income communities whose lives revolve around social ties, networks, and emotional and physical interdependence. Relocation disrupts their familiar neighbourhoods, workplaces, and access to preferred education. Consequently, many residents move out and eventually return to their original settlements. To align living environments with social, economic, and environmental needs, inhabitants engage in space modifications, personalisation, and behavioural adaptations. However, space modifications and personalisation are restricted in most mass housing developments. As a result, behavioural adaptations become an essential interim solution for housing satisfaction until more substantial modifications can be implemented. Within these constraints, residents adapt through minor adjustments permitted by relevant authorities.

Given the lack of comprehensive literature and research in this field of low-income high-rise housing in Sri Lanka, increased academic inquiry and professional discourse are essential. Understanding the key factors contributing to the success or failure of low-

income housing initiatives, especially those involving high-rise structures, is crucial (Dolapihilla, 2013).

1.1 BEHAVIOURAL ADAPTATIONS AND HOUSING MODIFICATIONS

Behavioural adaptations refer to modifications or changes in an organism's behaviour that enhance its survival and reproductive success within its ecological niche (Tooby & Cosmides, 1992). These adaptations are often responses to environmental changes or selective pressures. In the context of human behaviour, we observe behavioural adaptations when people react to shifts in their surroundings. For instance, in response to environmental concerns like climate change or urbanisation, individuals may adopt resource-saving practices such as water conservation or waste recycling. Additionally, behavioural adaptations occur through the lens of social norms and cultural traditions. Changes in family dynamics or social roles may arise due to economic shifts or technological advancements.

Urban contexts also witness behavioural adaptations. Daily routines and spatial use change to address urban challenges like traffic congestion, housing affordability, and access to amenities (Gärling & Steg, 2007). People may adapt to commute habits, use of public spaces, and social interactions based on infrastructure, crime rates, or socioeconomic conditions (Qi et al., 2003). Within the built environment, individuals strive to align their behaviours with the constraints and potentials of their surroundings (Archea, 1977; Proshansky et al., 1970). These adaptations, influenced by cultural, social, and economic factors, manifest in various housing modifications from spatial rearrangements to structural changes, residents personalise their living spaces to enhance comfort and well-being (Franck, 1985; Rapoport, 1969). Further, these adaptations reflect individual values and needs (Gifford, 2007; Nasar, 1983).

Research by Vega and Rubin (2010) compares residents' assessments of housing quality across three types of public housing. Their findings shed light on how these views impact inhabitants' behavioural responses to their living environments, emphasising varying degrees of satisfaction and coping strategies. Chiu (2004) delves into the socio-cultural aspects of housing sustainability, exploring how inhabitants modify their behaviours and living spaces to meet cultural and social demands. The study established a conceptual framework for understanding the relationship between housing design, community practices, and sustainability. According to Fernando and Coorey (2023), residents' satisfaction with liveability in two low-income high-rise housing complexes in Colombo was examined. The research identified critical issues related to building scale characteristics, which significantly influence tenants' overall satisfaction beyond individual dwelling units.

1.2 PERSONALISATION IN HOUSING: BRIDGING USER PREFERENCES AND DESIGN INTENTIONS

The satisfaction of housing needs encompasses both physiological and psychological dimensions, influenced by cultural, social, and economic factors (Maslow, 1943 as cited in Asad Poor Zavei & Jusan, 2012). Personalisation emerges as a critical process through which individuals express their values and aspirations within their living environments. It involves "quality homemaking" within the standards set by households themselves, promoting sustainable housing that balances quality and affordability (Jusan & Sulaiman, 2005). Grounded in basic needs theory, personalisation bridges the gap between user

preferences and designer intentions, ensuring that housing environments meet diverse inhabitants' needs (Rapoport, 1969). According to Gifford (2007), this ongoing process of personalisation reflects the dynamic nature of human needs and aspirations, emphasising individuals as agents of environmental change (Gifford, 2007). Evaluating housing environments and the process of personalisation are intertwined aspects of individuals' interactions with their living spaces. A comprehensive framework integrating affective, cognitive, and behavioural dimensions, while considering cultural, social, and economic influences provides valuable insights into occupants' experiences and the dynamic nature of housing environments.

However, despite the importance of personalisation, mass housing and public housing production often lack end-user participation during design stages. These developments offer typical 2-bedroom layouts to a diverse community, disregarding variations in family sizes, social needs, emotions, and economic backgrounds. Consequently, end-users may end up in conflict with housing layouts, leading to modifications without professional consultations, resulting in suboptimal living spaces (Kularatne et al., 2019). Encouraging end-user participation, flexible design, and varied house types and layouts are essential for accommodating personalisation without compromising the purpose of creating habitable living environments.

1.2 AIM AND OBJECTIVES

The challenges of everyday life vs the built environment have implications on the behaviours and adaptive measures in housing. This research aims to explore the challenges to everyday life; adaptive measures and housing modifications to overcome such challenges. The objectives are to:

1. Examine the basic needs and challenges to everyday life of “low-income dwellers” when living in high-rise resettlements.
2. Examine the behavioural adaptation and housing modifications in high-rise resettlements in response to the basic needs and challenges of everyday life.

2. METHODOLOGY

2.1 INTRODUCTION TO THE CASE STUDY

This research employs a case study approach to investigate a typical model of high-rise low-income housing. The selected case is shown in Figure 1.



Figure 1: Case study 1 - unit layout, floor layout, and the photograph of the housing development
Source – UDA & by author

The selected case is a 14-story low-income housing complex comprising 200-250 dwelling units per block. The residents have lived in their units for 4-5 years, with construction spanning from 2015 to 2019. Housing units are approximately 500.55 sq. ft with a living room, two bedrooms, a kitchen, and a toilet which is consistent across low-income high-rise housing. Notably, these buildings feature a natural ventilation system facilitated by windows, ventilation grills, and light wells, allowing residents to regulate airflow according to their preferences.

2.2 DATA COLLECTION

Sample: Respondents for this study were identified through a pilot survey interview involving 150 individuals, of whom 57 agreed to participate in further interviews. The selection criteria encompassed various factors influencing household dynamics, including family size, the gender and age of children, the family life cycle, and housing design.

Interviews: Interviews served as the primary method of data collection. A standardised set of questions guided the interviews, ensuring consistency across. The interview structure encompassed several sections namely 1. Demographic information such as occupation, family size, length of stay, and Building occupation details; 2. Building conditions and facilities; 3. Residents' satisfaction and rating on comfort, neighbourhood, and amenities in and outside the houses; 4. Community's diversity, infrastructure, and personal customisation of the housing units; 5. Problems that residents encounter and suggestions for future modifications and 6. Overall housing satisfaction of the living environment.

Observations: observations supplemented the interview data, with photographs and sketches used to document physical changes within the housing units. However, access to the internal spaces of respondents' homes for photography was limited.

3. FINDINGS AND DISCUSSIONS

3.1 CONTENT ANALYSIS OF INTERVIEW DATA

Content analysis was employed for analysing interview data. This approach facilitated the identification of recurrent patterns within the recorded communication, enabling the exploration of meaning units, codes, categories, and underlying themes. The overarching objective of this process is the systematic transformation of voluminous textual data into a meticulously organised and brief summary of paramount findings.

3.1.1 Housing Needs and Challenges

Table 1 illustrates transcribed interview data explored as meaning units, codes, categories, and the formation of thematic elements. This iterative method involved gradually shifting from overt and explicit content to researching latent meanings buried in the dataset. According to Table 1, the major challenges to everyday life are lack of space for a variety of indoor and outdoor functions, privacy, security & safety, and maintenance, which are directly related to the design characteristics of the housing. The analysis also shows concerns related to mental health, social interactions, and other social problems that can be considered as the social conditions of the housing. Physical comfort such as light, ventilation, and thermal comfort that relates to the environmental conditions of the housing were also identified as important basic needs affecting the everyday life of the inhabitants.

Table 1: Overall summary of organisation of related coded meaning units into codes, categories, and themes based on housing needs and challenges to everyday life.


Meaning units condensations	Codes	Categories	Themes
Two bedrooms are insufficient.	Lack of bedroom space		
No space for a kitchen yard, and storage	No space for storage		
No space for a garden, and balcony as such	Lack of Garden & Balcony	Space requirement	
Lack of place for the garbage disposal	No space for Garbage		
Lack of space for Dry clothes	Lack of laundry area		
Lack of parking space, no individual parking slots being provided	Lack of parking space		
Lack of community hall or a gathering space	Lack of internal and external spaces for community interactions.		Housing Need
Lack of play area, or playground for children	Lack of play space	Space for Social Activities	
Lack of connection between the community	Community interactions		
No such space as a funeral hall or a space to hold a funeral	Lack of community hall		
Bedroom windows opened to the corridor	Lack of privacy	Privacy	
Lack of clear division of the spaces inside the house	Space Constraints		
A breakable door is a main door	Lack of safety	Security & Safety	
No grills are fixed to the windows	Lack of safety		
The front window starts low on the wall, providing easy access to the living area when opened	Lack of security		
Bedrooms are dark and no proper ventilation	Inadequate Light & Ventilation	Poor Housing Quality	
Housing units inside the environment are really hot	Thermal dissatisfaction	Physical Comfort	
Plumbing and Electrical problems	Poor Construction	Maintenance Issues	
Regular Lift breakdowns	Lack of Maintenance		
Lack of maintenance of the overall building	Lack of Maintenance		Housing Challenges
Small to large-scale robberies happen all the time	Theft	Social problems	
New drugs and drug dealers	Drugs & Alcohol		
Prostitution	Illegal businesses		



Meaning units condensations	Codes	Categories	Themes
Increased crime rates including violence			
Lack of Grama Niladari services	Lack of Social Services		
Loss of memory due to being forcibly displaced from previous home	Amnesia		
Sudden change in daily life routines	Unable to bounce back to normal	Displacement	
Vastly different new environment	Disorientation		
No experience with high-rise living always lived on the ground level	Lack of coping and control		
Moving away from familiar environments and feeling lonely	Mental Health Issues		
Missing the previous home environment	PTSD	Gentrification	
Losing the previous home and the familiar neighbourhood	Lack of confidence		

3.1.2 Behavioural Adaptations and Modifications

The below section explores the behavioural adaptations and spatial modifications in response to basic needs and challenges to the everyday life of resettled communities in high-rise housing. Both interview data and observational data are analysed in Table 2.

Table 2: Summary of behavioural adaptations or modifications in response to the basic needs and challenges of everyday life based on interview data and observations

Basic needs and challenges to everyday life in high-rises	Behaviour Adaptation or modifications	Photographs
Lack of Space		
<ul style="list-style-type: none"> • Lack of laundry areas and places for drying clothes. • Two bedrooms are insufficient due to large family size and extended family. • Lack of shared spaces for communal interactions - internal & external • Lack of storage space • Lack of green spaces and balconies/outdoors • Lack of space in pantry/kitchens 	<ul style="list-style-type: none"> • Use of corridors and corner spaces. • Use mattresses on the floor to sleep. • Bedrooms used as a multifunctional space • Corridors used for communal space • Storage inside bedrooms and service duct spaces used for kitchen yard/equipment • Common corridors used for fish tanks, and plants. • Extension of kitchen using appliances 	

Basic needs and challenges to everyday life in high-rises	Behaviour Adaptation or modifications	Photographs
Privacy		
<ul style="list-style-type: none"> • Lack of divisions and demarcation of spaces in living/dining • Positions of windows/doors across units & proximity of housing towers affect privacy 	<ul style="list-style-type: none"> • Use of curtains, and tinted windows. • Use of temporary boards to block views • Closing doors and windows at all times • Overcome heat and light issues by using fans and lights during the day 	
Light & Ventilation		
<ul style="list-style-type: none"> • Lack of light or ventilation in the bedrooms - especially rooms facing the corridor 	<ul style="list-style-type: none"> • Closing windows due to privacy and using fans and lights for light & ventilation 	
Safety & Security		
<ul style="list-style-type: none"> • Lack of security 	<ul style="list-style-type: none"> • Additional grill gates for doors and windows. • Grill gates at roof slab levels • Grill gates at every floor level 	

4. SUMMARY OF FINDINGS

Privacy: The research underscores the critical role of behavioural adaptations in maintaining privacy across different activity systems. Notably, these modifications are essential for achieving visual seclusion, limiting unwanted social interactions, ensuring smooth daily routines, preserving parental intimacy, securing privacy for adolescents, demarcating sleeping areas, and maintaining privacy during guest visits within domestic environments. The need for such adaptations is particularly pronounced in households with adolescent daughters and sons, where spatial segregation accommodates their distinct daily routines.

Multifunctional Use of Space & Shared Spaces: Living and dining areas in high-rise housing serve a multitude of functions, including dining, relaxation, sleeping, study, and even clothes drying. Family members share this space for various activities. The research highlights a common practice of bedroom sharing. Unlike the concept of individualised rooms, which did not emerge, children grew accustomed to communal privacy during their early years. However, privacy becomes more critical during adolescence. Notably, Islamic households tend to establish separate sleeping spaces for parents, daughters, and sons to ensure privacy. This aligns with the concept of spatial appropriation discussed by Giuliani et al. (1990). Spatial constraints within housing units lead to behavioural adaptations that occasionally diverge from cultural norms. For example, entertaining male guests may be relocated from interior spaces to the living area, challenging expectations of family privacy. Respondents also acknowledged that spatial limitations prevent accommodating overnight relatives, conflicting with cultural norms of hospitable

treatment, especially among Muslim and Hindu families. Achieving privacy for family members in the presence of guests proves challenging due to the open layout. The interchangeable functionality of dining and living zones occasionally leads to conflicts in use.

Privacy and Social Interactions: A significant number of participants emphasised the importance of behavioural adjustments to maintain privacy, limit unwanted social interactions, and enhance security. Regular practices included securing entrances, keeping windows closed, and shutting doors, all aimed at regulating these aspects. However, these measures sometimes had a negative impact on neighbourly interactions. Respondents primarily focused on intra-family dynamics, with interactions among neighbours being rare. The close proximity of the towers and window placement encroached upon the privacy of families residing across from each other. While these adaptations ensured privacy, they also led to visual constraints, reduced ventilation, and fewer interactions among neighbours.

Privacy, Family Organisations, and Arrangements: The proximity of neighbouring and common areas in high-rise housing can compromise familial privacy. Corridors indirectly serve as spaces that balance interaction and privacy, especially during the presence of male guests. The reorganisation of bedrooms results in functional sleeping quarters tailored to the privacy and activities of adolescent children. Consequently, parents and small children often use the living area to sleep at night. During family functions or when guests arrive, the living area accommodates males, while females use the bedrooms. However, this arrangement often compromises the comfort and quality of sleeping spaces.

Privacy and Physical Comfort: In high-rise housing, residents often face a trade-off between light, ventilation, and privacy. Windows and openings oriented toward corridors and common areas compromise natural light and airflow in exchange for security and privacy. Tinted glass windows, layered curtains in bedrooms, and bamboo blinds for pantry windows are used to regulate visual privacy. Additionally, strategic placement of grill gates and other privacy-enhancing measures is observed. The reorganisation of interior spaces, coupled with intentional modifications to windows and doors, exemplifies the dynamic interplay between architectural adaptations and the essential need for privacy, security, comfort, and versatility within domestic environments. This finding aligns with a study by Wong and Yap (2003), emphasising the significance of home privacy in densely populated living spaces like Hong Kong. Prioritising privacy often leads to limitations on interactions, causing individuals to retreat within their confined boundaries. Other behavioural adaptations include noise control within personal residences and refraining from peering into adjacent units, especially when units directly face each other.

Extension of Domestic Space: In low-income high-rise housing, residents often reorganise and extend their living spaces. This process involves the living area, kitchen, lobby, and bedrooms. By doing so, they indirectly redefine spatial boundaries, blurring the lines between public and private realms. Simultaneously, corridors shift into a semi-private domain. The lack of space provisions for day-to-day needs drives this extension of activities into public and semi-public areas, a strategy reminiscent of former informal settlements. Residents optimise spatial utilisation for daily activities and interactions. Service ducts serve as kitchen backyards or storage spaces, while corridors double as

areas for drying clothes. Corridors, which resemble extended verandas, offer better ventilation and become spaces for relaxation. In a way, they represent “borrowed space.” However, authorities often regulate these personalised extensions, limiting residents’ ability to meet their human needs.

Lack of Domestic Space: In contrast to addressing other basic needs, residents in high-rise housing face limitations when it comes to modifying their living spaces. Unlike in previous low-income informal settlements, where vertical incremental growth was common, residents cannot expand their units or increase square footage to accommodate extended families, family growth, or multigenerational living. Instead, they adapt behaviourally by sharing spaces, using multifunctional areas, and extending domestic activities (such as relaxation, religious practices, and storage) into public and semi-public spaces like corridors and lobbies. However, encroachment or any form of personalisation of these common areas is restricted and regulated by authorities. Unfortunately, the mass housing model typically provides a uniform 2-bedroom unit for all residents, regardless of family size or life cycle, making it impossible to allocate sufficient space for multiple families and restricting comfortable living.

Community Living: Corridors became a part of the house and the corner area of the towers was converted into shrines for religious activities common to all. The lack of playgrounds and lack of secured play areas within close proximity is a challenge. Residents adapt by using corridors, stairwells, and ground floor central courts. Corridors and stairway lobbies facilitate better surveillance of younger children within close proximity to their homes and parents' views.

5. CONCLUSIONS

The study highlights the crucial role of behavioural adaptation, personalisation, and housing modifications among low-income families residing in high-rise buildings. These adaptations are essential due to limitations in environmental comfort, functionality, space allocation, and socio-cultural requirements. Residents adapt their behaviour to enhance daily comfort, family privacy, and social interactions, harmonising domestic life within the constraints of high-rise housing. Interestingly, some behavioural adaptations occasionally diverge from cultural and religious norms, revealing a complex interplay between architectural modifications and deeply rooted beliefs. However, the opportunity for personalisation and modification based on residents’ needs is often restricted, compromising comfort and well-being. The research underscores the dynamic relationship between behavioural adaptation, housing modifications, and cultural considerations in low-income high-rise housing. To create an optimised and harmonious domestic environment, architectural interventions should balance physical requirements with socio-cultural needs, values, and lifestyle patterns.

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