

Article

Factors Influencing Housing Satisfaction in Post-Disaster Resettlement: A Case of Nepal

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Abstract: Housing satisfaction, crucial for sustainable post-disaster resettlement housing, has received limited attention in research. This study aimed to identify households' perceived importance of housing satisfaction factors and their significance in post-disaster resettlement housing programs. Focusing on Nepal's Panipokhari Integrated Settlement after the 2015 Gorkha earthquake, it identified relatively significant housing satisfaction factors using mean satisfaction scores, the relative importance index, and Spearman rank correlation. The data were derived from a structured questionnaire survey, complemented by field observations, measurement, and semi-structured qualitative interviews that support the findings. The study found key housing satisfaction factors as need-based housing design ($r = 0.70$), layout ($r = 0.74$), modification flexibility ($r = 0.70$), utility spaces such as kitchen gardens and cattle sheds ($r = 0.67$), house completeness ($r = 0.80$), thermal comfort ($r = 0.63$), and social and cultural aspects such as traditional hearths ($r = 0.72$) and spaces for rituals and events ($r = 0.77$). The study concluded that the integration of these factors in the policy-making, planning, and design is important for successful resettlement housing outcomes in regions with comparable socio-cultural and economic backgrounds. The study has practical significance and, thus, will help policy-makers, implementers, and researchers aiming for successful and sustainable resettlement outcomes.

Keywords: factor; housing; post-disaster resettlement; housing satisfaction



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1. Introduction

Over the last decade, the frequency and severity of disasters have increased significantly, leading to extensive damage to the built environment. In 2021, disasters caused a staggering 23.7 million internal displacements out of the total 38 million displacements worldwide [1]. Among the several measures adopted to manage such displacements, resettlement has emerged as a widely discussed and practiced approach. Resettlement entails the planned, assisted, and permanent relocation of displaced populations by introducing them to a new built environment [2,3]. It is considered a durable solution for post-disaster reconstruction and mitigation [4]. However, despite significant financial investment and policy provisions, many resettlement projects have produced limited outcomes in resettlement projects, which often overlook the long-term well-being of the affected communities [5]. In line with the research by several scholars [3,6–10], it is stressed that identifying crucial factors for successful resettlement is essential. These factors include creating enabling positive conditions that support the adaptation of the affected community to the new built environment and discourage them from returning to their previous locations. Tas et al. [11] highlight that permanent housing should not only meet the basic accommodation needs, but also take into account the psychological, social, and economic requirements of displaced households, considering their extended stay in the resettled area. To achieve these goals, scholars [12–14] emphasize understanding residential satisfaction, which has become a major reason for determining the choice to remain in a resettlement site or return back to the original area.

Nepal is positioned among the most disaster-prone countries globally, ranking 11th in seismic risk, 30th in flood risks, and 4th in climate change vulnerability [15], which poses significant challenges to resettle vulnerable communities. The devastating 2015 Gorkha earthquake of a magnitude of 7.6 on the Richter scale caused massive human losses and physical damage across 32 hilly districts of Nepal. The majority of the attention was given to the in situ reconstruction of damaged houses [16], leaving behind the issue of the resettlement of over 5000 families to safer locations from 21 districts coming under 99 local government jurisdictions [17]. Although the Government of Nepal initiated developing about 55 “Integrated Settlements” to address the resettlement needs, the majority of resettlement sites were partially resettled, unoccupied, or rejected by the affected households [18–20], putting stress on public finances. This has necessitated the need for a study on the residential satisfaction of the affected households with housing characteristics in resettlement sites.

The factors influencing housing satisfaction in post-disaster resettlement projects have been examined by numerous researchers in the international context encompassing physical, social, economic, cultural, and environmental factors. Several researchers [21–25] have investigated the link between residential satisfaction and housing characteristics. Although a few studies [26–29] have examined the post-disaster resettlement sites developed after the 2015 Gorkha earthquake, limited research on the factors influencing residential satisfaction of the post-disaster resettled communities has been conducted in Nepal. These studies indirectly provide insights into the relationship between housing satisfaction and housing characteristics in these resettlement areas.

The success of resettlement is heavily reliant on the satisfaction of the end-users [3]. Given the uniqueness of each post-disaster situation, continuous research is necessary to develop a comprehensive understanding [30]. Upon reviewing these scholarly works, it became evident that, although several housing satisfaction factors related to physical, social, economic, cultural, and environmental aspects were identified in post-disaster resettlement, they were not discussed in terms of their relative importance as perceived by the affected households and their significance in resettlement housing. There is a dearth of research related to housing satisfaction in post-disaster resettlement in Nepal. In this context, the objective of this study was to identify and examine factors influencing housing satisfaction and their significance in post-disaster resettlement housing.

While researchers have mainly employed either qualitative [3,23,31,32] or quantitative methods [12–14,23,33,34] to identify the factors influencing housing satisfaction, this study adopted a mixed-method approach utilizing both qualitative and quantitative methods. The study incorporated observation, qualitative interviews, and the Relative Importance Index (RII), a method employed in satisfaction research across various fields [35,36], alongside the mean satisfaction score and Spearman rank correlation as part of the quantitative methods. By assessing the relative importance of the factors affecting housing satisfaction and correlating this with qualitative findings, this research aims to provide valuable insights for policy-makers and decision-makers in developing countries. The findings hold practical significance, guiding policy-makers and planners to make informed choices regarding resource allocation and intervention strategies and implementers to integrate important satisfaction factors in the planning and design of houses. This ensures the integration of household preferences and efficient allocation of limited resources to address the most-pressing needs and concerns of the resettled communities. The findings of this study also contribute to the SDGs, which aim to ensure universal access to adequate, safe, and affordable housing by 2030 based on various socio-cultural and economic criteria.

2. Post-Disaster Resettlement Housing

Housing holds immense value as the most-prized possession for individuals and families [37,38], with significant social and economic importance. It represents a dynamic process, rather than a mere endpoint, as people continuously strive to improve and customize their dwellings to cater to their evolving needs. Housing goes beyond being a

physical structure with four walls and a roof; it is regarded as a psychological reality that ensures a safe and secure haven, promoting physical comfort and mental well-being while upholding a sense of peace and dignity. This recognition is reflected in Article 25 of the 1948 Universal Declaration of Human Rights and Article 11.1 of the 1966 International Covenant on Economic, Social, and Cultural Rights [39]. Additionally, SDG Target 11.1 aims to ensure universal access to adequate, safe, and affordable housing and basic services by 2030 [40]. Criteria for adequate housing, as defined by the United Nations [41], encompass various elements such as secure tenure, essential services, affordability, habitability, accessibility, appropriate location, and cultural suitability. In Nepal, the Constitution, along with the Right to Housing Act (2018), enshrines the right to suitable housing for all citizens. However, the hazard literature highlights housing as the most-affected and -challenging sector in reconstruction programs [38,42]. Post-disaster resettlement houses in Nepal differ considerably from conventional houses, involving variations in layout, design, materials, and construction processes. The Sphere standard [43] provides minimum humanitarian standards, including a living space that caters to diverse household needs, respects local culture and lifestyles, ensures optimal lighting, ventilation, and thermal comfort, and includes appropriate spaces for cooking and livelihood activities.

2.1. Housing Satisfaction

Housing satisfaction and residential satisfaction are often used interchangeably in post-disaster resettlement research. Housing satisfaction can be defined as a reflection of the degree to which the inhabitants feel that their housing is helping them achieve their goals [44]. In post-disaster contexts, residential satisfaction can be referred to as a “feeling of contentment when one has or achieves what one needs or desires in a house”. Since displaced households are long-term users, their perception largely shapes their satisfaction with the built environment and housing in the resettled community [3]. The success of post-disaster resettlement is not solely determined by the number of permanent houses constructed, but is greatly influenced by the residential satisfaction with the housing [3]. The degree of satisfaction determines whether the residents will actually inhabit the houses in the long term [6]. Studies on post-disaster resettlement [11,22] have focused on understanding the perceptions and needs of users for their long-term residential satisfaction. If the needs and expectations of affected people are not addressed in terms of comfort, building materials, construction quality, and sensitivity to cultural and community practices, households may respond by refusing to accept or occupy the house or attempting to modify it [22,45]. Successful resettlement is essential for the sustainable recovery of disaster-affected communities [34]. Thus, the satisfaction of the resettled households plays a crucial role in resettlement decisions and is at the core of the resettlement’s sustainability.

2.2. Factors Influencing Housing Satisfaction in Post-Disaster Resettlement

The literature review on the factors influencing residential satisfaction in post-disaster resettlement reveals several key findings from various studies conducted over the years. Kronenberger [46] identified the lack of culturally important ritual spaces in the resettled village as a potential reason for failure. Coburn et al. [47] emphasized the failure of the layout to provide sufficient space around dwellings for tool sheds, animal pens, and other agricultural needs as a reason for the abandonment of resettlement sites. Likewise, researchers [46,47] have also highlighted that the faulty construction and use of inferior materials also create difficult living conditions, particularly regarding thermal protection in different seasons. Aysan and Oliver [48] highlighted the incompatibility of four-roomed single-story prefabricated houses built after the 1970 Gediz earthquake with the lifestyles of displaced households depending on agriculture and animal husbandry. Sey and Tapan [8] found that houses remained empty since they were not completed on time and left empty due to faulty construction and the use of inferior materials, leading to difficult living conditions. Oliver-Smith [49] pointed out that the monotonous uniform design in post-

disaster housing imposed urban middle-class values on rural populations and failed to consider the needs and lifestyles of the household.

Dikmen and Elias-ozkan [50] emphasized that the preference for concrete as a building material for the post-1970 Gediz earthquake reconstruction resulted in houses that were considered cold and damp by the users. Ozden [51] highlighted construction problems in post-disaster housing, such as inadequate chimney design for wood- and coal-burning stoves in houses designed for a gas heating system. Enginoz [52] revealed that the households complained that the brick masonry houses were cold in winter and hot in summer, unlike the old mud brick houses. Steinberg [53] stressed the importance of meeting the psychological, social, and economic expectations of displaced households in the newly built environment. Tas et al. [11] identified several factors influencing the satisfaction of resettled households, including the aesthetics of the housing and the loss of privacy attributed to the new layout. Onder et al. [54] highlighted the dependence of housing satisfaction on various variables such as the meaning placed on housing, its design, users' background, lifestyles, and expectations. Perera et al. [21] found that the rate of satisfaction was higher for households participating in the design and arranging of the layout of houses in Sri Lanka. Danquah et al. [44] emphasized the importance of housing design and the size of plots and rooms in Ghanaian post-disaster resettlement and further stressed that residential satisfaction is also affected by appropriate technical supervision along with beneficiary participation.

Wagner [55] explained that households compare their old and new environments, leading to the decision to abandon their rebuilt dwelling. In the empirical study of poor villagers after the Gujarat earthquake, Barenstein [56] discovered that agency-driven post-disaster reconstruction was culturally inappropriate and caused stress and discomfort to affected people. Oo et al. [6] have reported cases where the resettled households have rejected or moved out of the provided housing for several reasons, such as poor-quality work, use of technology, and design that were unsuitable for local weather and cultural sensitivities. Wijegunaratna et al. [38] also highlighted that resettlement projects fail due to housing that does not respond to the needs of resettlers, such as the loss of livelihood and the disruption of daily routine. Cuaton [57], in his study of poor coastal communities in the Philippines, stressed that permanent and stable shelter is an integral part of living with dignity. Iuchi and Mutter [58] also stressed that the consideration of local culture will increase community involvement, resulting in higher satisfaction and a successful resettlement outcome. Zhang et al. [59] pointed out that the major problems faced by the resettled households were contradictions between the housing layout and local lifestyle and culture, the size of the room, a monotonous and uniform design, and a non-flexible design. Chen et al. [60] revealed that the availability of farmland rather than the size was important as farmland was needed for the livelihood of the rural resettled household.

Siriwardhana et al. [61] in their study highlighted various cultural issues related to ethnicity, religion, the social environment, the natural environment, livelihood, and lifestyle influencing post-disaster resettlement satisfaction in developing countries like Sri Lanka. Hadlos [62] in his post-Haiyan resettlement study in the Philippines identified that the residents were less satisfied with the lot size, overall size of the house, size of interior spaces, lot ownership, level of completeness of the house, etc. Kurum Varolgunes [23] argued that the uniform post-disaster housing design resulted in ignoring individual needs and lifestyles. He also stressed the factors such as the plot size, distance between houses, arrangement of houses, spaces required for rural households such as animal sheds, storage areas for farm products, and traditional bread-baking areas, space for expansion, and modification are important for user satisfaction. He further suggested the design of the sustainable housing samples by considering the culture, climate, and topography along with community participation. Likewise, Tharim et al. [13] identified that the post-flood resettled communities in Malaysia were unsatisfied with the housing design, the size of the house, and the indoor air temperature during the daytime. Senanayake et al. [4] stressed that community involvement in the planning and alteration of the housing design

will increase housing satisfaction. Meanwhile, Pormon et al. [24] conducted a study on post-disaster resettlement in the Philippines after Typhoon Haiyan and found that cultural activities played a significant role as common predictor variables in determining residential satisfaction.

In the context of post-disaster resettlement in Nepal, He [27] in his study of the post-disaster resettled communities after the Gorkha earthquake highlighted that the resettled communities preferred the availability of farmland and house-building training for their sustainable recovery. Other studies [28,29,63] on post-Gorkha earthquake resettlement planning have highlighted the significance of proximity to agricultural farmland for households reliant on place-based agropastoralism for achieving successful resettlement outcomes. Additionally, Baniya [26] in his study of the poor Majhi community of Nepal revealed that the strict technical restrictions on the design and choice of construction materials affected the resettlement projects. The study also highlighted the dissatisfaction resulting from the lack of participation and neglect of socio-cultural aspects in the decision-making processes for reconstruction. These findings collectively emphasize the intricate and multifaceted nature of factors that influence residential satisfaction in post-disaster resettlement efforts in Nepal. The factors identified from the literature and taken into account for examination in this study are presented in Figure 1.

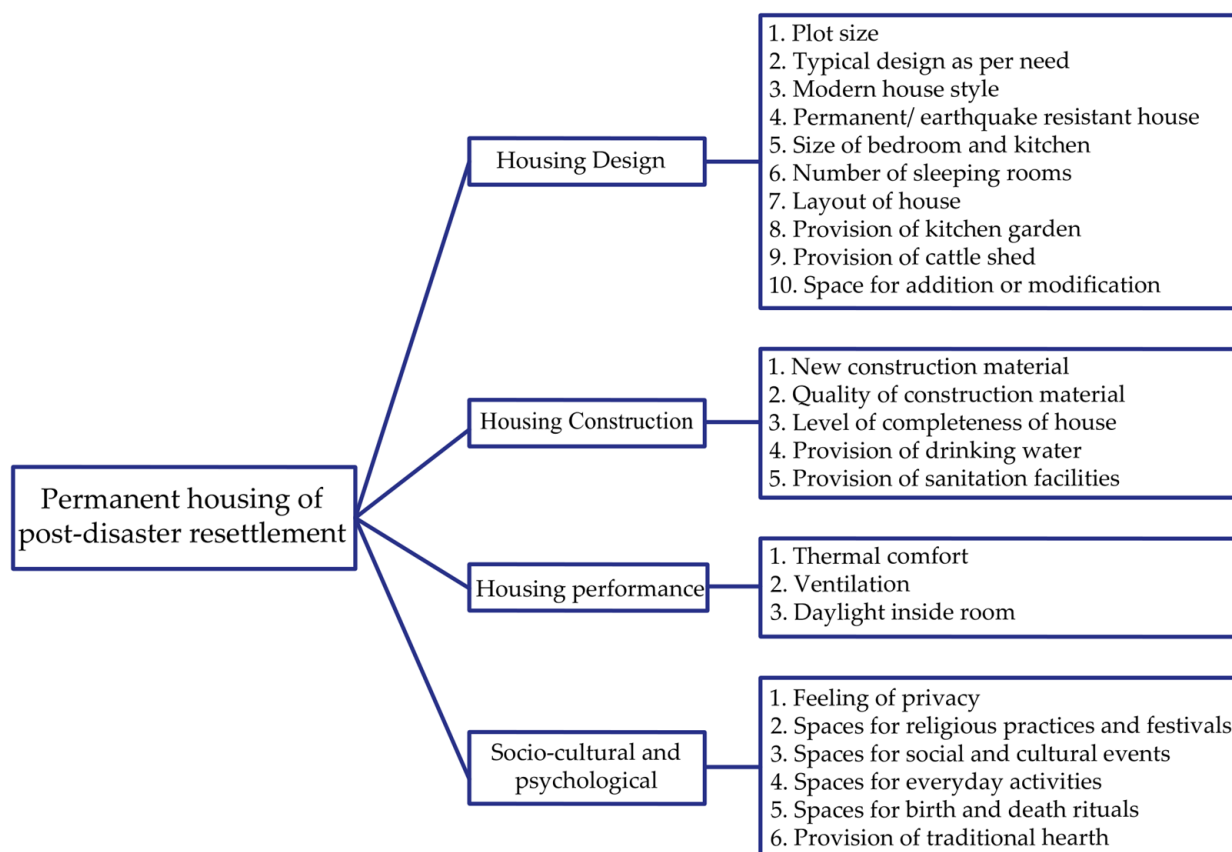


Figure 1. Factors influencing residential satisfaction.

3. Materials and Methods

A case study methodology was used to investigate the factors influencing the residential satisfaction of the displaced households resettled in Panipokhari Integrated Settlement. The data collection involved mixed methods, including a questionnaire survey and interviews with the households, along with field observation and measurements. A comprehensive literature review was conducted to identify the factors influencing satisfaction,

categorized under four main groups: (i) sustainable housing, (ii) building construction, (iii) building performance, and (iv) socio-cultural context (Figure 1).

Residential satisfaction is a measure of residents' subjective assessment of the adequacy of their living environment to satisfy their needs, expectations, and ambitions [64]. For data collection, a face-to-face questionnaire survey with household members aged 18 or above was conducted in the Nepali language, targeting all 56 households in Panipokhari to gather quantitative data. However, only 46 households could be surveyed, as 10 were unavailable due to their engagement in daily farm activities, labor work, seasonal migration for employment in larger cities, or abandoning their houses. The data collection took place between the 4–10 January 2023, nearly eight years after the 2015 earthquake and almost four years after their resettlement into the new housing, which aligns with the recommendation by Huizenga et al. [65] for a post-occupancy assessment to be conducted at least six months after moving to the new settlement.

The questionnaire was designed based on a literature review of factors influencing residential satisfaction and contextualized from a pilot survey conducted in 2021 (Figure 1). It consisted of questions related to demographic information and an additional 24 questions aimed at measuring households' satisfaction with various housing characteristics. Respondents used a five-point Likert-type scale to rate their satisfaction, ranging from "1 highly unsatisfied" to "5 highly satisfied", with options for "2 unsatisfied", "3 neutral", and "4 satisfied" in between. To ensure the validity and reliability of the scale, the questionnaire underwent pre-testing in the pilot survey. The internal consistency of the measurement scale was further assessed using Cronbach's Alpha test, resulting in a value of 0.939, which exceeded the recommended acceptable reliability coefficient of 0.7, as suggested by Pallant [66].

The collected quantitative data were analyzed using descriptive statistics to present the socio-demographic characteristics of the affected households (Table 1). Additionally, the mean satisfaction score and mean attribute score calculations, Spearman's rank correlation coefficient analysis, and the Relative Importance Index (RII) were employed to analyze the factors influencing satisfaction. The mean satisfaction score provided the average rating of overall satisfaction, while the mean attribute score revealed specific housing attributes contributing to satisfaction. Spearman's rank correlation coefficient analysis measured the strength and direction of association between variables and overall satisfaction, with test values ranging between -1 and 1 . A result of -1 implied a perfect negative correlation, and vice versa. Furthermore, the study used the relative importance index to identify and prioritize critical factors significantly impacting housing satisfaction and adoption in post-disaster resettlement housing. Additionally, 15 semi-structured interviews were conducted to understand the factors influencing the satisfaction of the resettled households. These interviews further validated the results of the quantitative questionnaire survey.

Table 1. Socio-demographic information.

| Personal Factor | | Number | Proportion |
|-----------------|----------------|--------|------------|
| Gender | Male | 33 | 71.7% |
| | Female | 13 | 28.3% |
| Age | 15–29 years | 3 | 6.5% |
| | 30–44 years | 15 | 32.6% |
| | 45–59 years | 13 | 28.3% |
| | Above 59 years | 15 | 32.6% |
| Marital status | Married | 44 | 95.7% |
| | Unmarried | 1 | 2.2% |
| | Widowed | 1 | 2.2% |

Table 1. *Cont.*

| Personal Factor | | Number | Proportion |
|---------------------------------------|-----------------------|--------|------------|
| Family size | | 4.07 | |
| Education level | Illiterate | 20 | 43.5% |
| | Basic (I–VIII) | 21 | 45.6% |
| | Secondary (IX–XII) | 5 | 10.9% |
| Occupation | Agriculture/Livestock | 24 | 52.2% |
| | Labor | 6 | 13.0% |
| | Business | 5 | 10.9% |
| | Service | 1 | 2.2% |
| | Masons/carpenter | 1 | 2.2% |
| | Remittance | 2 | 4.3% |
| | Others | 7 | 15.2% |
| Household expenditure per month (NPR) | | 15,000 | |
| Household income per month (NPR) | | 20,000 | |
| Single women | Yes | 6 | 13.0% |
| Persons with a disability | Yes | 9 | 19.6% |
| Number of school-going children | | 44 | 95.7% |
| Foreign employment | Yes | 6 | 13.0% |
| Cattle | Yes | 31 | 67.4% |
| The original place of settlement | Bosimpa | 30 | 65.2% |
| | Buma | 15 | 32.6% |
| | Others | 1 | 2.2% |

3.1. Case Study Area

Panipokhari Integrated Settlement is located in Bhimeshwor municipality of the Dolakha district of Nepal. Dolakha district was selected for the study as it was one of the 14 most-affected districts by the 2015 Gorkha earthquake, with about 170 deaths, 56,293 houses completely destroyed, and 4346 houses partially damaged [67]. The earthquake, followed by subsequent aftershocks and landslides, displaced the indigenous Thami community living traditionally in a dispersed settlement facing southeast on the hilly terrain of Bosimpa and Buma village. In this regard, the geo-hazard assessment by the National Reconstruction Authority in February 2017 classified the land as CAT 3 (unsafe for settlement, necessitating relocation of households to safer areas). Following this, the Government of Nepal planned Panipokhari Integrated Settlement (Figure 2) to relocate 56 households from the vulnerable Buma and Bosimpa villages located at a five minute walk and an hour's walk, respectively. Although Buma is at the same elevation as Panipokhari (1765 m above sea level), Bosimpa is located at a higher altitude (1845 m). The displaced households first stayed in the temporary shelters in Panipokhari and then built temporary houses before the resettlement planning. It was only in 2019 that the first household decided to relocate to Panipokhari Integrated Settlement. Even after 8 years of disaster events, only 30% of the households have completely relocated to Panipokhari Integrated Settlement, while other households stay in both Panipokhari and the old villages. Figure 2b shows the houses occupied by the displaced households at the time of the survey.

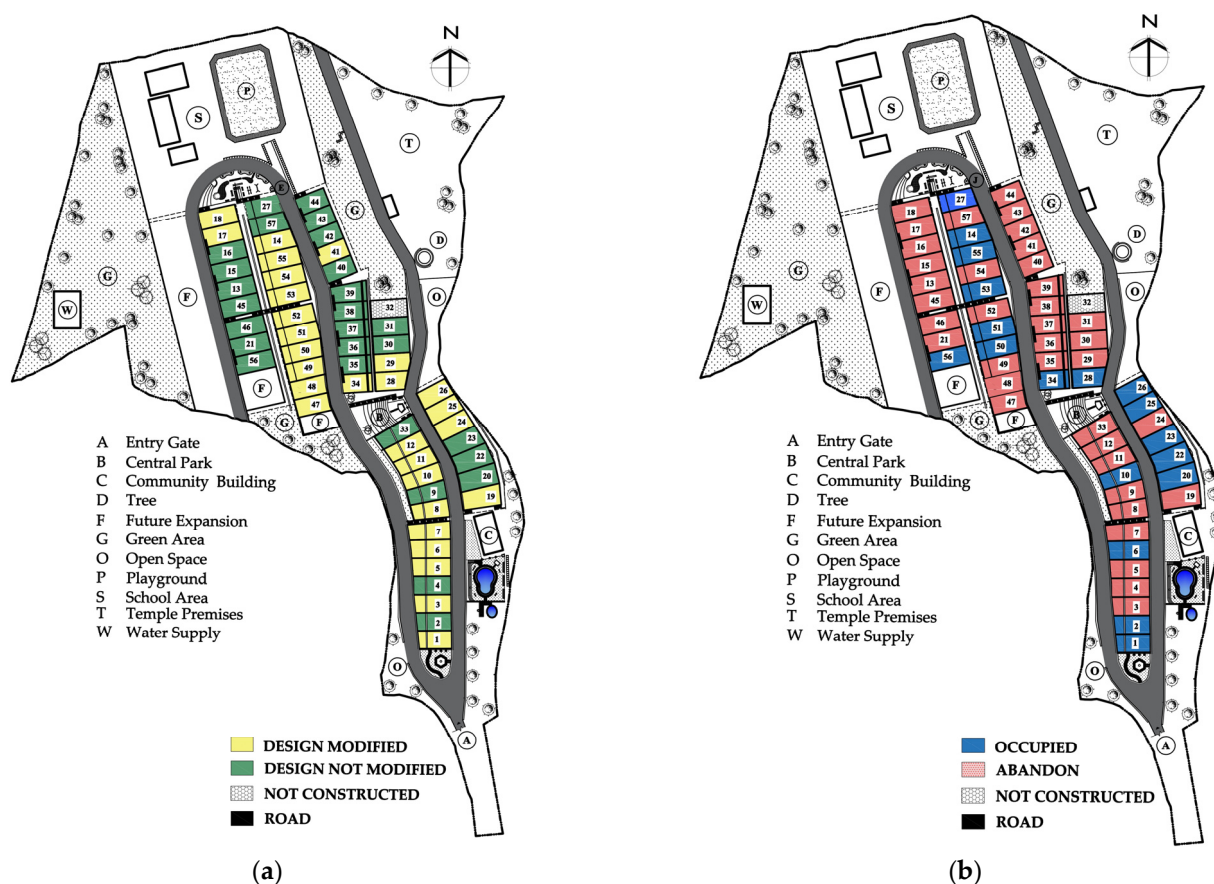


Figure 2. Master plan of Panipokhari Integrated Settlement: (a) house modification; (b) house abandonment.

3.1.1.1. Pre-Disaster Settlement and Housing

Panipokhari Integrated Settlement was developed for the displaced “Thami” community, the indigenous Tibeto-Burman ethnic group found mostly in the rural hilly villages of two districts—Dolakha and Sindhupalchok of Nepal. They practice a unique syncretic combination of indigenous shamanism rituals mixed with Hinduism and Buddhism [68]. Prior to the earthquake, the Thami settlement was scattered in the hilly terraces facing the south, with houses surrounded by agricultural fields. Each residential complex had a dwelling along with other structures required for rural life, such as storage space, cattle sheds, and other spaces dedicated to other animals such as chickens, goats, etc.

A typical Thami vernacular house is two-storied, rectangular in plan, with its longer axis facing towards the south. The ground-floor plan consists of a large single room without any partition functioning as a kitchen, a living room, and also a bedroom (Figure 3a). Shneiderman [69] reports that the single, distinctive feature of the Thami house design is the hearth marked by “*bampa*”. *Bampa* is a large piece of flat rock rammed vertically into the floor, which is not only used as a windbreak to protect the central hearth, but also has much cultural and religious significance linked to important birth, death, and marriage rituals. Although the hearth was placed centrally in the earlier houses, later, the houses started constructing it in the left corner of the room to vent out the smoke. The stairs lead to the first floor, which is used for sleeping and storing food grains (Figure 3b). The semi-open space in front of the house veranda covered by the roof serves multiple functions depending upon time and season, from sun basking to taking a rest and entertaining guests, among others. The houses are constructed of locally available climate-responsive building materials such as stone in mud mortar with medium-sized openings. Although roofs in most of the vernacular houses are either made up of slate or thatch, however, the trend of Corrugated Galvanized Iron (CGI) started increasing before the earthquake.

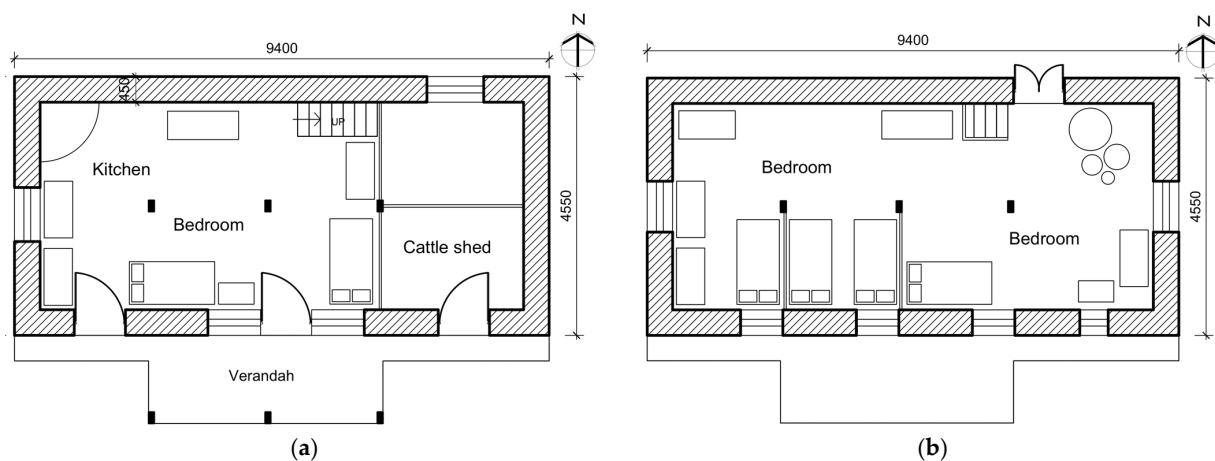


Figure 3. Floor plans of a typical vernacular house: (a) ground-floor plan; (b) first-floor plan.

3.1.2. Post-Disaster Settlement and Housing

Panipokhari Integrated Settlement was planned on 39,642 sq.m (9.8 acres) of undulating public Government land. The master plan and housing design were prepared by the National Reconstruction Authority of Nepal, while the houses were constructed by the house owners with a Government tranche of USD 2310. The overall resettlement planning was carried out respecting the natural contour with a layout of mostly two-storied row housing. The settlement is provided with different community infrastructures such as community buildings, open-air theatres, children's parks, playgrounds, schools, temples, etc. One of the striking features of the settlement is the allocation of space for future expansion and the provision of schools for children in the area. Each household received a plot area of an average of 160 sq.m.

The architect-designed prototype houses constructed for the displaced households adopted a "one size fits all" approach with similar dimensions and layouts (Figure 4). All the houses are detached, and as a part of the bylaws of the Bhimeshwor municipality, setbacks of 0.9 m and 1.5 m were left on the two sides of the house. The house form is square-shaped and two-storied, facing towards the east. The ground floor consists of one kitchen, two bedrooms with a veranda (Figure 4a), and a single-flight staircase leading to the first floor, which is used as a bedroom and store (Figure 4b). The houses are load-bearing structures constructed of bricks in cement mortar with single-glazing windows and CGI roofing. Unlike the old houses, the post-disaster permanent houses lack a space for animal sheds and kitchen gardens.

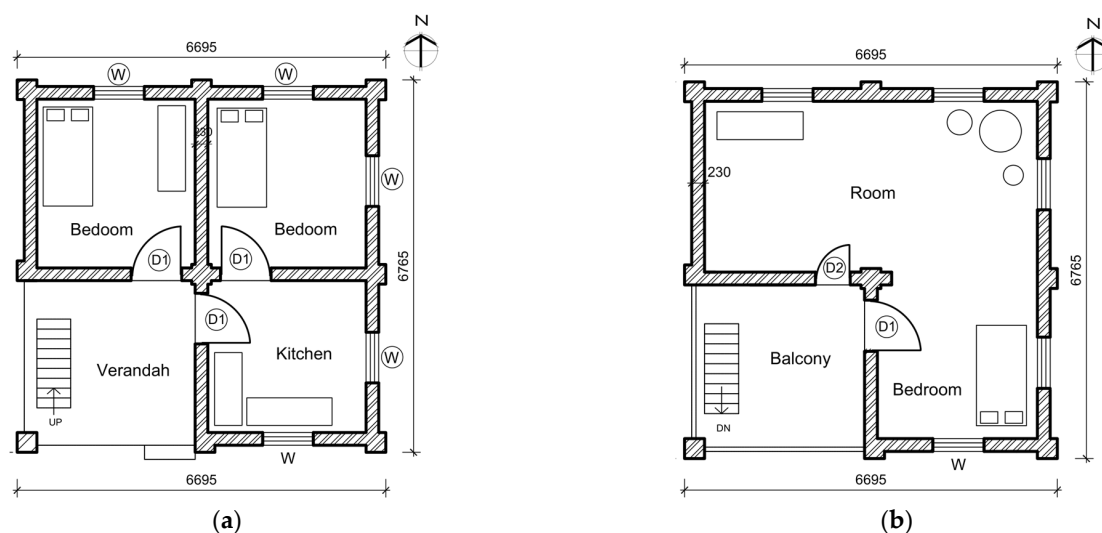


Figure 4. Floor plans of a post-disaster permanent house: (a) ground-floor plan; (b) first-floor plan.

4. Results

4.1. Respondents of the Survey

The resettlement decision is primarily influenced by socio-demographic characteristics [70]. The socio-demographic information of the respondents is presented in Table 1. Out of the total surveyed respondents, 71.7% were male, while only 28.3% were female. This was mainly due to the fact that Panipokhari predominantly had male-headed households, while females were less active compared to male members. The highest share, nearly a third (32.6%) of the households, were between the age groups of 30–44 years and above 59 years, which suggests that the settlement had older people with the migration of the younger generation to bigger cities and abroad for education and employment opportunities. The ethnic composition of the resettled household consists of about 95% poor indigenous Thami community and 5% of the people from the Dalit community, who are considered untouchable and the lowest in the stratum of the caste in Nepal. Although the average household size is four persons, about 45.6% of households had a family size of less than three members, while 15% had more than seven family members. The status of education is very poor, with 46% illiterate and another 43.4% having basic education up to only Grade 8.

Subsistence agriculture and livestock are the mainstays of the economy for more than 50% of the households, while 13% of households are also involved in labor wages. About 13% of the houses have at least one member abroad for foreign employment. This indicates that, like other rural areas, the trend of young generations going abroad for foreign employment in Gulf countries is also increasing in Panipokhari. Although households found it difficult to disclose their income and expenditure, the household average income was reported to be as low as, only USD 155, while the expenditure was reported as about USD 117 per month. Almost all families have cattle in their old village, such as goats, cows, buffalo, etc. The settlement had 4.4% of single women of old age living without any family members. About 19.6% of households have people with disabilities, mostly physical disabilities and blindness. A significant portion (95.7%) of the households has at least one school-going child. Out of the surveyed households, 65.2% were from Bosimpa village and 32.6% were from Buma village. Almost all the respondents reported having cattle in their old village. As of now, only one household has received a land ownership certificate, while the remaining households are desperately waiting for a certificate from the Government.

4.2. Satisfaction with the Housing

The residential satisfaction of the households in Panipokhari Integrated Settlement was examined based on the analysis of twenty-four factors related to housing characteristics. Table 2 presents the RII, mean satisfaction scores, and perceived importance of the factors influencing the satisfaction of the resettled households. The factor with the lowest satisfaction score was the provision of a kitchen garden, scoring only 1.46 in mean satisfaction. The size of the plot also received low satisfaction (mean = 1.76) followed by space for house modification (mean = 1.78) and provision for a traditional hearth (mean = 1.83). Residents were also dissatisfied with thermal comfort (mean = 1.87), level of completeness of the house (mean = 1.91), and cattle shed provision (mean = 1.96). Medium satisfaction was expressed for factors such as spaces for social and cultural events; religious practices and festivals; everyday activities; the number of sleeping rooms; spaces for birth and death rituals; the size of the bedrooms and kitchen; typical design as per their needs; house layout; and provision of drinking water. On the other hand, residents were most satisfied with the permanent or earthquake-resistant houses, scoring a mean satisfaction score of 4.3. Other factors with high satisfaction included the modern uniform house style; the quality of the construction material; the new construction material; provision of sanitation; the feeling of privacy; daylight inside the room; and ventilation.

Table 2. Residential satisfaction with the factors of the housing characteristics.

| Factors | Mean | N | RII | Rank |
|---|------|----|------|------|
| Provision of kitchen garden | 1.46 | 46 | 0.29 | 1 |
| Plot size | 1.76 | 46 | 0.35 | 2 |
| Space for addition/modification of house | 1.78 | 46 | 0.36 | 3 |
| Provision of a traditional hearth | 1.83 | 46 | 0.37 | 4 |
| Thermal comfort | 1.87 | 46 | 0.37 | 5 |
| Level of completeness of the house | 1.91 | 46 | 0.38 | 6 |
| Provision of cattle shed | 1.96 | 46 | 0.39 | 7 |
| Provision of drinking water | 2.00 | 46 | 0.40 | 8 |
| Layout of house | 2.09 | 46 | 0.42 | 9 |
| Need-based typical design | 2.11 | 46 | 0.42 | 10 |
| Size of bedroom and kitchen | 2.22 | 46 | 0.44 | 11 |
| Spaces for birth and death rituals | 2.24 | 46 | 0.45 | 12 |
| Number of sleeping rooms | 2.26 | 46 | 0.45 | 13 |
| Spaces for everyday activities | 2.37 | 46 | 0.47 | 14 |
| Spaces for performing religious practices and festivals | 2.52 | 46 | 0.50 | 15 |
| Spaces for social and cultural events | 2.57 | 46 | 0.51 | 16 |
| Ventilation | 3.09 | 46 | 0.62 | 17 |
| Daylight inside room | 3.20 | 46 | 0.64 | 18 |
| Feeling of privacy | 3.22 | 46 | 0.64 | 19 |
| Provision of sanitation facilities | 3.26 | 46 | 0.65 | 20 |
| New construction material | 3.37 | 46 | 0.67 | 21 |
| Quality of construction material | 3.50 | 46 | 0.70 | 22 |
| Modern house style | 3.85 | 46 | 0.77 | 23 |
| Permanent/earthquake-resistant house | 4.30 | 46 | 0.86 | 24 |

4.3. Factors of Residential Satisfaction

Table 3 presents the results of Spearman's rank correlation coefficient analysis for 24 housing satisfaction factors. While modern houses; permanent/earthquake-resistant houses; the use of new construction material; ventilation in the room; water leakage in the house; moisture; and daylight inside the room were found to be statistically insignificant ($p > 0.05$) with the overall housing satisfaction, other variables showed statistical significance ($p \leq 0.05$), indicating a statistically significant relationship with housing satisfaction. There was a strong positive correlation between the level of completeness of the house and housing satisfaction ($r = 0.803$; $p = 0.000$). Likewise, housing satisfaction showed significant positive correlations with other variables such as the provision of space in the interior of the housing for different rituals such as birth and death, which was found to be 0.775 ($p = 0.000$), need-based typical design ($r = 0.708$), the layout of the house ($r = 0.748$), space for addition/modification ($r = 0.709$), provision for a traditional hearth ($r = 0.729$), provision of kitchen garden ($r = 0.674$), provision of cattle shed ($r = 0.671$), thermal comfort (0.632), spaces for performing religious practices and festivals ($r = 0.605$), and spaces for performing social and cultural events ($r = 0.651$). The analysis revealed an intermediate, positive correlation between housing satisfaction of the resettled families and the plot size; the size of the bedrooms and kitchens; the number of sleeping rooms; spaces for everyday activities; the quality of the construction material; the feeling of privacy; and provision of drinking water.

Table 3. Factors of housing satisfaction.

| Factors | Housing Satisfaction | | |
|---|----------------------|-------------------------|-------|
| | N | Correlation Coefficient | Sig. |
| Provision of kitchen garden | 46 | 0.674 ** | 0.000 |
| Plot size | 46 | 0.538 ** | 0.000 |
| Space for addition/modification of house | 46 | 0.709 ** | 0.000 |
| Provision of a traditional hearth | 46 | 0.729 ** | 0.000 |
| Thermal comfort | 46 | 0.632 ** | 0.000 |
| Level of completeness of the house | 46 | 0.803 ** | 0.000 |
| Provision of cattle shed | 46 | 0.671 ** | 0.000 |
| Provision of drinking water | 46 | 0.434 ** | 0.003 |
| Layout of house | 46 | 0.748 ** | 0.000 |
| Need-based typical design | 46 | 0.708 ** | 0.000 |
| Size of bedroom and kitchen | 46 | 0.474 ** | 0.001 |
| Spaces for rituals and events | 46 | 0.775 ** | 0.000 |
| Number of sleeping rooms | 46 | 0.442 ** | 0.002 |
| Spaces for everyday activities | 46 | 0.594 ** | 0.000 |
| Spaces for performing religious practices and festivals | 46 | 0.605 ** | 0.000 |
| Spaces for social and cultural events | 46 | 0.651 ** | 0.000 |
| Ventilation | 46 | 0.108 | 0.474 |
| Daylight inside room | 46 | −0.228 | 0.128 |
| Feeling of privacy | 46 | 0.379 ** | 0.009 |
| Provision of sanitation facilities | 46 | 0.208 | 0.166 |
| New construction material | 46 | 0.280 | 0.060 |
| Quality of construction material | 46 | 0.323 * | 0.029 |
| Modern house style | 46 | −0.036 | 0.812 |
| Permanent/earthquake-resistant houses | 46 | −0.089 | 0.557 |

*, ** Correlation is significant at the 0.05 and 0.01 level, respectively.

During the field interview, residents expressed significant dissatisfaction with the typical designs provided by the implementing agencies. Although they appreciated the uniform appearance of the houses, they found that these standardized houses did not meet the specific needs of individual families. They lamented the lack of fuller consultation and explanation regarding the housing design and drawings, which took place during limited participatory meetings in the design phase, and expressed that they would have altered the floor plans and opted for reinforced concrete construction if they had been given the opportunity. They were dissatisfied with the limitation of the constructed houses to cater to their socio-economic, cultural, and everyday needs despite the additional loaned investment they made in the construction to compensate for inadequate Government support. The study also observed that all the monotype houses underwent modifications by the occupants, including changes in floor plans, room functions, and the addition or removal of spaces to align with their lifestyle. Kürüm Varolgüneş [23] explained that uniform permanent houses constructed without considering local conditions and occupant satisfaction give rise to various problems. Numerous studies [60,61,71] have highlighted the challenges faced by communities during relocation and their resulting discontentment with their new living environments and livelihoods.

4.3.1. Need-Based Typical Design

The analysis revealed a strong positive correlation of uniform housing design with overall housing satisfaction. In Panipokhari Integrated Settlement, the Government designed the uniform prototype permanent houses resembling the vernacular houses of the rural hilly areas in Nepal with two stories and gable roofs aiming to create an ideal model settlement. All 56 houses constructed have similar floor plans, with three rooms on the ground floor and the upper floor used as a bedroom and storage. However, the focus on aesthetics and little consideration given to spaces catering to the functional needs of the households have contributed to dissatisfaction (mean satisfaction score = 2.11). An observation made by Barenstein [56] indicated that the typical prototype housing approach is also influenced by other considerations, such as time constraints, cost-effectiveness, and safety. In the study area, the design seems to have largely overlooked the resident's lifestyle and socio-demographic characteristics. Unlike the vernacular houses before the earthquake, which were highly functional and had evolved over time, the new houses could not accommodate the households' seasonal spatial needs. For example—the houses lack spaces for storing the grains in the harvesting season and additional rooms for guests in the festive months, as pointed out by one of the respondents living in Buma village.

“During festivals, we find ourselves returning to our old house because the new house can only accommodate a limited number of rooms, which is not enough for our extended family. Moreover, the lack of storage spaces in the new house results in our food grains rotting in the attic due to the presence of a tin roof. Additionally, the generous exterior spaces that were available in the old village are no longer present in the resettlement area”.

The dissatisfaction was also related to the adequacy and appropriateness of semi-open and open exterior spaces within and around the house. As the majority of Thami households are primarily agrarian, they usually spend most of their time in outdoor spaces around their houses, in agricultural fields, or in labor markets. However, the design failed to provide such spaces that could cater to their socio-economic and everyday needs. For instance, the prototype house lacked sufficient areas for house frontage and between the houses constructed in rows (0.3 m), causing issues such as the disruption of the everyday rhythm of life and the hindrance of household privacy, especially for those who otherwise lived relatively scattered in sparsely dispersed settlements. These limitations, among others, have resulted in the modifications to adapt or the abandonment of housing. Such dissatisfaction is found in the context of agency-driven typical/prototype designs, and the causes are consistent with the findings of Dikmen and Elias-Ozkan [25].

4.3.2. Layout of Housing

The correlation analysis revealed a strong and positive relationship between the layout and housing satisfaction ($r = 0.748$), indicating its significance as a factor for housing satisfaction. However, despite the initial positive impressions, resettled households later expressed a high level of dissatisfaction (2.09) with the layout of their new houses. Over time, they identified several faults in the functionality of the layout, which led to their discontentment. One of the households opined:

“To improve the layout of the house, we could have included a separate passage. Unfortunately, the absence of such a passage forces us to pass through one room to access the inner room, creating difficulties in using the rooms separately as needed for our daily activities and socio-cultural practices”.

The architects and expert team from the implementing agency initially presented different ideas and designs to the community. However, the majority of respondents reported that they were not involved in the planning and design of the house. Instead, the decision-making process was limited to the user committee's decision, which was responsible for selecting the prototype houses' design. While some respondents had the opportunity to view the design drawings, it was challenging for the poor and illiterate

Thami households to fully understand the two-dimensional representations. A male respondent from Bosimpa complained:

“If I had the opportunity to visualize the drawing, I would have made several corrections to the existing layout. One significant change would have been swapping the positions of the kitchen and room. The new house is different from our old house in Bosim-pa, and we were more accustomed to the layout of the previous houses”.

The spatial planning of the prototype house differed significantly from the vernacular houses, which had evolved and been modified over time to meet the specific needs of the community.

4.3.3. Space for Addition/Modification

The study found a positive correlation ($r = 0.709$) between the availability of space for addition or modification and housing satisfaction. However, the respondents expressed lower satisfaction with the space for addition and modification in their houses, as indicated by the mean satisfaction score of only 1.78. This dissatisfaction in general was primarily due to the small plot sizes that could not accommodate their rural livelihood needs. For instance, many respondents were dissatisfied with the lack of space to add an external kitchen or extend the attic floor, among others. Only a few households with larger plots managed to add an external kitchen for cooking using firewood. Initially, the implementing agency designed single-storied prototype houses and restricted the construction of walls for the attic floor to only 0.3 m in height. In response to their extended family's needs and the rural lifestyle, some households increased the wall height to use the attic floor as bedrooms. However, those who constructed their houses earlier found themselves unable to make their houses two-storied unlike their neighbors due to these strict restrictions. The empirical study showed that the households were dissatisfied with their inability to make changes to their houses despite their desire to extend them, which resulted from the strict restrictions by the implementing agencies.

4.3.4. Provision of a Kitchen Garden

The households that are reliant on place-based agropastoralism become severely affected after the displacement from their indigenous homeland [63]. Farming served as the primary livelihood for the poor Thami community, but the resettlement site lacked the provision of a kitchen garden and immediate access to farmland. The analysis found a positive correlation ($r = 0.674$) between housing satisfaction and the availability of kitchen gardens, indicating its significant influence. However, in the case study area, the households were allocated a small plot size of about 160 sq.m, which is inadequate for a rural family dependent on agriculture. The planning process largely overlooked the need for an adequate plot size for rural households as expressed by one of the respondents:

“Without a kitchen garden, it becomes challenging for us to access fresh vegetables. Since there is no nearby market, we have to go to Bosimpa daily just to get vegetables, even for small items like chilies. The absence of a kitchen garden adds inconvenience and extra effort to our daily lives”.

4.3.5. Provision of Cattle Shed

A traditional hilly Thami house typically comprised a dwelling along with other structures in the residential complex, including animal sheds. However, in the pursuit of creating a model settlement, the resettlement site lacked spaces for cattle sheds. The design oversight disregarded the previous lifestyle and livelihood of the Thami communities, who were primarily engaged in animal husbandry after agriculture. Without cattle sheds, the households were compelled to leave their cattle in their old village and now have to travel there daily. Consequently, some respondents even mentioned that they predominantly stayed in their old village and only used the new houses in the rainy seasons in July and August. As a result, the overall satisfaction with the new housing was quite low with a

mean satisfaction score of only 1.96. The correlation between the provision of cattle sheds and housing satisfaction was notably strong, with a value of 0.671.

4.3.6. Thermal Comfort

The analysis disclosed a correlation of 0.632 between thermal comfort and housing satisfaction, suggesting the significance of thermal comfort as an important factor influencing housing satisfaction. One of the major problems faced by the households is the poor thermal performance of the houses, evident from the mean satisfaction score of only 1.87. Upon investigating the indoor thermal environment, it was found that vernacular houses experienced less fluctuation in indoor air temperature compared to the post-disaster prototype houses in both the morning and at nighttime (Figure 5). Specifically, the prototype houses had an air temperature of 2.1 °C lower than the vernacular house at night, leading to thermal discomfort for the occupants. This points to a lack of consideration for local climatic conditions during the house design process.

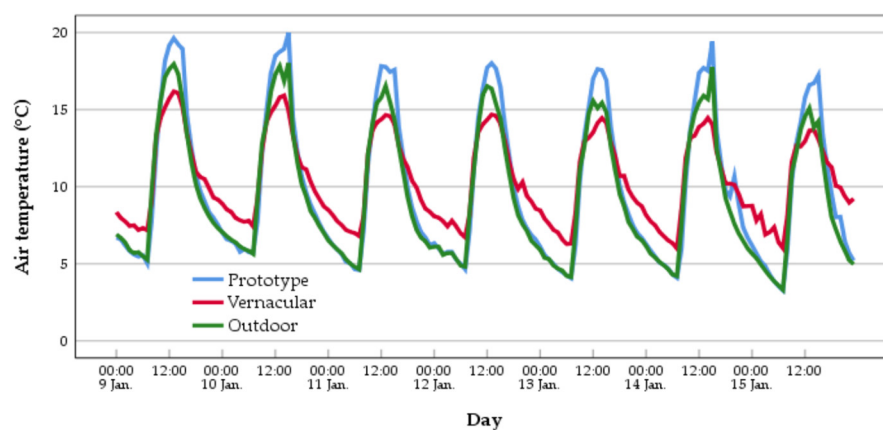


Figure 5. Variation of indoor and outdoor air temperature in the prototype and vernacular houses.

Furthermore, a common issue observed was the location of bedrooms in most houses towards the north and west side, which negatively affected the thermal conditions. Additionally, the construction of the new prototype houses did not utilize local materials and traditional techniques, unlike vernacular houses, which traditionally used locally available stones. Instead, the prototype houses were constructed using bricks procured from other regions of the country. In a typical house of the Thami community in a temperate climate, heating was carried out by the centrally located hearth on the ground floor. However, in the new prototype houses, the implementing agencies prohibited heating the rooms with firewood, citing concerns that the smoke might damage the paint. Such a decision created a challenge for households with poor economic conditions, as they could not afford active heating systems, leading to further discomfort during colder months.

4.3.7. Level of Completeness of the House

The result showed a strong positive correlation ($r = 0.803$) between the level of completeness of the house and housing satisfaction, underscoring its significance in post-disaster resettlement. Even eight years after the Gorkha earthquake, the house construction remained incomplete due to factors such as low economic status, high construction costs, and loans taken by households at high-interest rates from informal sources. The majority of the respondents reported that they had taken a loan to construct the house of USD 6815, which was double the Government tranche of USD 2310. Kumar Thami, the president of the Panipokhari Users Committee, commented:

“The government tranche of 2310 USD provided for housing construction proved to be insufficient, leading us to take loans from informal sources at exorbitant interest rates. Due to financial constraints and the lack of collateral required by formal bank-

ing systems, many households were unable to complete the construction in a timely manner. The inadequate funding created challenges for the successful completion of our housing projects”.

To mitigate labor costs and also assist vulnerable households, individuals contributed labor using the “Parma system”, a prevalent form of labor exchange in hilly regions [72]. However, despite their efforts, many houses remained unfinished as residents faced challenges with unfamiliar materials and construction techniques involving brick masonry, leading them to hire contractors for the construction. Respondents expressed that, with the additional investment made, they could have built faster and less expensively using Reinforced Cement Concrete (RCC) construction, as suggested by technical persons from implementing agencies supervising the construction. Misinformation from technical personnel about avoiding questions on timely completion added to their confusion. The extra investment took a toll on their already weak financial status, leading many to seek employment in Gulf Countries or the capital city of Kathmandu to repay loans, further exacerbating their dissatisfaction. These factors collectively contributed to the discontent of residents, whether they were willing to shift or those who have already moved to the resettlement site.

4.3.8. Provision of a Traditional Hearth

The analysis demonstrated a strong positive correlation ($r = 0.729$) with housing satisfaction. Historically, the hearth and “bampa” (Figure 6) were the central and essential parts of a Thami home located in a colder climate, as it served as the primary source of heat energy. It provided warmth, cooking, heating, and other domestic activities as the households primarily relied on firewood readily available from their farmlands and forests. However, the house designs lacked space for a hearth, instead resembling urban layouts with kitchen counters designed for the use of Liquefied Petroleum Gas (LPG). LPG is neither easily available nor affordable to households, leaving them unsure of how to use their new kitchen effectively. Moreover, the implementing agency strictly prohibited the use of firewood in the new kitchen to prevent respiratory diseases and also to maintain the aesthetics of the house. As a result, many households resorted to building separate outdoor kitchens, but the limited plot sizes often posed challenges. This significant mismatch between the housing design and the actual needs and lifestyle of the rural Thami community is evident.

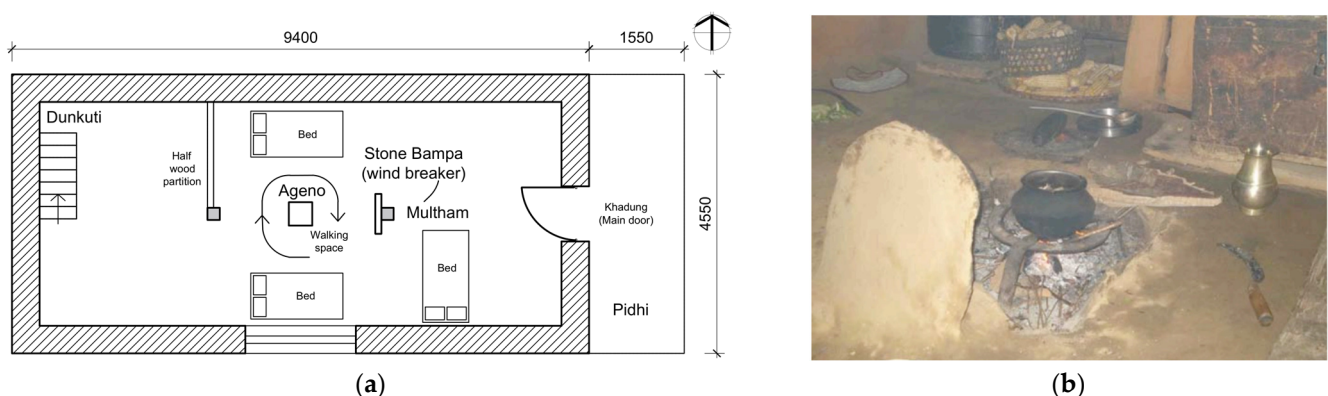


Figure 6. Traditional hearth with bampa: (a) ground-floor plan in the old vernacular house; (b) bampa in a vernacular Thami house (Source: Tek Bahadur Thami, as cited in [69]).

4.3.9. Ritual Spaces

In Thami people’s lifeworld, a house holds a profound socio-cultural significance beyond being just a dwelling. Shneiderman and Turin [73] reported that the central hearth marked by “bampa” is a distinctive and characteristic feature of a typical Thami house, carrying both socio-cultural and religious value. Notably, the hearth, king post, and “bampa”

hold symbolic meanings and are involved in cultural practices related to life cycle rituals and shamanism. The absence of this cultural element and the households' efforts to adapt were evident during field observations. For instance, to perform marriage rituals, makeshift fires were set up using a tin pot inside the middle of the house. Kumar Thami emotionally expressed his sentiments on the loss of this important cultural element in the new design of the houses:

"The hearth is of great importance for conducting our birth and death rituals, as well as social events like crucial aspects of the wedding ceremony. It holds immense significance for the shamanistic practices we perform. However, we don't have it in our house. In its absence, we have to adapt and perform our rituals differently, but I am concerned that this may lead to a loss of our culture, which is crucial for future generations to connect with and preserve their cultural identity".

The absence of these important elements in housing left affected households dissatisfied, as indicated by the low mean satisfaction score of 2.24. The correlation coefficient of 0.775 showed a strong positive relationship between the availability of ritual spaces and residential satisfaction. One of the respondents even expressed:

"In the future, I might consider using the central column for performing the rituals that we used to conduct around our king post and 'bampa', which held cultural and religious significance in our lives. To do so, I will have to remove some parts of the walls to create space for circumambulation around the central column".

4.3.10. Spaces for Social and Cultural Events

The analysis showed a strong positive correlation ($r = 0.651$) between the availability of spaces for collective social and cultural events and housing satisfaction. The survey results indicated that households were satisfied with the spaces for such events, as evidenced by the mean satisfaction score of 2.57. Residents expressed high satisfaction with these areas, particularly due to the community center constructed by the implementing agencies as a part of the reconstruction. The center served as a venue for organizing social and cultural gatherings, with several wedding events already hosted there. A woman happily shared her experience, stating:

"We are happy with the community center. . . I hosted my son's wedding in the hall inviting relatives from our village and neighboring areas. . . . It kept our home clean and tidy as guests didn't need to be accommodated within our rooms".

5. Discussion

Disaster management and resettlement studies have shown that the success of resettlement projects is contingent upon the satisfaction and well-being of displaced households. When implementing post-disaster resettlement, it is common for implementing agencies to prioritize speed, cost-effectiveness, and limited time [56,74]. However, this focus on technical and physical aspects can inadvertently disregard the diverse needs and preferences of the affected communities, potentially leading to dissatisfaction with the new housing and built environment. The choices of where people reside are influenced by their livelihoods, social networks, and deep cultural and historical ties [75]. Drawing from the literature review and pilot study, the empirical investigation conducted nearly eight years after the 2015 Gorkha earthquake at the Panipokhari resettlement site revealed that the resettled community expressed the least satisfaction with provisions such as kitchen gardens, space for the adding to or modifying the houses, traditional hearths, thermal comfort, house completeness, cattle sheds, and the layout of the houses, among other factors. However, the perceived importance was higher for permanent or earthquake-resistant and modern houses, the quality of the construction materials, daylight, natural ventilation, privacy in the new houses, and space for social and cultural events.

The study showed a significant influence of the typical uniform design of houses on residential satisfaction. Similar to previous studies conducted by Barenstein [56] in India and

Baniya [26] in Nepal, the settlement layout and house designs deviated significantly from traditional villages. These houses were designed in a modern urban style with a flat system, overlooking the unique needs and lifestyles of the households. Consequently, despite the perceived importance given to modern house designs, dissatisfaction arose due to the standardized monotype housing, which failed to cater to the specific requirements of the resettled households, as highlighted in various scholarly works [11–13,23,26,31,44,49,59,76–78].

The National Reconstruction Authority [79] also emphasized that, despite the positive aspects of integrated settlements, many such settlements feature houses that are too small to meet the needs of local communities. In certain instances, families are compelled to accommodate 10–12 people within a two-roomed house. Furthermore, the storage of agricultural products becomes a challenge, as the majority of these households rely on agriculture. The inherent notion of building a compact or integrated settlement with aesthetically pleasing uniform houses has limited the potential of resettlement to “build back better”. This finding challenges the prevalent perception of resettlement sites among institutional stakeholders, which often emphasizes what Alvarez and Cardenas [80] refer to as “aesthetic governmentality”. This situation underscores the paramount importance of factoring in local needs and lifestyle preferences while designing post-disaster housing, particularly in the context of rural communities with strong ties to agriculture. The study’s findings underscore the critical significance of housing design tailored to the specific requirements of the resettled households. This ensures that the houses are not merely visually pleasing, but also functionally suitable to increase residential satisfaction and overall well-being.

Furthermore, in line with multiple studies [11,14,22,26,31,38,59,81,82], the study identified dissatisfaction among resettled households regarding the layout of permanent houses in resettlement. The findings of this study are consistent with previous research conducted by several researchers [23,26,32,59], highlighting that the houses in Panipokhari also overlooked the need for space for addition and modification, a crucial factor for housing satisfaction. The provision of sufficient space for future modifications is particularly crucial in communities where households often experience changes in lifestyle, family size, or economic circumstances. Allowing households to adapt their homes to meet their evolving needs fosters a sense of control and satisfaction with their living environment. This aspect is often neglected during the design stage, as decisions were based on a top-down approach, as seen in this case. Therefore, it is imperative for implementing agencies, policy-makers, and other stakeholders to incorporate a participatory process during the planning and design stages of post-disaster housing projects [26]. By doing so, the specific needs and preferences of the affected communities can be taken into account, ensuring flexibility in housing layout. Prioritizing a participatory approach and providing room for future modifications can significantly enhance residential satisfaction and contribute to the long-term sustainability of resettlement initiatives [23,44]. This approach aligns with the principles of inclusive and community-centric development, fostering a more successful and satisfactory resettlement experience for the affected households.

Despite being designed by trained experts with academic knowledge and experience, the houses in the Panipokhari resettlement site neglected not only the lifestyle and needs of the rural Thami households, but also their livelihood, socio-cultural aspects, as well as the local climate. The absence of animal sheds and kitchen gardens in the housing design, which are integral to rural livelihoods, was evident. According to an article in a national newspaper by Shiwakoti [19], the majority of beneficiaries decided to stay back in their old village because they did not want to leave behind their farmland and cattle. This study aligns with previous research findings [38,56,60,83,84] that emphasize the importance of the presence of a kitchen garden as a significant factor influencing residential satisfaction. Similarly, as observed in numerous studies [23,25,56,83,85], the affected households in Panipokhari expressed dissatisfaction with the lack of space for an animal shed. This dissatisfaction with the absence of animal sheds has been so profound that households in Bosimpa village chose to return to their original settlements, as explained

by Shiwakoti [19]. These findings draw attention to the critical importance of integrating socio-cultural and livelihood aspects in shaping residential satisfaction and the success of resettlement projects. For this, the technical experts must be knowledgeable about the local context, including the livelihood patterns and cultural practices of the affected communities. For instance, the absence of animal sheds and kitchen gardens in the housing design indicates a lack of consideration for the rural way of life, where agricultural activities and animal husbandry are central to the livelihoods of the residents and may contribute to the economic sustainability of the resettled communities. This also necessitates realizing the need for a participatory approach involving real participation while designing homes, and a context-specific approach that accounts for the unique needs and characteristics of the resettled communities can lead to more-inclusive and -successful housing solutions that foster greater satisfaction and long-term well-being.

Similarly, consistent with the findings observed by several researchers [11,13,23,25,51,83,86], thermal comfort emerged as a major factor influencing housing satisfaction. The houses were reported to be very cold due to the selection of materials that were not responsive to the local climate. Moreover, the absence of a fireplace in houses equipped with a kitchen counter for Liquefied Petroleum Gas (LPG) further contributed to the dissatisfaction. The study thus highlights the importance of providing a traditional hearth for housing satisfaction, as also identified by Dikmen and Elias-Ozkan [25] in Turkey and Snarr and Brown [85] in Honduras. The lack of provisions for firewood usage also imposed an economic burden on poor households with limited resources.

Furthermore, incomplete houses, resulting from the households' inability to complete construction due to financial constraints, further exacerbated dissatisfaction among resettled households, aligning with the findings of other studies [3,6,62,83,85]. As a consequence, many of these houses remain unoccupied and empty, as they were not completed on time, as also pointed out by Sey and Tapan [8]. The dissatisfaction with incomplete houses and the delay in the completion of the integrated settlement in Panipokhari have had significant implications for the resettled households. As reported by Shiwakoti [19], some quake victims had already constructed houses in Bosimpa itself due to the prolonged completion period of the integrated settlement in Panipokhari. This highlights the urgency of timely and efficient execution of resettlement projects to avoid prolonged periods of housing uncertainty and dissatisfaction among the affected communities. The critical importance of the link between the local context of building and satisfaction is seen here, whether it is related to the selection of materials, construction techniques, consideration of the local climate, or cultural practices. Incorporating local building culture can include the local skills and practices inherent in the culture, such as the traditional hearth used as a cultural element, as well as an active heating system and energy-saving techniques, which are even more important when resettlement sites are subjected to topographical variations, especially in hilly areas. Making use of local building culture would also enhance the speed of construction, save energy costs, and contribute to income, which significantly influences housing satisfaction among resettled households. However, many times, this is not done despite the policy provisions made for it, as in this case. Additionally, it provides an opportunity to promote new construction technology and enhance the development of the construction industry, as suggested by Tong et al. [87]. This approach could potentially make post-disaster resettlement housing more economical by reducing construction costs and ensuring timely completion. Introducing such technology at the local level, tailored to the local context, could lead to improved post-disaster resettlement outcomes.

The implementing agencies' focus on technical standards often overshadows the critical social and cultural needs [86]. In some cases, historical and cultural attachments to specific places made affected households reluctant to relocate. These locales, occupied by networks, possess cultural, symbolic, and emotional significance for residents, shaping their relationship with their surroundings [75]. For instance, houses bear significant cultural and symbolic value for Thami clan lineages and their relationship with divine entities and territorial deities [69]. However, the introduction of uniform and standardized

dwelling units, as underscored by Pasupuleti [88], has brought about shifts in the meanings and practices associated with these cultural beliefs. This study reinforces the findings of several studies [22,24,31,44,58,61,89] by highlighting cultural appropriateness as a critical factor influencing housing satisfaction. Concerns about culture loss echoed the sentiments observed by Spoon et al. [29]. Despite the emphasis on cultural adequacy in the Sustainable Development Goals [40] and Sphere Standard [43], the new prototype houses inadequately cater to spaces for social and cultural rituals. The limited community involvement in decision-making, as discussed by Baniya [26] and Barenstein [56], resulted in disregarding the socio-economic and cultural dimensions. In a comprehensive approach to resettlement involving multiple stakeholders, prioritizing the resettled households' satisfaction and voices is critical. By integrating their socio-cultural needs and aspirations into the housing design and planning process, solutions can be culturally appropriate and satisfying for the affected communities. Such a participatory approach ensures that houses fulfill not only technical criteria, but also respect and preserve the residents' cultural heritage and practices [26]. In nations where family and communal ties hold significant sway, adopting a bottom-up approach to preparedness and recovery can harness and nurture these bonds for fostering resilience and shaping society for future events [90]. The findings further emphasize the importance of cultural appropriateness in housing design, going beyond mere aesthetics. This concept is intrinsically linked to well-being, identity, and social cohesion. Establishing a sense of belonging and cultural continuity is essential for the resettled households to effectively adapt and flourish in their new homes as supported by various studies [24,56,58]. Integrating cultural elements into housing design can cultivate a sense of pride and emotional connection to the houses, resulting in increased satisfaction and long-term sustainability of resettlement projects. Engaging affected households in the design decision-making process [26] and honoring their cultural heritage enable policy-makers and implementing agencies to forge more-comprehensive and -effective housing solutions that enhance cultural continuity and overall satisfaction among affected communities. This approach aligns with the principles of sustainable development [41,43], ensuring that resettlement initiatives are not only technically sound, but also culturally attuned and considerate of the local context.

Instead of exclusively focusing on technical and physical standards, post-disaster resettlement should encompass social, economic, and cultural considerations. The newly designed model-integrated settlements have overlooked essential utility structures such as animal sheds, kitchen gardens, and traditional hearths, which hold integral significance in rural daily life. As highlighted by Baniya [26], the standardized prototype houses have fallen short of meeting the socio-cultural and economic needs of the impoverished rural Thami community. For instance, the use of traditional firewood for cooking, the restriction of firewood use in the kitchen, and the limited space for separate outdoor kitchens were clear mismatches between the housing design and the actual needs of the community. As highlighted by studies [22,25], the incongruity between the residents' needs and their housing's design and lifestyle has emerged as a major cause of dissatisfaction, prompting households to either adapt through modification of their houses to suit their needs (Figure 2a) or abandon them and return to their former village to continue their rural livelihood (Figure 2b). A similar response to dissatisfaction was reported by Carrasco et al. [86] in the Philippines and Pasupuleti [91] in India, where resettled households either modified or returned to the original settlement or began living in both the new and old houses simultaneously to sustain their livelihoods. The dissatisfaction among households has prompted several families to return to the old village, potentially impacting the success and overall sustainability of the resettlement project [22,25]. Given the substantial investment and resources involved in post-disaster resettlement, the project's sustainability relies not only on the successful reconstruction of damaged houses [34], but also on the occupancy of households in the resettlement project.

The concept of post-disaster resettlement in Nepal initially held promise as a means to rebuild more effectively and enhance the socio-economic well-being of over 5000 vulner-

able households. However, the momentum towards resettlement diminished gradually, overshadowed by a preference for in situ housing and heritage reconstruction. This shift in focus can be attributed to political motives, a trend commonly observed after disasters with concentrated temporal and spatial impacts, carrying significant political salience and electoral relevance, as noted by Staupe-Delgado and Rubin [92].

The redirection of attention had tangible ramifications for Panipokhari Integrated Settlement. It led to the absence of context-specific resettlement approaches and housing design policies, resulting in resettlement initiatives becoming voluntary in nature. This pattern extended Government-led initiatives, including efforts led by development partners or communities. Consequently, this situation led to a greater emphasis on well-coordinated in situ housing reconstruction and heritage restoration initiatives, while the resettlement efforts remained largely neglected. As a result, many resettlement sites developed met limited success in terms of providing housing satisfaction, as the factors discussed in this study did not make it into the resettlement planning process. In the realm of government actions, agencies often adopted a top-down approach that overlooked socio-cultural aspects, while development partners engaged in resettlement programs fell short of fully considering the factors that influence housing satisfaction within their limited projects. Correspondingly, community-led initiatives of resettlement projects encountered delays and limited success due to challenges related to land ownership and transfer, financial and technical resource constraints, as well as the complex decision-making process involving local, provincial, and federal government entities. Another reason that could be cited was the lack of locally elected representatives in local government until 2017 [93], resulting in ineffective coordination for resettlement due to the absence of representation at the local level for three years after the earthquake. These challenges and gaps in stakeholder dynamics collectively contributed to the oversight of essential factors in the housing design, impacting the overall satisfaction of resettled households. The findings underscore the significance of coordination at various levels of government in effectively reducing regional disparities, an insight not previously documented in research [87].

The findings discussed here, thus, emphasize the importance of considering factors influencing housing satisfaction during the planning and design of post-disaster resettlement. Often, the focus is primarily centered on physical aspects, neglecting social, economic, and environmental sustainability, along with key indicators of satisfactory housing such as security of tenure, affordability, cultural appropriateness, and thermal comfort, which are largely ignored. These aspects are notably recognized by initiatives such as the Sustainable Development Goals [40] and the Sphere Standard [43]. Furthermore, active community engagement during the planning and design stages emerges as critical. It helps identify specific socio-cultural needs, foster ownership, and cultivate positive perceptions of the new homes and settlements [26,44]. This emphasizes the need for community members to actively participate as partners in all relocation decisions throughout the entire relocation process [75].

6. Conclusions

In conclusion, this study aimed to assess factors influencing housing satisfaction in post-disaster resettlement. Utilizing a mixed-method approach, it examined the perceived significance of housing satisfaction factors within the context of the Panipokhari Integrated Site—a post-Gorkha Earthquake housing program initiated by the Nepalese Government. Among the 24 factors examined, eight were found to have significance: need-based housing design ($r = 0.70$), layout ($r = 0.74$), modification/flexibility ($r = 0.70$), kitchen garden ($r = 0.67$), house completeness ($r = 0.80$), thermal comfort ($r = 0.63$), and social and cultural aspects (traditional hearths $r = 0.72$, spaces for rituals $r = 0.77$). The empirical investigation revealed that thermal comfort and social-cultural factors played crucial roles in overall housing satisfaction, influencing outcomes such as partial occupation or resettlement housing abandonment. These aspects, often overlooked in post-disaster resettlement research, have significant implications for community integration, cohesion, well-being,

and sustainability when integrated into policies. This research significantly contributes new insights into the critical determinants of post-disaster housing satisfaction, bridging gaps in existing knowledge and offering essential considerations for formulating effective resettlement strategies. While the findings are grounded in the specific case study, their implications reverberate beyond these boundaries, resonating with regions marked by analogous socio-cultural and economic contexts. This broader applicability underscores the study's relevance and wider significance. The research is crucial for international and local stakeholders, including policy-makers, implementers, and researchers, struggling to achieve successful resettlement out-comes, thus contributing to the sustainability of post-disaster resettlement projects.

Acknowledging the temporal limitations inherent to its scope, the study proposes avenues for future research, particularly longitudinal studies to unravel the long-term impacts and intricate relationships among various satisfaction factors. Future research could delve into exploring the intricate interplay between satisfaction factors, socio-cultural dynamics, thermal comfort, social interactions, cultural identities, and energy costs, resulting in a more-comprehensive understanding. The study's insights offer valuable guidance for post-disaster resettlement policies, emphasizing the key roles of socio-cultural considerations and thermal comfort in enhancing living conditions, nurturing community cohesion, and improving overall well-being. These insights could inform the design and execution of more-effective resettlement initiatives. This research's broader practical implications encompass disaster management, sustainable development, and urban planning. Through advocating socio-cultural and thermal comfort integration, it lays the groundwork for resilient communities and transformative policy reforms. The study reveals factors shaping post-disaster housing satisfaction, advocating cultural values and well-being to foster inclusive, resilient communities and drive impactful policy changes. Its findings guide effective resettlement strategies and hold far-reaching potential to nurture compassionate, stronger societies.

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