

Residents' Usage of, Adjustment to, and Evaluation of Donated Post-Disaster Housing

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Abstract

Natural disasters have physical, psychological, economic, and social impacts on survivors, especially if they are forced to relocate. Such drastic environmental transitions require adaptation and adjustment. To understand their influence on residents' lifestyle, as well as how residents use and evaluate donated post-disaster housing, a new post-disaster settlement was investigated by a comprehensive survey, using questionnaires, in-depth interviews, and observations. Items related to house conditions and usage, residents' evaluation, and participation in community activities were analyzed. The results suggest a discrepancy between design and actual usage. Moreover, evaluations indicate dissatisfaction with fixed aspects of the house design and outdoor spaces. Although certain behaviors are impeded, residents have adapted and adjusted, to retain their prior lifestyles. This study shows that facilitating social interactions and flexible, open-ended design are vital for allowing survivors to make the transition to a new environment.

Key words: adjustment, community participation, evaluation, post-disaster housing, usage

Introduction

Earthquakes often cause catastrophic damage, which requires immediate attention. To accelerate reconstruction and to improve disaster prevention performance, prefabricated materials and modern construction methods are sometimes necessary. However, donated post-disaster housing often originates from other countries, and it often differs culturally from the local dwellings. In such cases, the survivors' only choice is to accept donated housing, especially when they must relocate. Tercan (2001) has demonstrated that any

attempt to remove people from their existing physical, social, and economic environments significantly impacts their lives. This is also true for the post-disaster housing settlement in New Ngelepen, Yogyakarta, and Indonesia. After the Java earthquake on May 27, 2006, original Ngelepen village was considered geographically unbuildable land, thus the residents were relocated to a new type of settlement and given dome post-disaster housing at New Ngelepen, which differed drastically from their Javanese vernacular dwellings.

Altman and Chemers (1980) have specifically addressed the interaction between behavior, environment, and culture that shapes a social system in an integrated manner. The physical environment influences people and their cultures and vice versa. Thus, it is necessary to consider both why environments should be culturally responsive and to whom they should be culturally responsive and, consequently, how (Rapoport, 1987). Ikaputra and Titisari's 2005 study found that imported culture inevitably influences the local identity (Ikaputra, 2008). Monolithic dome houses have been built because they are secure, low cost, disaster-resistant, low-maintenance, and durable, as Rick Crandall¹ has argued (Parker, 2008), but the construction of dome house settlements in New Ngelepen has raised many controversies about how it will influence the residents.

Several studies have investigated the impact of social behavior on Javanese dwellings. Some have focused on the influence of social interactions and their meaning for the morphology of traditional Javanese dwellings (Revianto, 1997), while others have examined the impact of social interactions on the presence of non-traditional dwellings, such as public housing (Subroto, 1995). Although cultural changes in a society are accompanied by changes in housing, social behavior apparently still influences Javanese dwellings. Consequently, the first hypothesis of this study assumed that social behavior is an important cultural factor in Javanese society that is reflected in the usage of dwellings and needs to be facilitated, even in post-disaster housing.

A built environment acts as a setting for human activities. It can facilitate or inhibit certain behaviors, cognitive processes, etc. Because inhibiting environments reduce competence, they have a greater effect than facilitating ones (Rapoport, 1969); therefore, flexibility is important. Environments that allow responses to cultural specifics (and their manifestations: Lifestyle, activity systems, social networks, etc.) are more satisfying and avoid obsolescence longer because they remain more congruent (Rapoport, 1990). Consequently, such settings are more supportive and become an active component of the culture (Rapoport, 1987). The second hypothesis of this study presumed that the limited condition of the donated dome houses is an inhibitive environment for some aspects of the residents' previous lifestyle. In order to fulfill their needs, adaptations and adjustments are necessary; thus, flexibility becomes essential.

Several studies have been conducted at New Ngelepen, including studies on the response to dome house (Ikaputra, 2008), as well as residents' perceptions about their new environment (Saraswati, 2007). However, studies about residents' dwelling conditions and usage before and after the earthquake, evaluation of their current dwelling

¹ Rick Crandall is an architect from Crandall Design Group. He was invited to join the Monolithic Dome Institute as the principal consulting architect.

conditions, and participation in community activities have received considerably less attention. Through questionnaires, in-depth interviews, and observations of residents' activities, this study strives to understand how residents use and evaluate their post-disaster housing, as well as to elucidate the influence of culturally different post-disaster housing on their lifestyles.

Overview of Survey Study

The case study area for this research is located at New Ngelepen, Sleman Regency, Yogyakarta special province, Indonesia. It is a new post-disaster settlement relocation area situated approximately one kilometer from the original village.

New Ngelepen introduced a house cluster site plan design, where 11 or 12 houses form a block with shared electricity, public toilet/washing areas, and approach pathways to the houses (Figure 1). Monolithic domes with a hemispherical roof and a circular floor plan were introduced, using a concrete cast as a single integral structure. The diameter of the

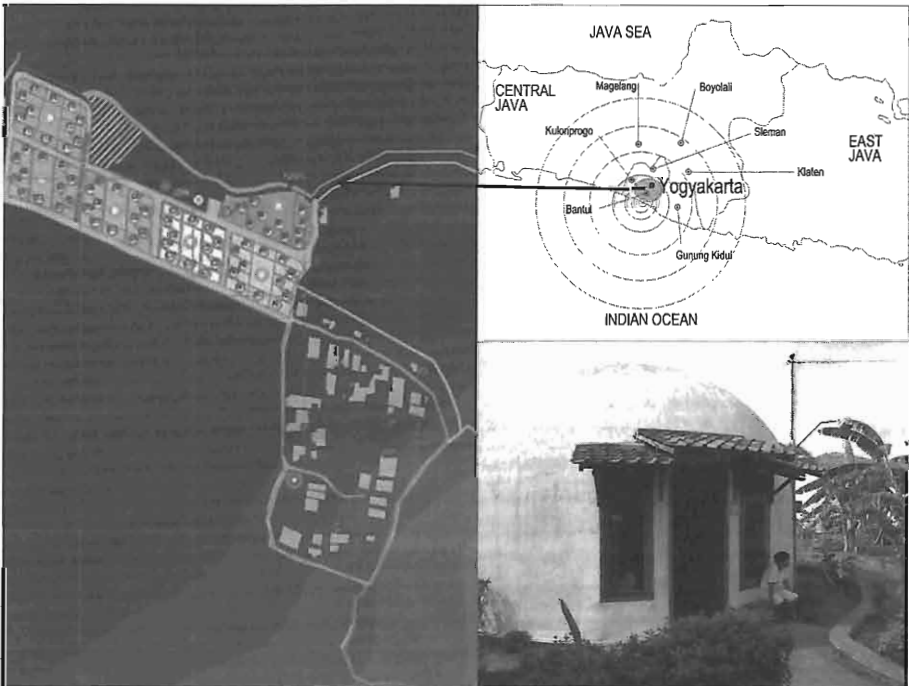


Figure 1. Site plan, cluster typology, and dome house. (Source: the authors)

two-story house is seven meters with a total area of about 38 m². Each house consists of a guest room, two bedrooms, and a kitchen on the first floor, and a family room on the second floor. The houses were built by the World Association of Non-Governmental Organizations and the Domes for the World Foundation. Construction began on October 10, 2006, and occupation began in late April 2007. The houses were built on land owned by the local government, Sleman's Regency, but they were donated free of charge. Survivors were allowed to live rent free for three years, and the donated dome houses were distributed via a lottery. Based on observations and confirmation from the village official in August 2009, 50 of the 71 dome houses built for and distributed to survivors were occupied.

Research Methods

A comprehensive fieldwork survey was conducted, using questionnaires, in-depth interviews, and observations of residents' activities. Additionally, the physical changes made to the original donated houses and site plan were documented for approximately one month (August 2009) with the assistance of volunteer architecture students from Gadjah Mada University, Indonesia. Thirty-four households (68%) from 50 occupied dome houses participated both in the questionnaire survey and in the in-depth interviews. The sample had follows:

- Age: < 30 years (40%), 30–60 years (60%);
- Education: College (6.5%), senior high school (25.8%), junior high school (32.3%), elementary school (12.9%), not educated (12.9%), unknown (9.7%);
- Income: No income (9%), < Rp. 500.000 (\$US50) 39.4%, Rp. 500.000 – Rp. 1.000.000 (\$US50-100) 45.5%, Rp. 1.000.000 – Rp. 2.000.000 (\$US100-200) 6.1%.

Questionnaires and in-depth interviews contained the following items:

- *Dwelling conditions and usage*: Previous and current house conditions, living situation, etc., residents' recognition of room/space availability, future preferences to add to or alter the condition of the dome house, and changes residents have made to the original donated house, were assessed.
- *Residents' evaluation of house design and outdoor spaces*: Residents were asked about their capability to control their house design, including flexibility, personalization, and maintenance, their acceptance of situations related to the outdoor space of the house, neighborhood streets, and cluster facilities. For the evaluation questions, the items were derived from intensive field observations.
- *Participation in community activities*: Participation in community activities by heads of households and their spouses was assessed.

Additionally, place-centered behavior mapping, similar to Whyte (1980), was conducted by observations on random days (weekdays and holidays) between 8 am and 8 pm. Volunteers observed the residents' activities by walking a specific route at 15 minutes intervals and documenting the types of behaviors, age and sex, location, estimated duration, and number of people, on diagrams and maps.

The data in this paper was mainly derived from the questionnaire and in-depth interview data related to residents' background, prior and post disaster house condition and usage as well as residents' evaluation and participation in community activities. The behavior mapping and physical documentation were used as supporting data.

Results and Discussion

Dwelling Conditions and Usage

Most of the New Ngelepen residents are from the same destroyed original Ngelepen village (almost 50%), and the remainder are from neighboring villages. Based on the data achieved on residents' prior house condition, in previous Ngelepen village, residents lived in one-floor single detached houses with a non-circular floor plan and a gable or hip roof. There was a private washing, bathing, and toilet area, a stock house and a crop yard, as well as a private approach pathway to the house. Close neighbors usually had a familial relationship; one house sometimes consisted of multiple households, where more than one family lived together (e.g., parents lived with their child's family).

In New Ngelepen, the findings suggest that the residents use and recognize some rooms and areas within the house and its outdoor space differently than as intended in the architects' master plan. For instance, although the second floor in a dome house was designed as a family room, only 44% of the residents acknowledge the availability of a family room. This is understandable because the designers overlooked the latent meaning of a "family room." In a traditional Javanese dwelling, a family room is used as both a private family gathering space and an extension of a social interaction space. Consequently, continuity and accessibility with other rooms is important, which explains why a secluded second floor is not recognized or used as a family room.

Moreover, 67% of the yards are used as a crop yard, fish pond, or chicken coop, whereas the landscape master plan suggested that yards be esthetically clustered fruit tree and flower gardens. The real use indicates the need of the yard as part of the residents' lifestyle that provides additional income for the residents.

Additionally, the residents indicate that not all their needs have been met, because certain rooms are either unavailable in the original dome house or the available rooms are not flexible enough to change the intended function. Highest on the residents' lists for changing the conditions of the original dome house are adjustments to terraces, kitchens, and private bathrooms. More than 80% have an added terrace or canopy, to protect the original

dome windows and doors, which are unsuited for a tropical environment, as well as to provide extension of social space.

Furthermore, more than 80% of the residents would prefer to add another kitchen where they can use cordwood cooking,² which is more affordable and the residents are more accustomed to, instead of the propane gas stove in the dome's kitchen. Residents' cooking customs consist of multitasking activities, which require a multifunctional kitchen that provides space to prepare, cook, store, eat, and to socialize with family and others. Because of this special cooking custom, they perceive kitchens as "dirty places." The high demand for another "dirty kitchen"³ is understandable, as the "clean kitchen"⁴ in the dome houses does not facilitate residents' cooking customs and differs from their perception of a "kitchen" (supported by Ikaputra, 2008). Additional private bathrooms are also necessary, because shared bathrooms in communal areas invade privacy. In the original settlement, some facilities, such as toilets or kitchens, were shared within neighboring family units, but in the dome settlement, residents share pathways to houses, public bathrooms, etc., with unrelated families.

Another concern is changes in living habits. According to data from the interview with a New Ngelepen village official, in the residents' original houses, 34% lived in multiple households, but only 6% of the dome houses are multiple households. The inability of dome houses to accommodate an extended family in one house indicates a situation where nuclear families are encouraged to each own a separate house. Consequently, some family members have returned to live in their original house, which is considered dangerous, or have moved to a nearby village.

Residents' Evaluation of House Design and Outdoor Spaces

The residents indicate that the house design has some limitations. For example, changing the function/layout of a room, enlarge space, and alter doors/windows are "very hard" (Figure 2a, b, c). Moreover, adding extra rooms to the original dome house is "neither easy nor hard" (Figure 2d), but adding a room compatible with the dome house is considered "hard" (Figure 2g).

As shown in Figure 2e, residents consider personalization to differentiated own dome house differently from others, using reused or recycled items from the previous house,

² Cordwood cooking is a traditional method using fire-place stove with cordwood as fuel, which produces ashes and smoke.

³ The "dirty" kitchen is basically where all activities from storing raw materials, washing, to preparing and cooking food, etc., are conducted. The area is preferably hidden from outsiders, because it usually remains messy and dirty.

⁴ The "clean" kitchen is rarely used as the actual area for cooking; rather, it is a place where cooked food is prepared and where food and clean tableware, etc., are stored. It is usually located near the dining area and sometimes open to visitors.

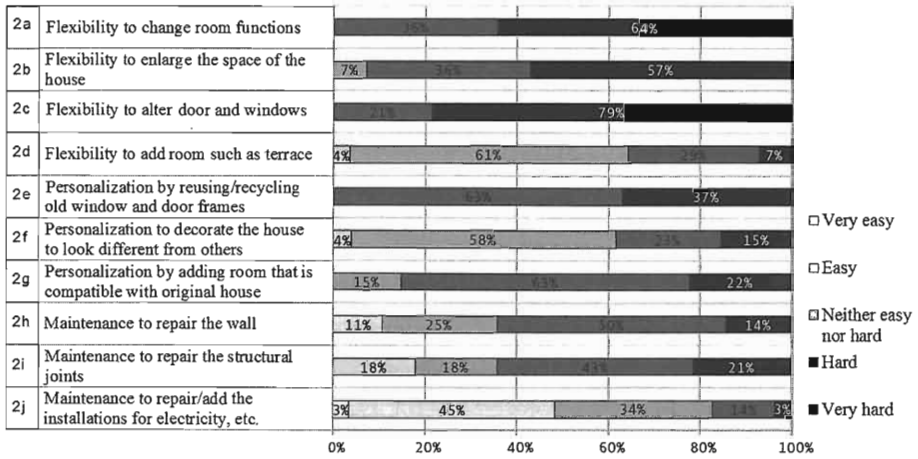


Figure 2. Residents' evaluation of the flexibility, personalization, and maintenance of the donated dome houses.

“hard or very hard.” The only personalization considered “neither easy nor hard” is to decorate the house to make it look different, with paint or by adding new elements, without changing the house structure (58%). Maintenance related to fixing the damage to walls and structure joints is considered “hard” (Figure 2h, i). Only fixing or adding installations for electricity, etc., unrelated to structure, is considered “easy” (Figure 2j).

Residents express dissatisfaction with many aspects of houses' outdoor space, neighborhood streets, and cluster facilities. In particular, they indicate a need for private pathways (57%), additional social gathering spaces in the yard/house (61%), and a front terrace (50%) (Figure 3a, b, c).

The results suggest that a house's outdoor space plays an important role in household activities. Typical rural Javanese dwellings have multifunctional yards, which not only facilitate household activities such as doing laundry, harvesting crops, etc., but also serve as important socialization spaces, where housewives chat, children play, and social events such as weddings, family gatherings, etc., are hosted. The residents' agreement with the statement that “large front yards are better than large streets for social gatherings” is consistent with typical Javanese rural dwellings (Figure 3e).

Because it is impossible to conduct certain social gatherings inside dome houses, and also due to the house's limited outdoor space, residents have learned to use the neighborhood's streets for their activities. Therefore, the streets “act” as their yards and hang-out spaces. Although most consider the streets too dangerous for unsupervised play, the interviews and observations show that children play freely in the streets while their mothers chat on the sides (Figure 3d). The ground surface of the main street entrance is painted as a badminton field, where youths and men gather in the evening. Additionally, the streets

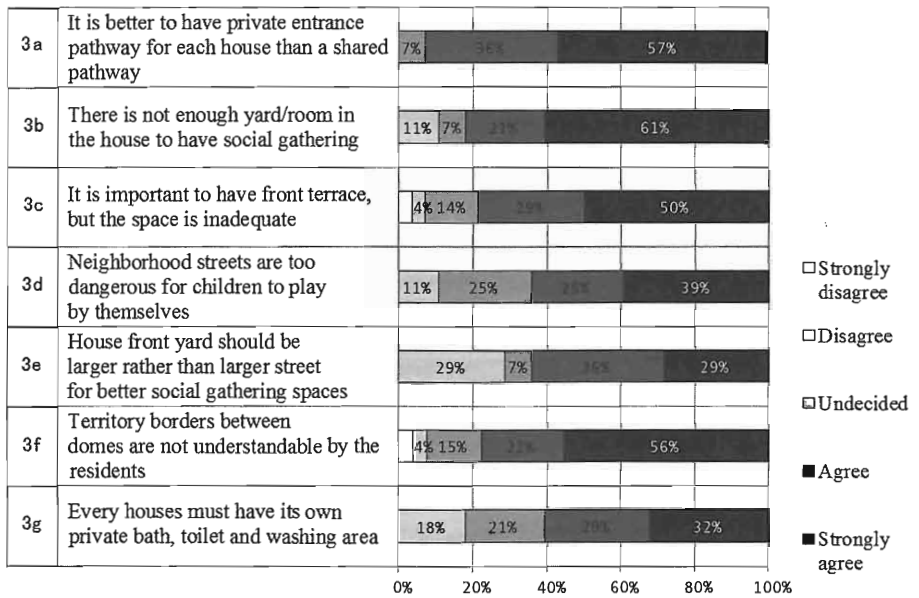


Figure 3. Residents' evaluation of outdoor space and neighborhood streets.

are closed to facilitate activities such as the weekly “ruwahan”,⁵ monthly meetings, and even a resident’s wedding ceremony, because the house and its outdoor space are inadequate.

Unfortunately, residents’ dissatisfaction does not only show their incapability to change the condition of the house design and outdoor spaces. Based on in-depth interviews, evidence has emerged that residents also worry about the land status, because their houses are built on land borrowed from the government. Thus, they are reluctant to make permanent changes. This may lead to other psychological problems. Because a house is the most fundamental basis for one’s personal life, an alternative, long-term solution is needed to give residents a sense of ownership and self-identity, for example, they have a long-term payment scheme to own the land, instead of just renting it.

⁵ Ruwahan is a set of traditional ceremonies during the ten days before Ramadhan (Islam’s sacred month), which consists of various community activities such as cleaning up the neighborhood, recitation from the Qur’an, etc.

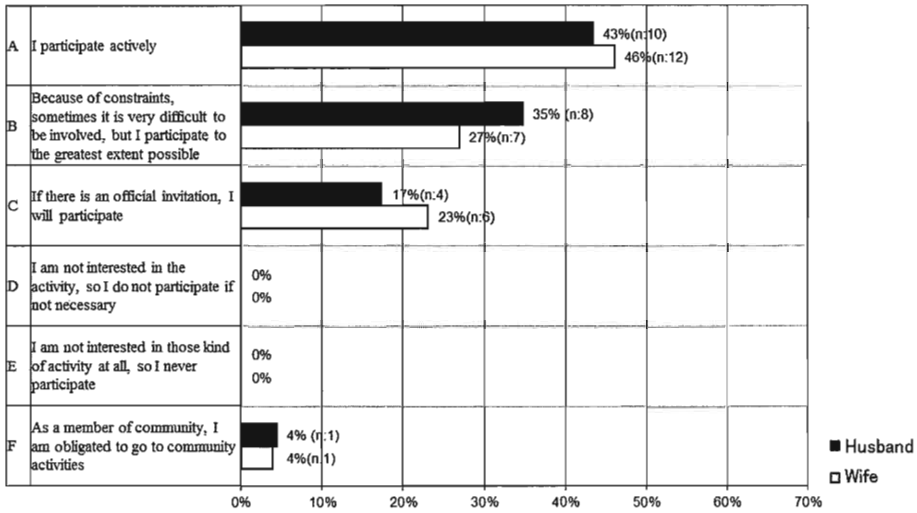


Figure 4. Residents' participation in community activities.

Participation in Community Activities

The results show that residents are highly involved and value their community activities. In the multiple-choice questions, responses A, B, and C are considered as “willingly participate,” responses D and E are “do not participate” and response F is “participate due to obligation.” Accordingly, more than 95% of heads of household and their spouses say that they willingly participate. Less than 5% participate due to obligation, and no one indicated that they do not participate (Figure 4). The high participation in community activities is supported by the residents' perception of the importance of community activities in their neighborhood. Approximately 65% of heads of household and 57% of spouses chose response A, “I feel that community activities are very important,” while only 35% said that “they are neutral” (Figure 5).

Because most residents are from the same or nearby villages, social cohesion is still maintained in the post-disaster settlement. Previous weekly and monthly routines, as well as incidental events like “gotong royong”⁶ still occur. However, community activities that used to take place inside the house now occur at different venues such as on the street, in the mosque, etc., due to limitations of the dome house. Additionally, in some cases,

⁶ Gotong royong is a traditional practice of Javanese people's mutual assistance among community members.

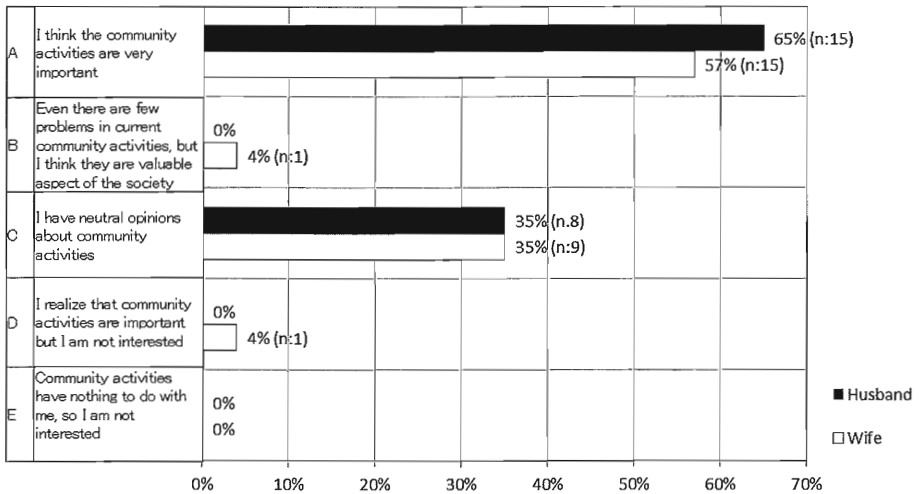


Figure 5. Residents' perceptions of community activities.

unavailability of the original setting means certain activities now occur less frequently or are suspended indefinitely.

The results confirm that social behavior is an important factor in Javanese society even in of post disaster housing, but the limited condition of the housing had enforced the residents to make adaption and adjustment in order to fulfill their lifestyle.

Summary and Conclusion

Although the implementation of a clean kitchen, shared bathrooms, large but secluded family room, esthetic landscape, shared pathway, etc., were designed to improve residents' quality of life, planners and designers failed to recognize or neglected the complex ways in which an environment acts as a setting for life, as clearly demonstrated by the discrepancies between the intended usages in the master plan and residents' actual usages and cognition. Consequently, the residents have had to adapt and adjust physical and behavioral aspects, to maintain their previous personal and social lifestyles. Understanding the latent function of services must be considered, so that the intended design does not become an environment inhibitive for residents' lifestyle, such as the presence of electric lightning (Rapoport, 1978) or efficient kitchens (Esber, 1972) that designed for better living quality but instead rejected by the residents. Hence, in order to create a settlement and house design for post-disaster housing that is close to the indigenous patterns, it is crucial that user lifestyle is fully investigated.

In New Ngelepen, the unchangeable house design and outdoor spaces have resulted in resident dissatisfaction. Residents' evaluation suggests that they are incapable of changing the condition of their donated post-disaster house design and outdoor space. The need for flexibility, personalization, and ease of maintenance are essential, because in the original settlement, residents routinely had social gatherings within the house, and used to repair or change the house on their own. Due to design limitations, dome houses and their outdoor spaces cannot facilitate prior activities such as larger gatherings. Thus, streets and public facilities now have a greater and more central role in facilitating social interactions.

Most Javanese dwellings consist of the core house itself, as well as the surrounding wells, streets, etc. These areas all serve as social spaces to accommodate various social interactions. The data shows that residents remain very involved and continue to value community activities (social interaction) very highly. Unfortunately, in post-disaster housing, these needs are sometimes neglected or cannot be facilitated, forcing residents to adjust by using neighborhood streets as gathering places and sport areas, going to a nearby village's mosque for large prayer gatherings, etc. In some cases, certain activities have been reduced or suspended indefinitely.

To aid in the post-disaster recovery process, post-disaster housing should not only be built for emergency situations, such as to accelerate reconstruction and to improve disaster prevention performance. Providers also need to understand survivors' previous lifestyle, activity systems, social networks, etc. in order to reconstruct a settlement that can accommodate these features, or is at least flexible enough for the residents to adapt and adjust. This could help them in their transition to the new environment and provide them with a better quality of life.

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