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Study on Social Interaction in Javanese Dwelling through Analyses of Residents' Adjustments in Post Disaster Housing

災害復興住宅に対する住民の適応からみたジャワの住居における社会的交流に関する研究

Doctoral dissertation

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ABSTRACT

Dwellings offer not only physical but also psychological amenities that sustain and support the residents which often essentials to the survival of their occupants. It is not only contained within a `house`, but also on the surrounding environments such as streets, facilities etc. that varies depend on the cultures. Similarly, various shape, arrangement of space, etc. can also varies an expression of different cultures. In Java, social interaction is an important cultural background where a house is a living environment that represents the philosophical concept of society. Post disaster housing as a dwelling is also a built environment that acts as a setting for human activities.

In order to understand how the culture-environment relationship in disaster circumstances, by considering the importance of social values in Javanese community, the objectives of this dissertation is to study the residents' perception, evaluation, adaptation and adjustments especially related to social interaction in different type of post disaster housing environment after Java 2006 earthquake. Self-built post disaster housing is studied as presumably the most ideal dwelling condition because the residents built and design their house from temporary to permanent condition based from their own cognition. Core-structure housing is studied as the most flexible donated housing because each house only consist of columns and roof structure with external toilet, while the arrangement of spaces are made by the residents themselves and dome donated housing was chosen because it is the most restricted condition of donated housing where the structure as well as space re-arrangement are hard to be changed especially since the residents does not have the knowledge relate to the dome structure.

This study presumed that restricted condition of the post disaster housing would to give a clearer understanding of how residents make adjustments to facilitate their social interaction lifestyle. The adjustments are being made because certain behaviors, cognitive processes, etc. of personal and social interaction need to be facilitated since they held important meanings. Therefore in this study, after finding out how residents social interaction and space cognition in their 'ideal' situation of self-built post disaster housing (chapter 3), later on the study try to analyze the different of physical adjustments in three different type of post disaster housing (chapter 4) and then analyzing the activities and cognition in outdoor spaces of fixed dome post disaster housing and its surrounding environment (chapter 5) and at last to know the residents' community activities and evaluation on donated post disaster housing(chapter 6). Through a comprehensive study by questionnaires, interviews, physical data collection and observations of residents' activities in different types of post disaster housing and settlement, this study strives know how residents facilitate their personal and social activities in their dwellings even in constraint situation like post disaster housing.

The results highlighted the importance of social interaction that need to be facilitate in Java dwelling even at in constraint situation. Meaning, values and ideals of social interaction are reflected on their cognition of spaces in the house as well as their usage and physical-behavior adjustments. Post-disaster housing should be built not only for emergency situations, but also to accommodate residents' way of life in a long term needs. It is necessary that even in post disaster housing need to consider social interaction importance as culturally sensitive design for reconstruction recovery. In area where built environment is inhibiting such as in case of dome housing where residents' certain behaviors are impeded, residents have adapted and adjusted to retain prior lifestyles. This study shows that facilitating social interactions and flexible, open-ended design are vital for survivors to transition to a new environment.

LIST OF PUBLICATIONS

Book article:

1. **Syam R.M.** and Ohno, R. **(2012).** Residents' Condition and Evaluation of New Ngelepen Post Disaster Settlement after Java 2006 Earthquake. "Vulnerability, Risk and Complexity: Impacts of Global Change on Human Habitats" *The 21. IAPS Post-Conference book*, Hogrefe in 2012 pp 67-78

Journal:

1. **Syam, R.M.** and Ohno,R. **(2012)** Importance of Social Space in Self-built and Donated Post Disaster Housing after Java Earthquake. *Asian Journal of Environment-Behaviour Studies*. ajE-Bs 3(7) January 2012, pp 25-34.

Conference Papers:

1. **Syam R.M** and Ohno,R. **(2013).** Spatial Characteristics Transformation of Self-built and Donated Post Disaster Housing. Proceeding of 10th CUEE、March 1-2, 2013、Tokyo Institute of Technology, Japan. ***(best presentation award)***
2. **Syam, R.M** and Ohno,R. **(2012).** Comparative study on residents' activities, perception and evaluation in two different type of donated post disaster housing. IAPS IAPS 22 International Association People-Environment Studies Conference, 24th -29th June 2012, University of Strathclyde, Glasgow, UK.
3. **Syam R.M** and Ohno,R. **(2012).** Social Interaction in the Outdoor Spaces of Relocated Donated Post Disaster Housing. Proceeding of 9th CUEE and 4th ACEE Joint Conference、March 6-8, 2012、Tokyo Institute of Technology, Japan.
4. **Syam, R.M** and Ohno,R.**(2011)** Social Interaction in Self-Built Post Disaster Housing after Java 2006 Earthquake. IAPS 2011 International Housing Network Symposium, October 10-14 Daegu, Korea
5. **Syam, R.M** and Ohno,R. **(2011)** Learning from Residents' Adjustments in Self-built and Donated Post Disaster Housing after Java Earthquake 2006. AcE-Bs 2011 Conference, 15 - 17 June 2011, Bandung. Indonesia
6. **Syam R.M** and Ohno,R. **(2011).** Residents Adaptation of Post Disaster Housing: The Role of Physical Environment for Social Interaction. Proceeding of 8th CUEE 8 Conference、March 7-8, 2011、Tokyo Institute of Technology, Japan
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8. **Syam R.M.** and Ohno,R.,(**2009)** Study of Javanese Social Behavior in Java 2006 Post Disaster Housing—A Spatial- Activity Pattern Analysis Approach- Nihon Kenchiku Gakkai, Tohoku University, Sendai, Japan.
9. **Syam R.M.** and Ohno,R.,(**2008)**.An Analysis of Physical and Socio Behavioral Aspects of affected people; Study Case of 2006 Central Java Earthquake ", NCU-KU-TIT Student Seminar, March 10-11, National Central University, Taiwan.
10. **Syam, R. M.** and Ohno, R. **(2007)**. Recovery Conditions and Behavior of the Affected People—A Case of May 27th, 2006 Central Java Earthquake, Proc. 4th Intern. Conf. on Urban Earthquake Engineering, Tokyo, 591–598. ***(best presentation award)***
11. **Syam, R.M** and Ohno, R. **(2007)**. インタビュー調査に基づくジャワ島中部地震における被災の**実**態と人間行動（その１）物理的環境の被**害について**,Nihon Kenchiku Gakkai, Kyushu University, Kyushu.
12. **Syam, R.M** and Ohno, R. **(2007)**.インタビュー調査に基づくジャワ島中部地震における被災の**実**態と人間行動 （その２）被災者の行動, Nihon Kenchiku Gakkai, Kyushu University, Kyushu.
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Study on Social Interaction in Javanese Dwellings through Analyses of Residents' Adjustments in Post Disaster Housing

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1.1. Background of Study

1.1.1 Dwelling as a house and home

Altman, 1985 has argued that there is a difference between the concept of house and home whereas house is an object, a part of the physical environment while home as a kind of relationship between dweller and their dwelling unit as an experience meaning. Therefore a dwelling as a house and home is offer not only physical but also psychological amenities that sustain and support the residents which often essentials to the survival of their occupants. Rapoport, 1969 said that for some culture, dwellings not only contained within a `house`, but also on the surrounding environments such as streets, etc. The various shape, arrangement of space, etc. as an expression can be various in different cultures. As stated in Rapoport 1987, it is necessary to consider both why environments should be culturally responsive and to whom they should be culturally responsive and, consequently how. For example, cultural notions about family social relations affect the arrangement and very nature of the spaces in homes and how they are furnished (Mizumura 2012). Similarly, cultural relations in the public realm influence how public space is configured and used (Low 1992). These highlight the importance of understanding cultural background in the design of a dwelling.

1.1.2 Javanese dwelling in Yogyakarta; importance of social entities within house

In Indonesia dwellings (particularly Javanese), social interaction is an important cultural background where a house is a living environment that represents the philosophical concept of society itself (Tjahjono, 1989). In Java community, social relationship with the neighbourhood is very important where they have social philosophy that had to be maintaining between neighbours. In fact in Java language ‘neighbour’ is called ‘*wong tangga’* which mean ‘*wong*’ or person and *‘tangga’* or support. Though in maintaining the relationships with each other there are social rule and behavioural codes in Javanese society that can be identify through the social hierarchy and arrangement in their lifestyle and social behaviour such as language and physical settings (home). Tjahjono (1989) mentioned that Javanese house plans followed an unwritten

prescription in which orientations, layout, and sequence of construction uncovered by *Kawruh Kalang* are regulated. The Javanese are among those people who consider cosmic view, built environment, power structure, and social organization as a totality and that Java dwelling is representing the philosophy concept of the society itself. Revianto, 1997 said that a house is called 'omah' in Javanese culture that comprised of a front and rear/back, which embodies principal ideas underlying the formation of a domestic setting as place to settle down and a place to establish relations. The front side is a place of social interaction where the residents meets others therefore it hold the task of encoding the social status of the owner. It is usually the neatest and most socially prestigious part of the house. In Javanese dwellings this front part of the house called *Omah ngarep – pendopo* is used for guest reception. Inner part of Javanese house called is *omah njero – dalem/senthong* used to sacred activity, sleeping parents and children; gandok/pringgitan use to sleeping, eating, family gathering and the back part of the house called *omah mburi - pawon*use to cooking and *kulah* used to bathing. Front part of the house and southeast corner of *senthong* are considered as a male zone, where he meet the public as the representative of the house while kitchen in the back of house and southwest corner of *senthong* are mainly a female zone. In traditional Javanese houses gender separation is not strictly applied in routine activities involving members except for certain areas such as *senthong tengah*, well, bathing hut and kitchen, which once establish, are not subject to other use (Tjahjono, 1983). Nevertheless, gender segregation appears when outside guests are involved in the house especially in ritual events. The male group is received in the *pendopo* and the female group in the *gandok* or *pringgitan*. Differentiation between front and back area in Java dwellings justify the important of personal and social aspects within the house. Because social aspects occurred as an integral part of the house, behavior privacy mechanism is appropriated to secure residents' privacy. The rear part which include *omah jero* and *omah mburi* are more secured parts, though security can be accomplished through layering, heightening and thickening the enclosing wall or minimizing the penetration of light. Thus the nature of the security is rather protective than strictly private.

1.1.3 Post Disaster Housing Phenomena

Earthquakes often cause catastrophic damage and collapsed buildings, which require immediate attention. The huge number of damaged and collapsed buildings as well as infrastructures after a disaster creates a problem needing urgent attention. To accelerate reconstruction and to improve disaster prevention performance, prefabricated materials and modern construction methods are sometimes necessary. Many disaster planning efforts has been made related to the physical aspects such as design mechanism for structure to improve disaster

prevention performance, technology in prefabricated materials and modern construction methods to accelerate reconstruction, disaster preparedness and evacuation system, etc. which became necessity actions to reduce the impact of disaster and raise the resilience of the survivors. Though, these attempts for reconstructions without further understanding and application of how the local context works and culture is overlooked can let to the provision of inappropriately designed buildings and built environments as Drabek 1986 pointed out that the study of humans and human behavior is an important area of disaster planning and management.

However, there are cases where survivors of natural disasters did not have many choices than to accept the donated post disaster housing given by government or NGOs, moreover they must relocate and accept donated post-disaster housing that originates from other countries which sometimes culturally differ from the local dwellings. Tercan (2001) have demonstrated that any attempt to remove people from their existing physical, social, and economical environments significantly impacts their lives. For these people, they are not only facing physical and economic impacts caused by the disasters but also psychological and social impact. In many circumstances these misfit housing would either not use or abandoned in the long-term use. Contrary, the reconstruction of post disaster housing that adaptable to residents' lifestyle get better response from its open-ended design that facilitated the cultural needs. Various researches relate to disaster preparedness and mitigation system, rehabilitation, reconstruction, evaluation, etc. been conducted in disaster prone areas like Japan, Turkey, USA, etc, but only in recent years that it had caught the attention of East Asia countries, include Indonesia. However, most of the researches are relatively independent studies which rarely relate the physical aspects with the cultural aspects of the same research subjects and therefore sometimes cannot explain comprehensively how people conceptualize and cope with their environment in relation to disasters. Moreover, the differences in culture and local context of the disaster areas has made it necessary to understand the suitable circumstances to provide a better understanding and approach to reduce the impact of disaster and raise the resilience of the survivors.

This is the case for post-disaster housing settlement in *New Ngelepen*, Yogyakarta which raised many controversies. After the Java earthquake on May 27, 2006, *New Ngelepen* residents were relocated to a new type of settlement and given dome post-disaster housing, which drastically differed from their Java vernacular dwellings. As Rick Crandall[i] argued (Parker, 2001) that the obvious reasons why people built the monolithic domes are the culture living towards security, disaster resistance, low maintenance and durability of the house. Though, imported culture inevitably influenced the local identity (Ikaputra and Titisari, 2005).

Post disaster housing as a dwelling is also a built environment that acts as a setting for human activities. Although it cannot be a determining factor to generate certain behaviors, but it can either facilitate or inhibit certain behaviors, cognitive processes, etc. as Rapoport, 1969 suggest that inhibiting environment reduces competence (cultural, physical, and mental such as in post disaster situation), it has a larger effect than facilitating ones. This study presumed that restricted condition of the post disaster housing would to give a clearer understanding of how residents make adjustments to facilitate their lifestyle. The adjustment are being made because certain behaviors, cognitive processes, etc. of social interaction need to be facilitated since they held important meanings. The study will take place in three difference type of post disaster housing from the most ideal situation to the fixed housing that could be an inhibit environment Through questionnaires, interviews, physical data collection and observations of residents' activities, this study strives know the residents' physical and behavioral adjustments to understand how residents facilitate their Javanese cultural based behavior(social interaction) in their dwellings even in constraint situation like post disaster housing.

1.2. Previous Study

1.2.1 Javanese Social Behavior and Dwellings

Numerous previous studies have examined the impact of social behaviour on Javanese dwellings. Some have focused on the influence of social interactions and their meaning on the morphology of traditional Javanese dwellings (Tjahjono, 1989; Revianto, 1997), while others have examined the impact of social interactions on the presence of non-traditional dwellings such as public housing (Subroto, 1995) and urban houses (Yulyta, 2008). In previous researches, traditional 'margersari' housing and other public housing in Java consist of so called 'core house',where the room pattern is 'guest room', 'bedroom' and 'kitchen'. (Ikaputra,1992). Most of the 'core housing' alteration start with the expansion of double/triple size of 'guests room' which is a social space and then 'bedroom' as private space.(Subroto, 1995). Even in early stage of Java earthquake recovery process, we found that 'guest area' phenomena in temporary tents and house. At the time, although their needs of functional room (bedroom, kitchen, etc) are not fully accomplished yet in the house. All of these findings show the importance of social factors in the Javanese dwelling. Though cultural changes in the society accompany the change in house, social behaviour apparently still have influence in Indonesia dwellings, especially Java.

1.2.2 Misfit in Post Disaster Planning

There are many cases around the world where large scale of emergency house reconstruction that were done in a short time without cultural sensitivity had resulted in rejection of ill planned and designed settlement. For example, Oliver (1987) study that in post disaster rehousing after 1970 Gediz, Turkey earthquake when permanent apartments were provided, the residents preferred to continue to use the polyurethane domes designed by Bayer Corporation as storage places for their animals because the apartments failed to provide needs for these spaces. Another free donated domes post disaster housing projects after the 1972 Nicaraguan earthquake, where only 30% were occupied because they were culturally not suitable. Erikson 1976 study that even in temporary emergency rehousing trailer became a problem because their location and assigning first come first basis become problematic because their previous social system no longer available for socializing. Besides houses and other buildings, the layout of the neighbourhood, urban area, or town could also be unfit. It is not uncommon for these new post disaster settlements to be design in a standard grid pattern of streets like the residential estates layout where it may seem good and attractive to the outsiders, planners and designers, however probably not what the community considers liveable.

Similar case happens in Indonesia when an earthquake measuring Mw 6.3 (USGS and ERI) struck the Indonesian island of Java with an epicentre about 20 km south of Yogyakarta on Saturday, 27 May 2006. Even though the shaking lasted for only 57 seconds with a major aftershock occurring at 10:15 AM, killed over 5,000 people, injured thousands, and displaced up to 200,000 from their homes. The earthquake left tremendous damage in the lives of the residents both physically and psychologically. Right after the earthquake, various housing reconstruction program were undertaken by many parties, NGOs and government. While some reconstruction program depend solely on the community themselves to rebuilt their housing based on their own design, some had heavily involved the community in the planning as well as community based reconstruction, while others had raised controversies as donated housing that neglected the local context. There is a controversy relate to dome donated post-disaster housing settlement in *New Ngelepen*, Yogyakarta where the residents relocated to a new type of settlement and given dome post-disaster housing which drastically differed from their Javanese vernacular dwellings. Various studies at *New Ngelepen* have been conducted, including a study on the response and adaptation to dome house (Ikaputra, 2008), residents' perception about their new environment (Saraswati, 2007), etc. However, a comprehensive study for social interaction in Javanese dwelling by analysing the adjustments in different types of post disaster housing

and settlement by questionnaires, interview, physical data collection and behaviour observation has not been made before.

1.3. Objective and Hypotheses

In order to understand how the culture-environment relationship in disaster circumstances, we need obtain an understanding how the people view their lives against disasters and what they see as suitable way to behave, design and rebuild. Considering the importance of social values in Javanese community, the objectives of this dissertation is to study the residents' perception , evaluation, adaptation and adjustments especially related to social interaction in different type of post disaster housing environment after Java 2006 earthquake. Therefore in this study, after finding out how residents social interaction and space cognition in their 'ideal' situation of self-built post disaster housing (chapter 3), later on the study try to analyse the different type of physical adjustments in three different type of post disaster housing (chapter 4) and then analysing the behaviour activities and cognition in outdoor spaces of fixed dome post disaster housing and its surrounding environment (chapter 5) and at last to know the residents community activities and evaluation on donated post disaster housing(chapter 6)

The hypotheses of the study include the following:

1. That social behavior is reflected in the perception, evaluation and usage of Javanese dwellings, even in post-disaster housing.
2. That the self-built and open ended design post disaster housing is more facilitative environment than restricted donated post disaster housing, which is more inhibitive environment for some aspects of the residents' previous lifestyle. In order to fulfill their needs, physical and behavioral adaptations and adjustments are necessary.
3. The more inhibitive the housing environment, the larger consequences made to the neighborhood environment to facilitate residents' social behavior.

1.4 Research Framework

The structure of study is described in figure 1.1.

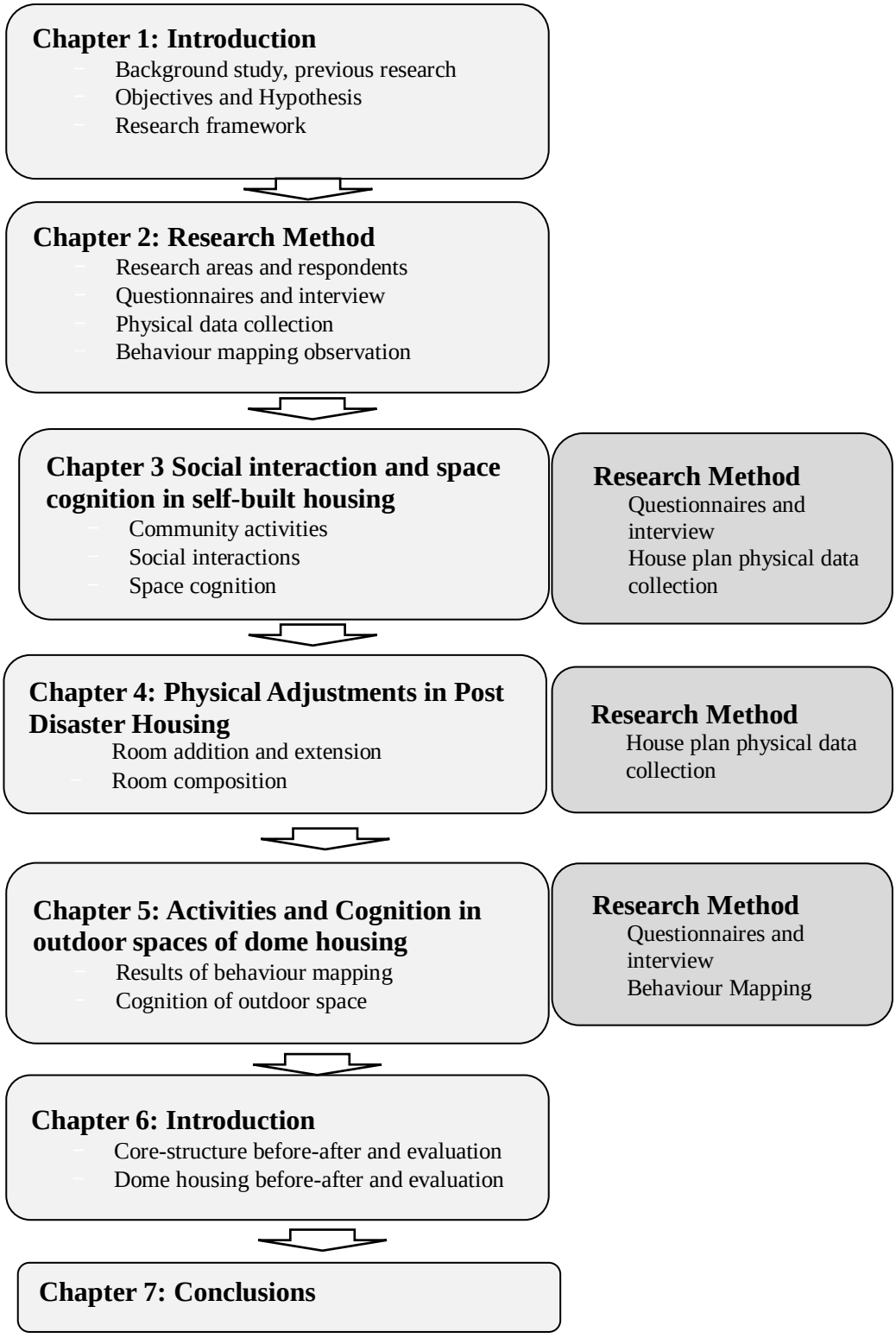


Figure 1.1 Research Frameworks

CHAPTER 2 Research Method
2.1. Introduction
2.2. Research Areas and Respondents
2.3 Questionnaires and Interview
2.4 Physical Data Collection
2.5 Behavior Observation

2.1 Introduction

Three study cases of post disaster housing after Java 2006 earthquake are being studied and selected based on the difference of on house design. These are self-built, donated core-structure and donated dome post disaster housing. The study investigated the situation in post disaster housing because they can be considered as 'constraint dwelling' since there is a change of situation from their previous ideal living environment before the earthquake to their 'temporary' restricted condition right after the earthquake until it finally become permanent housing. By studying different type of post disaster housing, author hope a clearer result can be achieve to understand how residents' perception, usage, behavioral and physical adjustment to the transition of their dwelling condition from their 'constraint dwelling' to 'ideal dwelling' to fulfill their lifestyle needs and ideal living environment especially for social interaction.

Self-built post disaster housing is studied as presumably the most ideal dwelling condition because the residents built and design their house from temporary to permanent condition based from their own cognition. The study assumed that the development of self-built temporary house to permanent house will be the reflection and actualization of residents' cognition of suitable dwellings that facilitate their lifestyle and need based on their situation, therefore is also assumed that self-built housing development will be similar contextually to the traditional housing.

The study on donated post disaster housing consists of two different type of housing which are core-structure housing and dome housing. Core-structure housing is studied as the most flexible donated housing because the each donated house only consist of columns and roof structure with external toilet, while the arrangement of spaces are made by the residents themselves by making the wall partitions. This study presumed that the development of donated core structure house would be similar to self-built housing which reflected how the residents' spatial perception is actualized to their activities and space arrangement in their dwellings.

On the other hand, dome donated housing was chosen because it is the most restricted condition of donated housing where the structure as well as space re-arrangement are hard to be changed especially since the residents does not have the knowledge relate to the dome structure. This study assumed that the restricted condition of dome house would inhibit some of residents' previous lifestyle (activities, etc) that could cause dissatisfaction therefore as consequences physical and behavioral adjustment are being made to the house outdoor and neighborhood space.

Table 2.1 Detail Description of Case Studies Areas

case	**Self-built Housing**		**Core-structure Housing**	**Dome Housing**
ethnic	Javanese 100%		Javanese 100%	Javanese 100%
Status	Owner 100%		Owner 100%	House owner 100%, Land borrower
Dwelling Design	Self-built post disaster temporary and permanent house build by self-design cognition		Donated core-structure housing with columns and roof also outdoor toilet. Flexible wall partitions and space arrangements by residents	Donated dome housing with unchangeable limited size & differ design cognition with residents previous house
Area type	Rural area, 3 sub villages (Ketonggo, Manggung and Tegalrejo), Bantul, Yogyakarta, Java. First survey obtained 39 data, only 33 data were re-attained.		Rural area, Tembi village, Bantul, Yogyakarta, Java. 23 data were acquired	Rural area, New Ngelepen, Yogyakarta, Java, From total 71houses, only 50 lived in and 34 interviewed
Time survey	*First survey* in Nov.-Dec. 2006	*Second survey* in Nov.2008	August 2009	August 2009

Slightly different approaches were undertaken in investigating self-built housing and donated housing. In self-built housing it is easier to ask the residents about the condition of their house, how they do activities, how they socialize in the house, etc. and have honest answer because the design and usage of the house is based on their own knowledge and how they think it is the best for their condition at the time therefore questionnaires data, house inner plan and activities in the house data can directly be obtained. As for in core-structure donated housing, because the flexibility of the open-ended design of the house that make it possible for the residents to do the arrangement of the space in the house as well as other personalization and maintenance (details

in chapter 6) therefor almost similar approach with self-built housing is made relate to the acquisition of questionnaires data, house inner plan and activities in the house that data can directly be obtained. In donated dome housing a different approach have to be made because the in-flexibility of the dome house design that give many disadvantage for residents' usage that make it not possible to have direct and honest answer especially relate to the questionnaires of evaluation and usage. It is because in Javanese culture it is not appropriate to bad-mouth about something that is given to them (in this case the dome house), therefore an additional behavior mapping in dome housing were made to see the actual activities of the residents.

Table 2.2 Difference in the condition and approach between three study areas

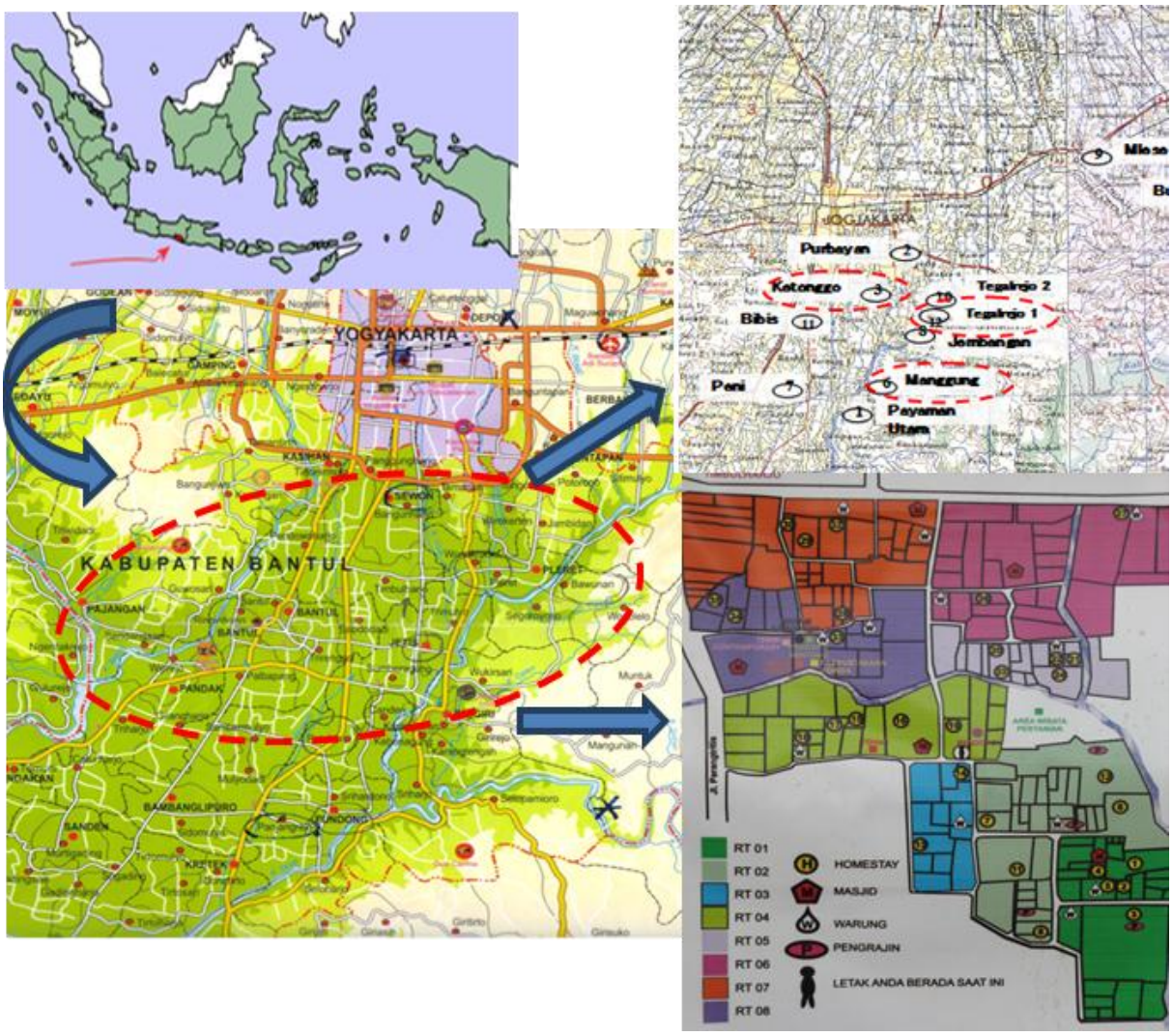
Research methods	Area	Site Plan (public facilities and incidental social space)		House and its outdoor space			Community (community activities and participation)	
				donated		self		
		same	differ	local	import		same	differ
Questionnaires, house outdoor plan, outdoor activities data, Evaluation, Behavior mapping	New Ngelepen		○		○			△
Questionnaires, house plan, domestic activities data Evaluation.	Tembi	○		○			○	
Questionnaires, house plan, domestic activities data Social interaction	Self Built	○				○	○	

Circle: the same Triangle: some

2.2 Research Areas and Respondents

Self-built and donated core-structure post disaster housing settlement are located in *Bantul, Yogyakarta*. *Bantul* is the most affected region after Java 2006 earthquake disaster. More than 2000 residents were killed, thousands are injured and 80% of houses in the vicinity were damaged or destroyed. It is located about 11 km to the southern part of Yogyakarta. The total area is approximately 508 km2 with more than 800.000 residents; more than 80% of its population is Moslem. The administrative area of *Bantul* consists of 17 sub-districts, 75 villages and 933 sub-villages. It has a historical background where it used to be the beginning area of old Java Mataram kingdom. Locations of Self-built and Core-structure post disaster housing settlement are shown in Figure 2.1.

Self Built housing area



Core structure housing area

Figure 2.1 Locations of Self-built and Core-structure post disaster housing settlement

Donated dome post disaster housing is located in New Ngelepen, Sumberharjo, Prambanan, Yogyakarta. It is a new relocation area made by opening sugar cane land situated about 1-1.5km from the original village (Ngelepen). In the original *Ngelepen* village, almost 50 houses were demolished by catastrophic landslide and the area declared as a geographically unbuildable land. As a result, the residents were relocated to *New Ngelepen* post disaster settlement. The dome post disaster housing were built by WANGO (World Association of Non-Governmental Organizations) for free given to the residents, but it was built on local government land of Sumberharjo, therefore the government only lend the land for free in 3 years to the residents starting from the time they resided. The development of the dome houses began in September-October 2006 and started to be occupied at the end of April 2007. The donated dome houses were distributed via a lottery. Based on observations and confirmation from the village official in August 2009, only 50 of the 71 dome houses built and distributed to survivors were occupied. Locations of Dome post disaster housing settlement are shown in Figure 2.2.

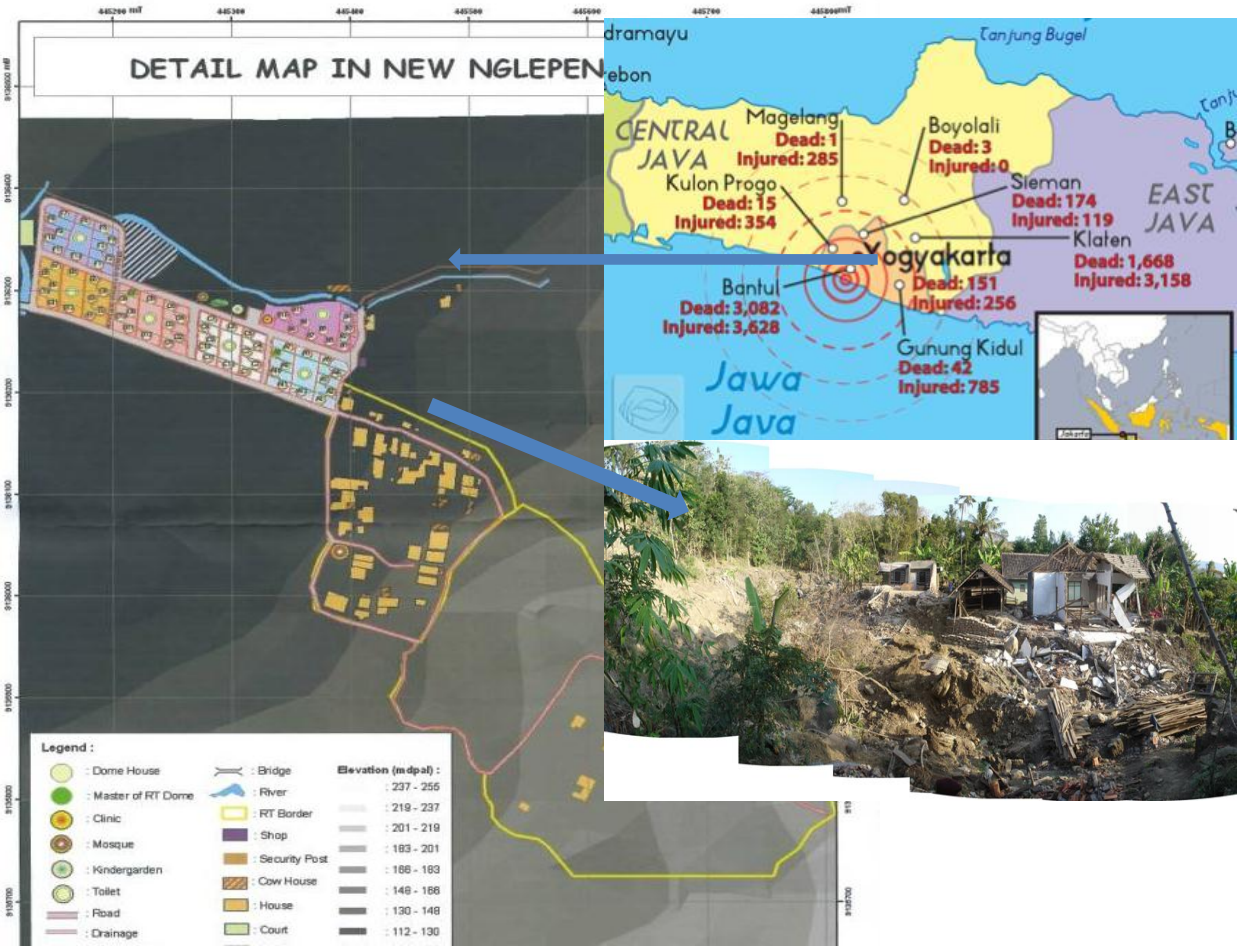


Figure 2.2 Locations of Dome post disaster housing settlement

Detail criteria and description for Self-Built, Core-structure and Dome post disaster housing settlement area and its respondents are as follows:

a) Self-Built post disaster housing

Observation Area for self-built housing are: *Ketonggo, Bawuran(Tegalrejo) and Manggung sub-villages, located in Bantul, Yogyakarta*. The studies for self-built post disaster housing were conducted into two main continuous and integrated surveys that were taken within 2 years difference. First survey was conducted on November 2006, about 6 months after the Java earthquake. At the time, most of the people affected by the earthquake had lived in temporary or semi-permanent houses. The second survey was taken in November 2008, two and half years after the earthquake. By that time most of the residents have built their permanent houses, although in some cases there are residents that still lived in both temporary and permanent structure house. Before two main surveys were executed, a preliminary survey was conducted a couple weeks after the earthquake on June 2006. It is a part of *'Physical and Behavioral Condition of the Java`s Earthquake Survivors'* research that was funded by Tokyo Institute of Technology CUEE (Center Urban Earthquake Engineering). This research was executed in 12 sub-villages of the inflicted area in Bantul. For this dissertation, further study of the areas chosen to be investigated more are three sub villages of *Ketonggo, Bawuran(Tegalrejo) and Manggung* (more precisely consist of two RT^{ii} in each sub village), see table 2.3.

Table 2.3 Detail descriptions of 12 sub-villages in preliminary survey.

No.	Kabupaten (District)	Kecamatan (Sub-district)	Desa (Village)	Dusun (Sub-village)	MSK* Intensity scale	House Structure				Characteristics **
						Brick-URM	Brick - CM	Wood-brick walls	Wood-wood walls	
1	Bantul	Imogiri	Imogiri	Payaman Utara	6.91	-	-	5	11	A
2	Yogyakarta	Kotagede	Kotagede	Purbayan	6.99	-	1	14	1	B
3	Bantul	Pleret	Wonokromo	Ketonggo	7	7	9	-	-	C
4	Klaten	Wedi	Kaligayam	Mindi	7.31	1	1	3	11	A
5	Klaten	Gantiwarno	Karangturi	Bungasan	7.33	-	2	5	9	A
6	Bantul	Imogiri	Wukirsari	Manggung	7.4	10	6	-	-	C
7	Bantul	Bantul	Palbapang	Peni	7.9	10	6	-	-	C
8	Bantul	Pleret	Segoroyoso	Jembangan	8.11	2	4	7	3	D
9	Klaten	Gantiwarno	Mlese	Mlese	8.2	10	6	-	-	C
10	Bantul	Pleret	Bawuran	Tegalrejo 2	8.54	3	6	6		D
11	Bantul	Sewon	Timbulharjo	Bibis	8.8	10	4	1	1	C
12	Bantul	Pleret	Bawuran	Tegalrejo	9.1	8	4	4	-	C

* Estimation of MSK seismic intensity scale by Prof. Murakami of Yamaguchi University (Murakami 2007)

** Area characteristics (type of community/degree of damage)

A: Rural village area with mostly little-damaged wooden houses. The majority of residents are farmers who still live in their previous homes.

B: Historic district of Yogyakarta built mostly of little-damaged 50+-year-old wooden houses with brick infill. Most residents are government employees and merchants.

C: Suburban area mostly comprising houses of brick masonry with/without reinforcement. The majority of residents still live in temporary shelters or tents. Residents include former merchants, employed workers, and construction laborers.

D: Suburban area made up mostly of houses built using brick masonry with/without reinforcement plus some wooden houses still standing and capable of reuse. People whose houses collapsed still reside in temporary shelters.

These three sub villages were selected because they were high damages areas. The respondents were chosen based on the condition of the houses after the earthquake where original houses were totally destroyed and the residents rebuilt both temporary and permanent post disaster houses by themselves and based on their own design cognition (example of self-built house figure 2.3). Most of the respondents are original residents of the surveyed area, 73% of them have live in the areas for more than 10 years. Most of the rebuilt houses were located in their own land where 94% of them have their land ownership. The neighborhood streets in all three *Ketonggo, Bawuran(Tegalrejo) and Manggung* sub-villages mostly for pedestrians with no pavement, only main neighborhood street with 3-5m width have concrete pavement. Many residents are native in the areas and they mostly know each other well (detail area map of the respondents in figure 2.4). In first survey, a total of 39 respondents were acquired. The second survey targeted same respondents from first survey, but from 39 respondents only 33 respondents able to be surveyed and interviewed again because some of them had moved to different villages.

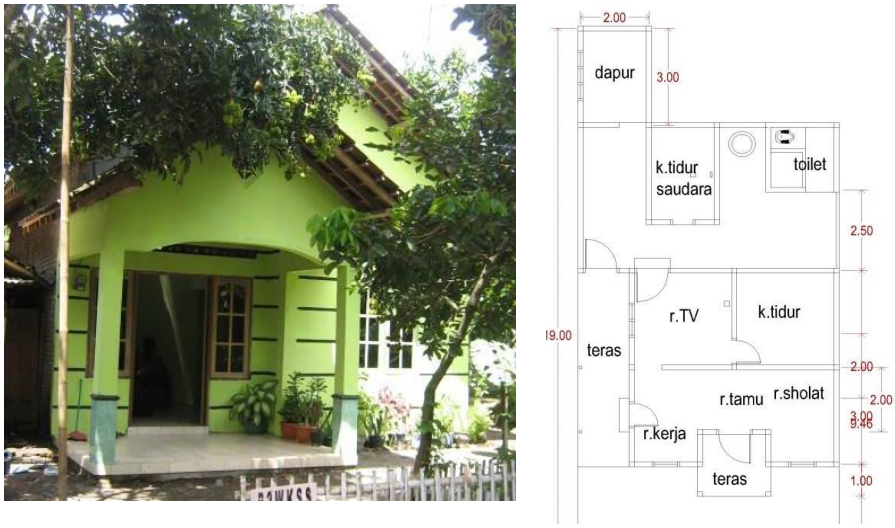


Figure 2.3 Example of self-built house façade and house plan

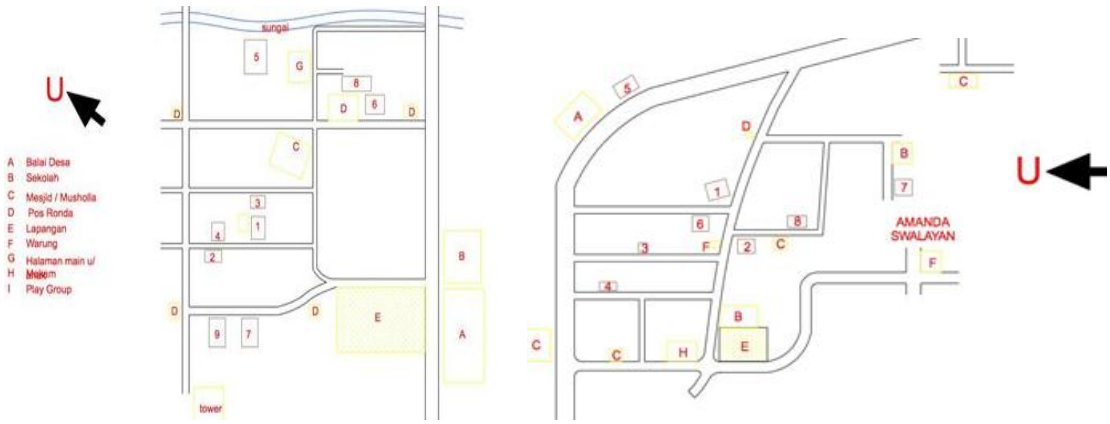


Figure 2.4 Diagrammatic map of self-built settlement area, from left Ketonggo and Bawuran

b) Donated core-structure post disaster housing

Observation Area for donated core-structure housing is in Tembi village, Sewon, Bantul, Yogyakarta. After Java earthquake 2006, not all houses in Tembi village were collapsed, therefore only few of the collapsed houses received donation. The donated housing is basically core-structure housing which each house consist of ten concrete column and roof, an addition of outdoor/external toilet also given as part of core-structure donated housing. The constructions of wall as well as space arrangement were made by the residents themselves (example of core-structure house in figure 2.5). The constructions of the core-structure housing were done by the residents with the help of family members, neighbors and paid worker.

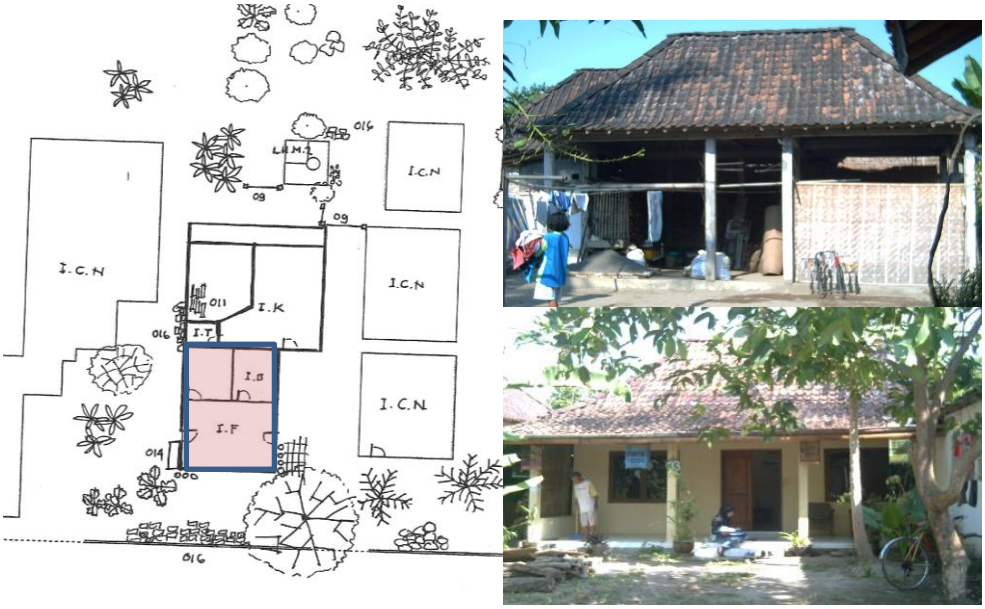


Figure 2.5 Example of core-structure house façade and house plan

The survey was undertaken only once in August 2009, by that time most of the donated core-structure house had become permanent houses. Most of the rebuilt houses were located in their own land and 94% of them have their land ownership. The neighborhood streets in Tembi village mostly for pedestrians with no pavement, only main neighborhood street with 4-5m width have concrete pavement that also acts as territorial border to different RT areas in Tembi village. Because most of the residents have live in Tembi village for decades therefore most of them know each other well, in fact many of neighboring people still have familial relationship with each other. There are very rarely physical territorial border such as fences, guarding, etc. can be observed between neighbors.

From the interview, there are many cases where the neighbors have family relationship and sometimes share the same service facilities such as toilets, washing well and kitchen. A total of 23 respondents in two RT in Tembi village were acquired. Respondents are chosen because all on them had received donated core-structure housing mostly from HSBC bank. Some core-structure houses that were not used as permanent house are excluded from the analyses. Most of the respondents are original residents of the surveyed area.

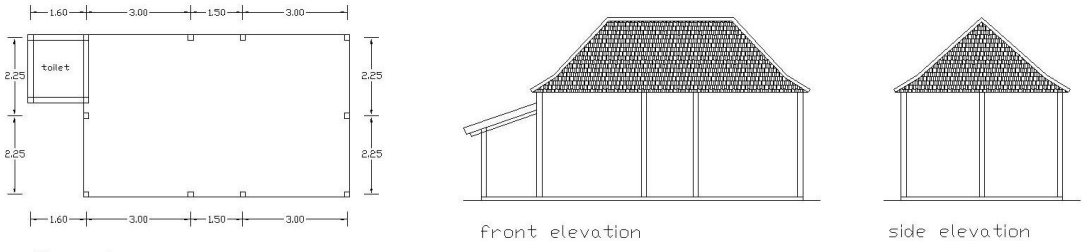


Figure 2.6 Diagrammatic core-structure house and house plan by time of donation

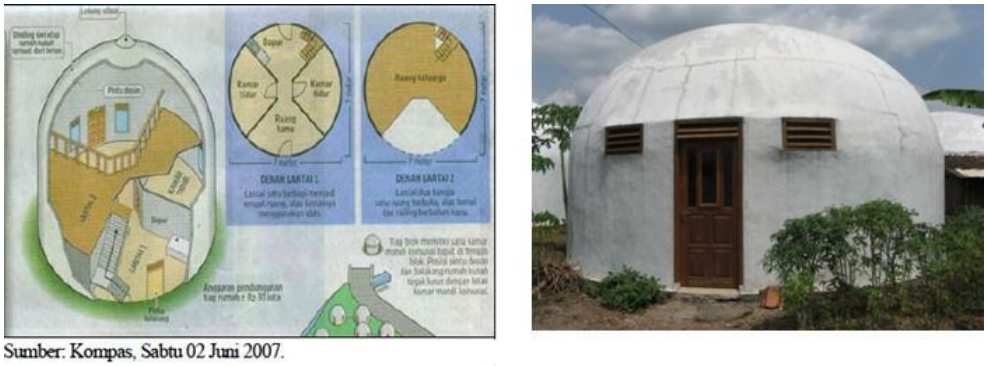
Figure 2.7 Map of donated core-structure housing settlement in Tembi village

c) Donated Dome post disaster housing

Observation Area for donated dome housing is in New Ngelepen relocation area of Sumberharjo, Prambanan, Sleman, Yogyakarta. Relocation in dome housing have close proximity between original and new site which only about 1-1.5km near their original village. Therefore residents still use some of the nearby facilities that are located in the neighboring village's area the same way they did before the earthquake. The donated dome housing introduced dome monolithic housing with a hemispherical roof and a circular plan with concrete cast as a single and integral structure as the donated post disaster houses. The construction of one dome house takes about 3 weeks and cost nearly $4000. The diameter of the house is 7 meters,

two stories with the total area about 48 sqm (include second floor). The total height is 4.6m with wall thickness about 10cm. Each dome house consisted of 4 rooms on the first floor. In the blue print of the design, the rooms were designed as guest room, two bedrooms, and inner kitchen on the first floor and family room on the second floor, see Figure 2.8.

The construction of the dome houses had involved nearby community and beneficial residents, but the technology to make the main structure of dome house was imported from USA since Indonesia does not have it yet. The construction step include: making the foundation by leveling and compressing the soil and after that making the floor structure with concrete, built up main structure of dome house by using balloon type molding imported from USA, the molding was pumped by compressor till hard then the metal structure frame as well as the windows and door frame were made and later on casted with concrete. After the concrete had dried, then the balloon molding was deflated and taken out from the door, after that all the inside partition for rooms as well as second floor wooden floor was constructed.



Sumber: Kompas, Sabtu 02 Juni 2007.

Figure 2.8 House plan design by donator and dome house façade

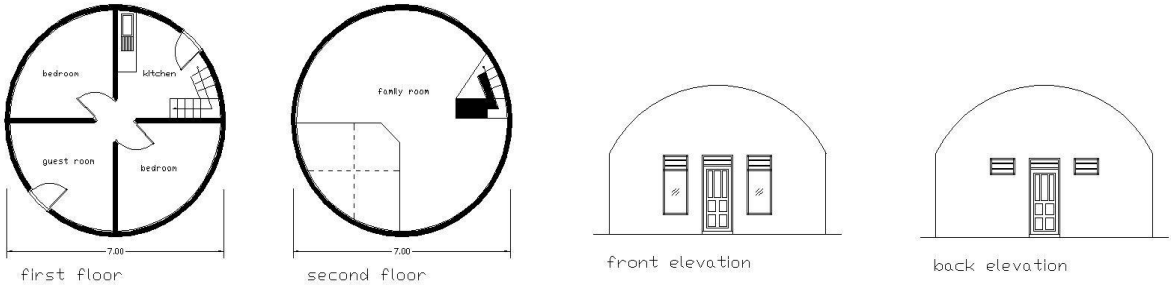


Figure 2.9 Diagrammatic dome house plan and house facade

In the master plan of the site plan, New Ngelepen settlement was introduced as house clusters design where every 11/12 dome houses form a block that shared electricity, public toilet/washing area in the communal block space and various approach pathways. The total 71 dome houses were built and arrange into 6 clusters divided by neighborhood streets made of asphalt that support two ways direction traffic for automobile with around 5-7m width. Semi-public facilities built in the area include musholla (small version of mosque), kindergarten, playground, and clinic. Other semi-public facilities include graveyard (that already built on the area before New Ngelepen settlement were constructed) and soccer field that residents made by them self on the open area. There is also badminton field that were made on the main entrance area by painting the street and using it at certain times only.

In the landscaping master plan, the clusters were plotted to be flower and fruit gardens, unfortunately in the later usage the residents use the landscape as their crop yard. The survey was undertaken once in August 2009, by that time most of the donated core-structure house had become permanent houses with some have houses have additional structure attached or separate from the dome house. The residents of dome housing being interview consist of 68% of the residents in 34 occupied dome house participated in two RT in New Ngelepen were acquired, though only a total of 28 household data are valid for analyses. Respondents are chosen only those who are living in the dome housing. Most of the residents in *New Ngelepen* are from the same destructed original *Ngelepen* village (almost 50%), and the remainder are from neighboring village. Land is government ownership.

Figure 2.10 Map of dome housing settlement in New Ngelepen village

2.3 Questionnaires and Interview

Before gathering data from the respondents in self-built, donated core-structure and donated dome post disaster housing, permission from the sub villages' officials were acquired. Basic information of the study areas such as number of families, overall occupations, community activities and organizations of the residents were received. The sub-villages map in self-built and core-structure housing were asked, but availability is only for villages map and none available for the chosen sub-villages, therefore diagrammatic map were made for self-built and core-structure housing areas on *RT* area level (where respondents' houses and public facilities nearby can be located). As for donated dome housing settlement map, because it's a new relocation area therefore a detail scaled map were made with the help of students from Geography Faculty, Gadjah Mada University.

After permission and information on selected sub villages were obtained, surveys were undertaken. Questionnaire and interview survey was conducted simultaneously with collecting physical data such as house plan or house outdoor plan. In the surveys for self-built, core-structure and dome post disaster housing, author was helped by part time volunteer students from Architectutre Department, Gadjah Mada University. The requirement for accepting volunteers are understanding of architectural details as they need to document house plan and site plan, and they also have to have the capability to speak Javanese, a native language to the residents of the surveyed areas, as most of the residents still speak local language.

In taking the data, besides author, the volunteers were divided into teams where each team consists of two people that work together but basically take different type of data at the same time for efficiency in survey time and data gathering. Author with a member of the team interviewed the respondents based on questionnaires and in depth structured interview prepared before. In self-built housing, another member of the volunteer team would asked the permission of the house owner to take a tour around the house (mostly by him/herself but sometimes accompanied by other family member of the respondent) and he/she would had to sketched the house plan and took photos for physical data documentation inside and outside the house. In some cases, certain rooms were not possible for the pictures to be taken because of its privacy. In core-structure and dome housing, physical data documentation was only taken for house outdoor space.

Self-built, core-structure and dome post disaster housing questionnaires and interview content include multiple choices and open-ended interview. In choices questionnaires, choices were said to the respondents to be chosen and answers will be written in the questionnaires sheet by the volunteers. In open ended question with interview, question were asked to the respondents to be answer based on their own cognition and in the process important notes were written. Sometimes during interview process, the volunteers will have to improvise the questions from the questionnaires so that the respondents understand completely of the questions being asked. It is also necessary for the volunteers to written down the answer to both questionnaires and open ended interview questions because the variety of respondents' educational level and the incapability of some elderly respondents to read the questionnaires and write the answers. During the process of interview, a record of the interview was saved in the questionnaires sheet and voice recording.

The written questionnaires and open ended interview were written by author in Indonesian language. Because when taking survey on the field most of the respondents speak Javanese instead of Indonesian language thus author and volunteers have to translate it back to Indonesian language for the written record data.

Questionnaires and Interviews consist of two separate sets for self-built and donated post disaster housing. The questionnaires for self-built consist parts of main research questions bellows: (attachment of questionnaires sample in appendix)

- Part 1 *Respondent's personal background and house condition* include name, sex, age, educational background, occupation, status in community organization, family member, expense in one month, type of current house, when it was built, since when they start living it in, how many people live in the house now, whether house located on owner's land, house structure and with whom the house were built.
- Part 2 *Respondents' perception, frequency and type of social interaction* includes asking respondents perception of traditional social behaviour values such as *gotong royong*[iii], etc. frequency of accepting guest in the house, frequency of involvement in community activity, frequency of going to neighbour house, frequency of borrowing stuff between neighbours, type of community organization/activities involved in.
- Part 3 *Personal activities include*
    - ✓ Cognition of spaces for personal and social interaction spaces.

- ✓ Personal activities include the location of personal activities includes eating, sleeping, praying, relaxing, cooking, washing clothes, washing laundry, take care children, etc.

- Part 4 *Information and risk perception of earthquake disaster*: this part basically asking respondents needs of information after the earthquake, how they feel about it, their willingness to apply it, future preparation and risk perception.

- Part 5 *Social Interaction and Privacy Mechanism*

  This part was questioned only to residents of self-built post disaster housing because dwellings are self-design, it is presume that residents have the opportunity to accept guest at the appropriate settings. To know how various interpersonal relationships influence to the spatial regulation, interviewee was asked of the location to accept different types of guests in the house based on different type of interpersonal relationship. It was presumed that the difference in interpersonal relationship will affects the difference of accepting guests and penetration to private area.

  Then interviewee was also asked the type of behavior/reaction the guests are their partner`s guests and being received in the area where he/she is doing certain personal activities at the same time. The answers to this question range from most subtle symbolical boundary to moderate and extreme physical boundary such as furniture, separation room, etc. in these questionnaires, it is expected that more physical boundary were given to less intimate guest such as `stranger/unfamiliar` guest, while less physical boundary are given to more intimate guests.

The questionnaires for donated post disaster housing both in core –structure housing in Tembi village and dome housing in New Ngelepen village consists parts of main research questions below: (attachment of questionnaires sample in appendix)

- Part 1 *Dwelling conditions and usage:* Previous and current house conditions, living situation, etc. (26 multiple questions, 5 open-ended questions), residents' recognition of room/space availability (7 open-ended questions), future preferences to add or alter the condition (1 open-ended question), changes residents have made to the original donated house (1 open-ended question) were assessed.
- Part 2 *Residents' evaluation of house design and outdoor spaces:* Residents were asked about their capability to control their house design, including flexibility, personalization, and maintenance (12 five-point scale questions), residents' agreement to situations related to the outdoor space of the house, neighborhood streets, and cluster facilities (10 five-point

scale questions). Related to evaluation questions, the question items were derived based on intensive field observations.

- Part 3*Participation in community activities:* Heads of households and their spouses participation in community activities were assessed (11 multiple questions, 2 open-ended questions).

2.4 Physical Data Collection

For physical data collection, details of physical condition of house outdoor space such as greenery, surface covering, objects, etc. as well as the residents activities such as household, leisure, socialization, storage, etc. on the plot were recorded and plotted

As Rapoport, 2005 said that the presence of such room settings and their names are culture-specific. In this study, to identifying each room (setting), author uses naming based on respondents interview mostly in Javanese language (some in Indonesian) and then translating it in English for the purpose of this dissertation writing. The naming of each space by respondents usually correlate to its main functions and the mainly appropriated activities conducted -- terrace, guestroom, family/tv room, dining room, bedroom, praying room, storage, kitchen, toilet, and so on –. In some cases an enclosed room can consist of two separate spaces that each space has their own main activities appropriation and can be differentiate by the arrangement of its semi-fixed elements such as furniture, objects, etc. In this case, after having the confirmation from respondents' interview, author differentiates it as two separate room settings for the analyses. In contrary, if an enclosed room consisted of multiple settings, whereas main activities appropriation differentiate only by time or situation and no differentiation of semi-fixed elements can be inferred to concluded it as separate space, then in this case author analyze it as one room setting.

2.5 Behavior Observation

Behavior mapping observations of residents' activities were conducted in dome housing settlement in August 2009 with the assistance of architecture student volunteers from Gadjah Mada University, Indonesia. The observations were carried on weekday and weekend covering all six residential dome housing clusters areas well as public facilities in New Ngelepen post disaster settlement. Place-centered behavior mapping similar to behavior mapping that Whyte W. (1980) conducted by observations on both weekdays and weekend. Volunteers were asked

to observe the residents' activities by walking a specific route within certain time interval and writing down data on types of behaviors, ages and sex, location, estimation time and number of people on diagram/maps. These behavioral maps consist of chart of people's location in place as an empirical document that describes what behaviors actually occurs rather than what was plan for the space (W.H Ittelson,H.M. Proshansky,& L.G Rivlin, 1970).

In order to coverage different types of outdoor activities in various time, the observation were made to assure a full span time of 8:00 to 19:00 (10 hours) with a total 20 hours full observation time of a weekday and a weekend. Considering the vast area of observation and limitation number of volunteers, the observation area were divided into two predetermined route based on the adjacent clusters; the A, B, C clusters route on the east side of main entrance street and the D, E, F clusters route on the west side of main entrance street. Each route takes approximately 15 minutes to fully complete, but since the time term unit is one hour, therefore within an hour, the same route will be observe four times to find out the duration of activities that happen as well as listing new additional activities. Two volunteers work as a team of observers; they walked together along the predetermined route and collect the data where each behavior was marked at the exact location where it occurred on a site plan map.

The context of observations included the number of users, users' gender, users' age range, location of activity, and type of activity. Before the observation started, a thorough inventory of the outdoor spaces was conducted. The outdoor space investigated in *New Ngelepen* consists of: public area (main village street), semipublic area (neighborhood streets, corner streets, facilities like playground, field, mosque, close by facilities, etc.), semi-private pathway and private courtyard.

In order to analyze quantitatively a variety of activities and users, types of activities and users' age were simplified further in some categories. The age of participants was judged by their appearance and classified into: elderly age over 50 years old, adult man, adult woman and youth age less than 15 years old. As for the type of activity were divided into 5 categories: 1) household activities, 2) relaxation, 3) economy related activities, 4) religious and 5) community activities. In this study, social activities were referred to as the observable behavioral interaction of two people or more, including nodding, talking, waving, and friendly physical contact etc.

CHAPTER 3 Social Interactions and Space Cognition in Self-built Housing

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3.1 Introduction

This chapter intends to reveal the community activities, social interaction and space cognition in self-built housing that author presumed as the most ideal dwelling condition because the residents built and design their house from temporary to permanent condition based from their own design cognition and appropriate situation.

Author presumed that the residents in self-built housing will have the tendency to build their dwelling back to their ideal situation before the earthquake in order to fulfill their needs and return to their previous lifestyle. In such constraint situation after earthquake, dwelling is not only about physical concern that shelter from the rain, wind, etc. but also have the importance of psychological concern such as privacy and social interaction. Therefore this chapter attempt to understand what is the situation in self-built housing as a dwelling for the residents, how the cognition of the space in their house, whether it is relate to their activities such as social interaction, how do they do the social interaction in their house, whether closeness gradient or sex differences have importance, etc. The method use for this chapter is mainly from questionnaires and interview with supported house plan data.Details the content of this chapter is as follows:

To reveal residents community activities questions relate to their participation, frequencies of accepting guests, borrowing activities, etc. is investigated

To reveal the social interaction in the house, the research questions include: *"how the residents in self-built housing accept guest in their house? "Are there any location differences in how the husband or wife accept guest in their house? "Is there any location difference in accepting different type of guest with different closeness gradient?", "what kind of behavior mechanism being appropriated if partner/ spouse accept guest in the same place while doing personal activities?"*

To reveal space cognition in the house, the research questions include: *"Is there spaces of the house that residents recognized as front-back, shown-hidden, etc.?", "whether all house plan from the most constraint or simplest situation to more complex always have space for social and personal?", Is there any space hierarchy within the house and how it relate to residents space perception of the house?"*

3.2 Community Activities in self-built housing Settlement

3.2.1 Residents' Perception of and Participation in Community Activities

In self-built housing community, first survey finding shows that over 90% of residents said they cherished traditional Javanese living practices and community values such as *gotong royong* (spirit of helping one another through good and bad) and *kekeluargaan* (feeling of extended kinship in which the community is considered to be one big family). Over 60% said these values grew even more significant to them following the earthquake.

Many recovery programs operated by NGOs and the government were community-based and designed to incorporate such traditional practices into the rehabilitation process. Woman were gather cook together in the public kitchen and arrange the usage of public kitchen and usage of wells, while the man gather together to clean up wreckage debris and built the temporary house together. In the second survey, although community based post disaster activities had stop but the interaction between the neighbors are still high where the data shows higher values of 95%.

Residents in self-built housing have good relationship with their neighbors. More than 50% man residents 'frequently visit each other for no specific purpose and for the woman although it is lesser value of 40% but an additional 20% of them 'casually chat at house terraces' which is higher than man that only less than 10%. In many cases casual chats happen for housewives while they take care of children on the front yard. More than 20% for both husbands and wives that visit each other for specific purpose and around 15% of them have relationship with their neighbors at 'meeting on community activities. See figure 3.1

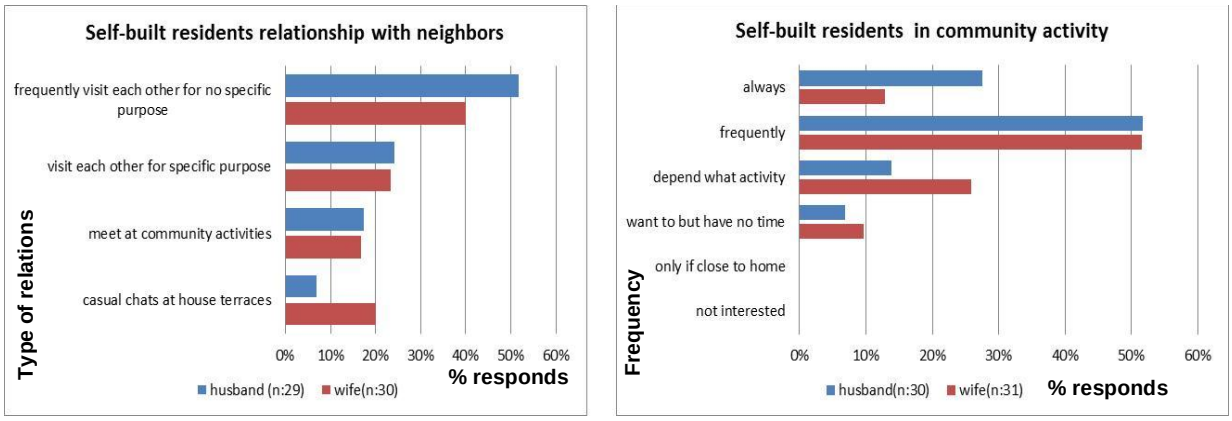


Figure 3.1 Self-built residents' relationship with neighbors and participation in community activities

Based on 33 respondents, accepting guest activities in the house occurs 40% for always (almost everyday occasions), 39% frequently (at least within a week), 15% sometimes (within month) and only 6% invite guest if they have occasion. Receiving large gathering guests also a custom in Java society, more than 84% residents involved in social organization or gathering of their neighborhood which required them to accept large occasion guests in their house. Borrowing behavior between neighbors also take place for more than 30% frequently(within a week) and 43% rarely(within a month) which include borrowing kitchen utilities, appliances and even food materials such as rice, eggs, etc. (see Figure 3.2)

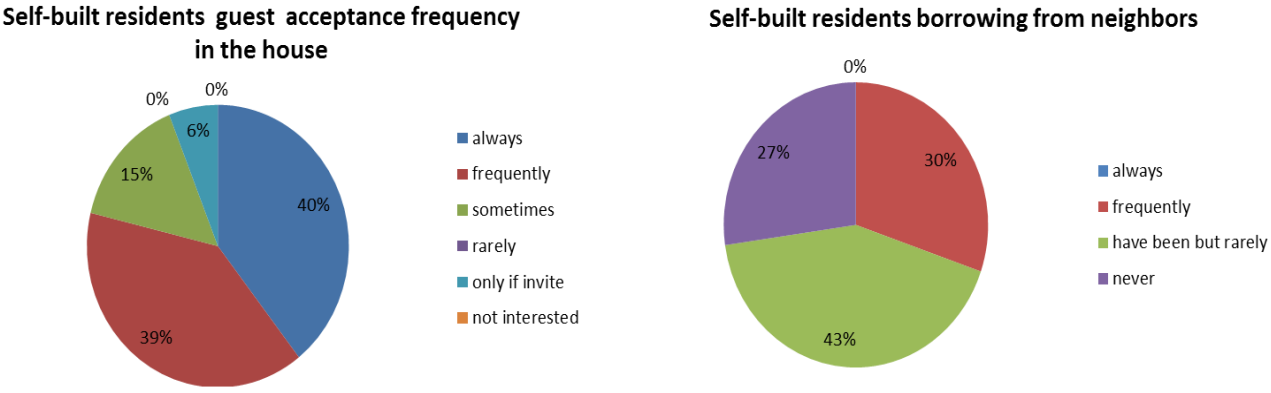


Figure 3.2 Self-built residents' guest acceptance in the house and borrowing activities from neighbors

3.2.2 Community Activities Before and After Earthquake

In self-built housing settlement, the previous social networks in the communities itself plays vital role in rehabilitation process. `*Rukun Tetangga*`(*RT*) a**s** the lowest sociopolitical hierarchy is not only works as a sociopolitical territorial unit but moreover as a community unit where they work and help each other. Other prior community organizations such as *Karang Taruna*` (the youth organization), `*PKK*` (the woman organization), etc give a lot of contribution in the recovery programs (see Table 3.1 for community activities). This traditional lifestyle, spirit and social networks had been going on for centuries in Javanese communities.

Another factor that is also important to advances the recovery process is the residents` place attachment to their neighborhoods. In self-built housing results revealed that more than 90% of the residents still live in their own property and almost 80% of them are not willing to be relocated to a new resettlement area. The reason for this preference might be caused by their familiarity to the surroundings and better access to the physical source, family supports and social networks. In most recovery cases, residents made their own motivation and efforts to progress their own recovery in fulfilling their needs and rebuilding their own house.

Table 3.1 Community Activities in self-built housing

Community Organization	Activities before Earthquake	Frequency	Activities after Earthquake	Starts from
RT/RW	beurocracy, sharing information, organized plan for community, etc	1-2x a month/in event	beurocracy, distribute donation, information post, education lecture and training, arrange recovery program	earliest 1st week
Karang Taruna	community event organizer such as wedding, independence, funeral, etc.	1-4x a month/in event	Cleaning up the debris, distribute donation, reconstruction public facilities.	earliest 1st week
PKK	sharing information for housewives, arrange health programs for mom and kids, lottery, preach, etc.	1-2x a month	public kitchen works, arrange public toilet use and wheel, psychological recovery program, etc.	earliest 1st week
Pos Kamling	Community security night watch guarding	every night	Community security night watch guarding	earliest 1st week
Takmir Masjid	arrange preaching, Friday pray, Islam religious occasion	1x a week	preaching, Friday pray, psychological recovery program	earliest 1st week

3.3 Residents' Social Interactions

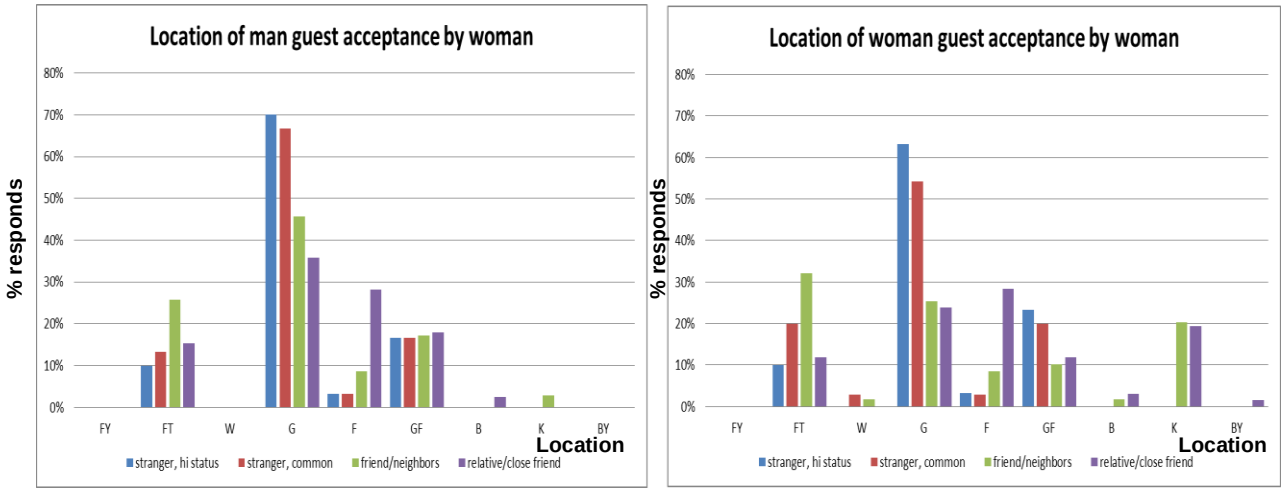
To understand how residents interact with other people in the house, residents were interviewed with structure questions about the location to accept various type of guest and what kind of behavior when their partner/spouse accept guest in the house in the same room they do personal activities. Open question on location in accepting guest and multiple question of behavior mechanism were asked to the respondents as follows:

1. Where is the location you(husband and wife) accept different type of guest as follows:
   a) *Stranger, high status*
   b) *Stranger, common status*
   c) *Friends/ Neighbours*
   d) *Relative/close friends*
2. If you are doing important personal activities, suddenly your partner/spouse is going to accept guest in the same room with you are doing your personal activities, what are you going to do?
   a) *I don't care. I will still do my activities in the same room without physical or behavioural distance.*
   b) *I will do my activities in the same room with behaviour distance such as move to the corner of room or looking away.*
   c) *I will still do my activities in the same room with physical distance such as furniture change, etc. that signage my territory.*
   d) *I will do my activities in another room*
   e) *I will stop my activities and go outside*
   f) *I will stop my activities but stay to accept guest with my partner/spouse*
   g) *Others*

3.3.1 Location of Guest Acceptance gradient by Different Guest Type and Sex Difference

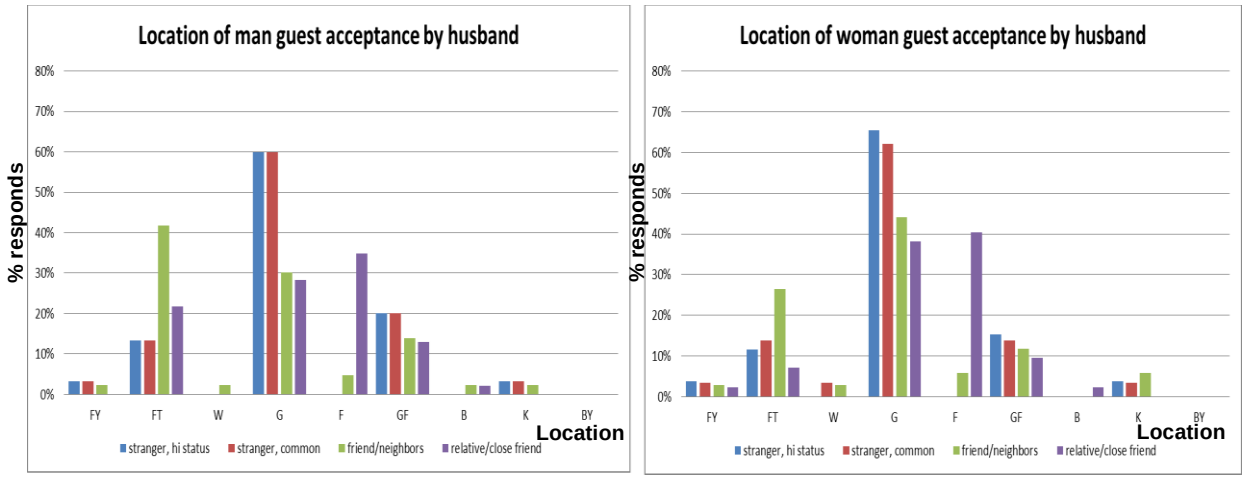
The result shows that all guests are accepted in front terrace, guestroom and guest-family room, while bedroom are less likely to be the place to accept guest, except for friends/neighbors or relative/close friends. For both husband and wife, there is high similarities location of guest acceptance for stranger with high status and stranger with common status, more than 60% of stranger for both status are accepted in formal guest room (or guest-family room in case guest room only not available), see figure 3.3

Acceptance for friends/neighbors are more variable that can be accepted in either formal guest room or non-formal family room, ranging from most open spaces like front yard until private space like bedroom and kitchen. Location of acceptance for friends/neighbors is the highest in the front terrace which is more open are/public (ranging 25-43% compare to under 20% for other type of guests), while relative/close friends is the highest to accept in family-room (ranging 30-40% compare to 10% for other type of guests) and even in more private area like bedroom. See figure 3.3. Acceptance of either man or woman guest by husband is almost equivalent for all types of guest which are mostly art guest room and family room. Wife accept woman guest either for friends/neighbors or relative/close friends around 20% in kitchen in contrary with the acceptance for man guest that is only less than 5% for friends/neighbors only. On the other hand, husband is rarely accepts guests in the kitchen with only less than 5% acceptance. See figure 3.4. This condition is relevance to resident's space cognition of public/private which indicates that the closer the interpersonal level is (intimacy), the more penetrate the guests to private space. However, the peculiar finding show for neighbors/friends` guest where acceptance is higher at outer terrace area even rather than `stranger`. This could be influence by the fact that neighboring activity occurs almost everyday frequency therefore there is no needs to be accepted formally inside the house.



FY: Front yard, FT: Front Terrace, W: working area, G: Guest room, F: family room, GF: guest-family room, B: bedroom, K: kitchen, BY: back yard

Figure 3.3 Location differences when wife accept different type of guest



FY: Front yard, FT: Front Terrace, W: working area, G: Guest room, F: family room, GF: guest-family room, B: bedroom, K: kitchen, BY: back yard

Figure 3.4 Location differences when husband accept different type guest

3.3.2 Behavior when partner/spouse guest accept guest

The results for behavior mechanism in accepting partner/spouse guest in the same room while doing personal activities shows that for both husband and wife, there is similarities of behavior mechanism for stranger with high status and stranger with common status(if there were differences between two categories only range 0-5%). For husbands, results shows that almost 50-60% prefer to "stop my activities but stay to accept the guest with my partner/spouse "if the wife's guests is stranger, while for wife reaction when husband's guest is stranger shows only 25-40% for same responds. Though, a higher responds for "I don't care. I will still do my activities in the same room without physical or behavioral distance "if the stranger guest is a man with responds of 25% compare to husband's response of less than 10%. See figure 3.5

For reaction toward friend/neighbors or relative/close friends categories, husband and wife have higher difference. For husband, results shows that almost 50-60% prefer to *"stop my activities but stay to accept the guest with my partner/spouse"* if the wife's guest is a man but only around 10% same response behavior if wife's guest is a woman, in contrary to higher responds of 40-50% for *"I don't care, I will still do my activity in the same room without physical or behavioral distance"* if wife's guest in a woman compare to 15-25% if is a man.

For wife, reaction if husband's guest is man or woman friend/neighbors or relative/close friends categories shows similarities with only 0-10% difference behavior for *"stop my activities but stay to accept the guest with my partner/spouse"*. See figure 3.6

From the results, we can conclude that residents responses for personal behavior mechanism when partner accepting guest while doing personal activities in the same room has shown high tendency of behavioral boundary mechanism than physical boundary mechanism. This is shown by their higher preference to stay at the same space as partner accept guest by either keep doing what he/she was doing before or stop doing what she/he was doing before and accept partner guest together rather than preference to continue doing what he/she doing at different space or go out of the house. Interesting finding is the high tendency for Javanese people prefers courtesy where he/she would stop what they are doing and prefer to stay and accept partner's guest together. This tendency is even higher if the partner is accepting opposite guests.

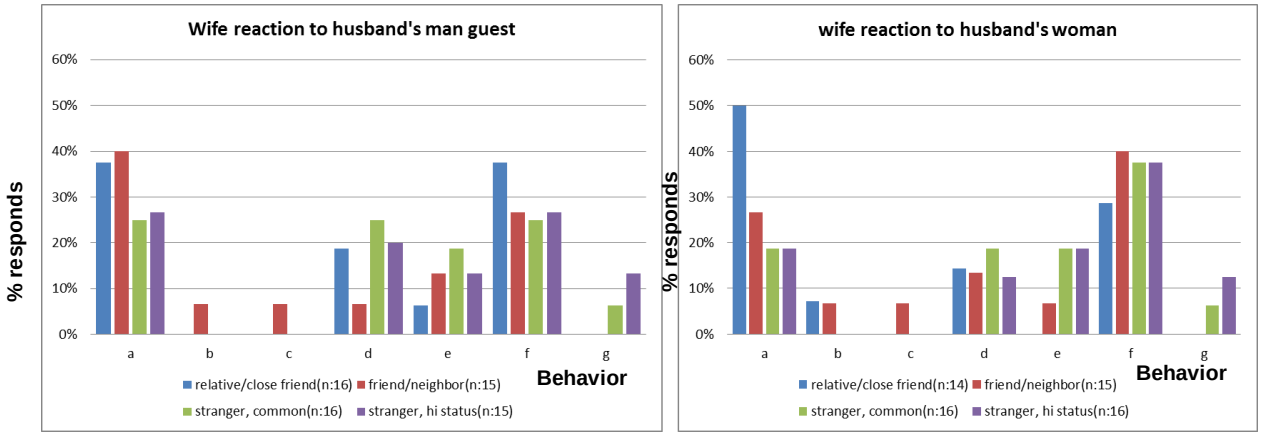


Figure 3.5 Wife behavior mechanism when husband accept guest in the same area doing personal activities

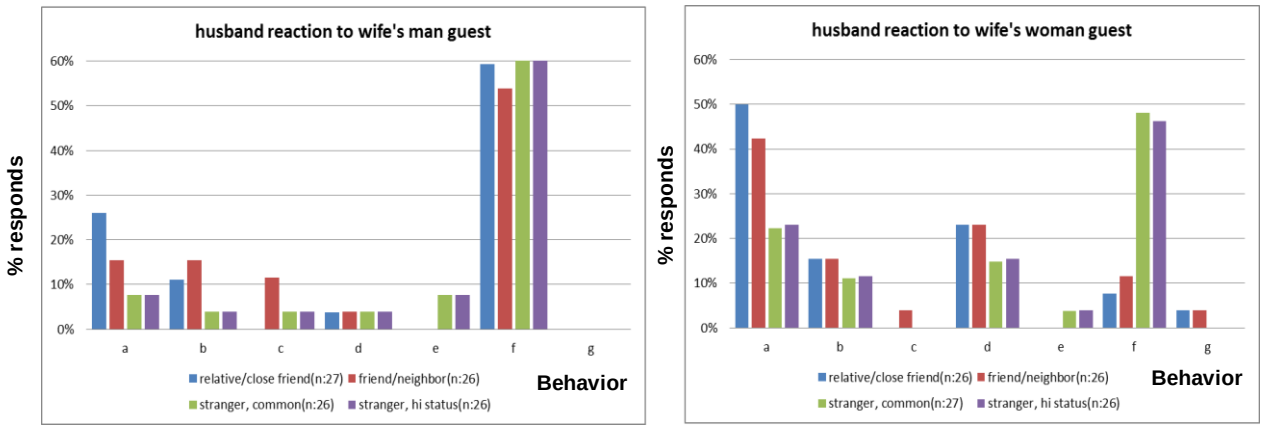


Figure 3.6 Husband behavior mechanism when wife accept guest in the same area doing personal activities

3.4 Residents' Space Cognition

3.4.1 Space Cognition of the House

In order to understand residents cognition toward their self-built dwelling, the residents were asked open ended questions relate to the space in the house that they considered as front-back, shown-hidden, family occasion, personally like and always cleaned

In the findings shows that residents acknowledge a differentiation of front-back and the cognition of front/back area have correlation to hidden/shown area to other people (Figure 3.7). The spaces that considered front area in the sequence from the highest are front yard, front terrace and guestroom. Response relate to front area also have the highest recognition as a space for family occasion and personally liked (although there are answer relate to animal house cognition on which in recognize as back but it is because it's a hobby therefore it is also space they personally like). The spaces that considered back area in the sequence from the highest are kitchen, toilet, animal house, back yard, bedroom and well/washing area.

This supported by previous research on traditional dwellings where front of house is outwardly-oriented domain where domestic prestige displayed in form of status differences and formality in meeting others (Revianto, 1997).

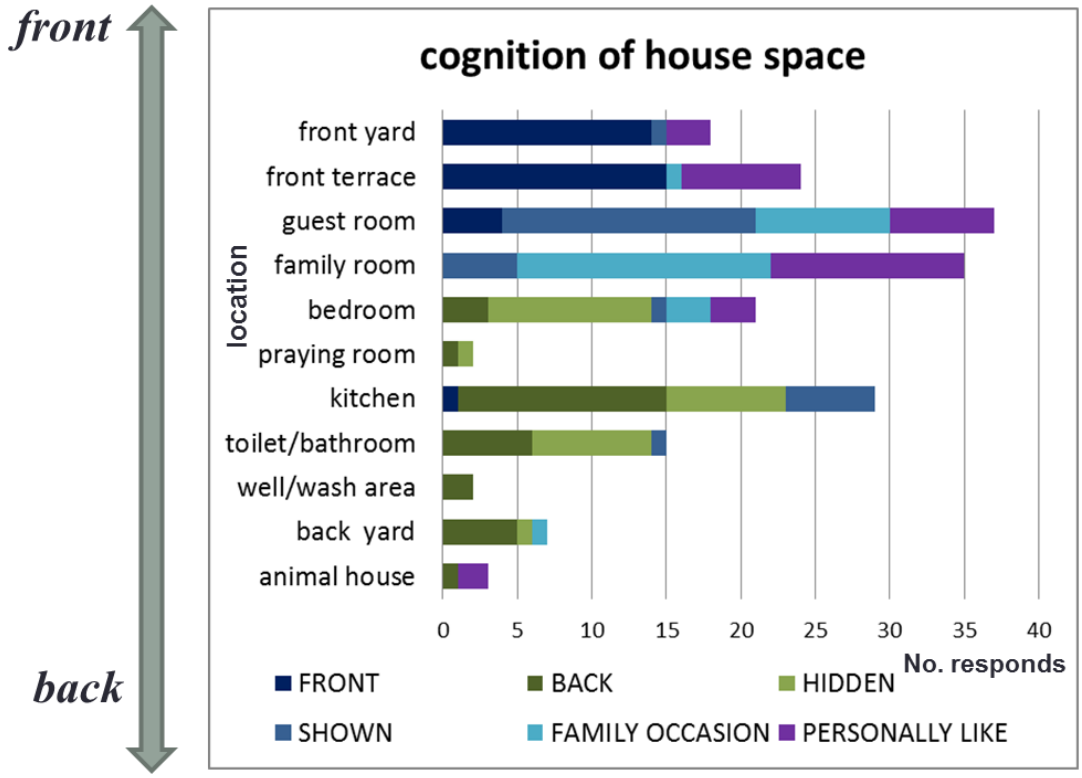


Figure 3.7 Self-built residents' cognition toward their house space

3.4.2 Activities in the House

From the interview, the naming of the room and how residents appropriate activities in the room has a relation for example a formal space where residents accept guest is called guest room, place for sleep is bedroom, place for praying is praying room, place for family interact is family room, etc. Although sometimes the room is occupied for different type of activities but the divided spaces are coded by the residents with specific functional names for the main activities it is mainly facilitated.

These domestic activities such as sleeping, eating, cooking, bathing, chatting with family, relaxing, praying, etc. are done in designated functional space to be maximally utilized for daily living. The flexibility of room usage was done by the placement of many furniture and appliances to differentiate the territorial border difference for different functional space. This is especially done for the mode of accepting guest and accommodating large gathering. The furniture or other semi-fixed elements have to be removed and rearranged to provide enough space for accommodating the large amount of people.

To analyze how residents use their house space, we asked an open ended question of the location where the residents do activities; eating, sleeping, praying, reading/studying, relaxing, washing clothes, washing dishes, cooking, accept guest, bathing and take care of children. The questions were asked in both surveys when they still live in temporary and permanent house.

From figure 3.8 and 3.9 we can see that there is a similarity tendency of residents' activity in temporary and permanent self-built housing whereas activities social interaction/accepting guest, relaxing, reading and studying is located in the front area of front terrace, guest room, family room, activities sleeping and praying in more private bedroom and specific praying room and household activities cooking, washing dishes and clothes on the back area kitchen, toilet and washing area.

Result shows that in temporary housing condition, private activities of bathing and household activities cooking, washing dishes and clothes were mainly done in public facilities or in area that is shared with others such as neighbors.

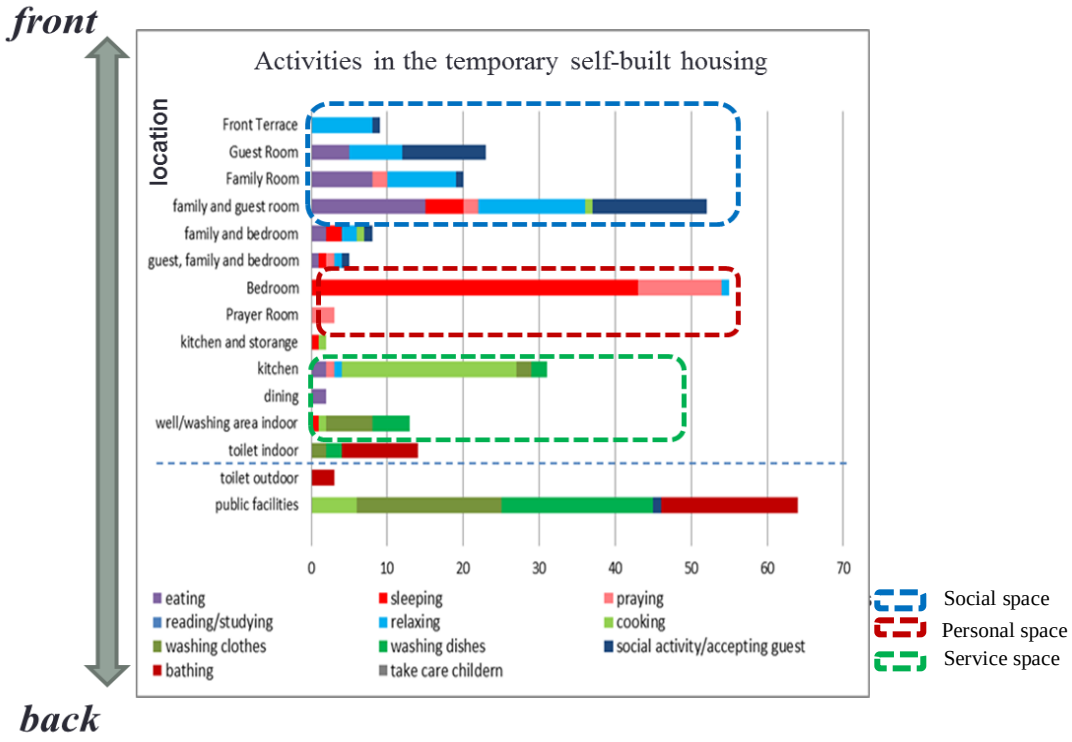


Figure 3.8 residents' activities in temporary self-built housing

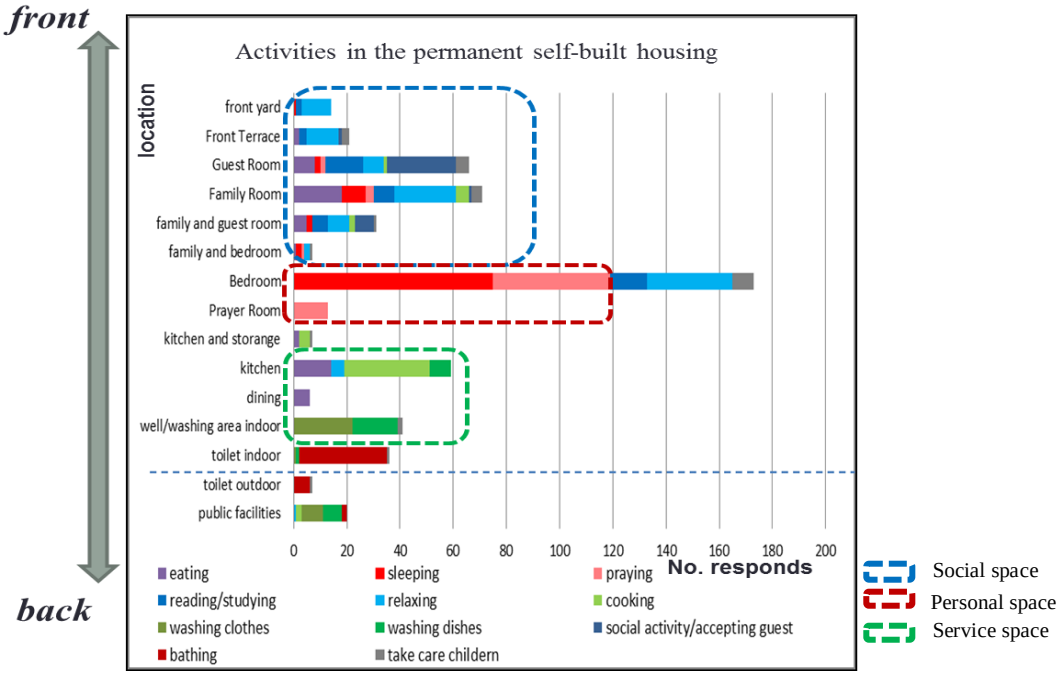


Figure 3.9 residents' activities in permanent self-built housing

By analyzing only the activities in the basic spatial units of guest room, family room, bedroom, kitchen, toilet and washing area, the results shows that there are activities that integrated and separates from the temporary housing condition to permanent condition in

self-built housing. The activities of eating, accepting guest and relaxing in guest-family room in temporary housing when the space separate to guest room and family room, accepting guest behavior mostly moved to guest room while a separate family room facilitates more various activities not only eating and relaxing but also take care children, sleeping, studying, cooking preparation etc. While in temporary housing bedroom mainly facilitate sleeping and praying but in permanent housing take care of children relaxing and studying also take place in bedroom. Kitchen in permanent housing also facilitates more activities, not only cooking but also eating, washing dishes and relaxing. See figure 3.10

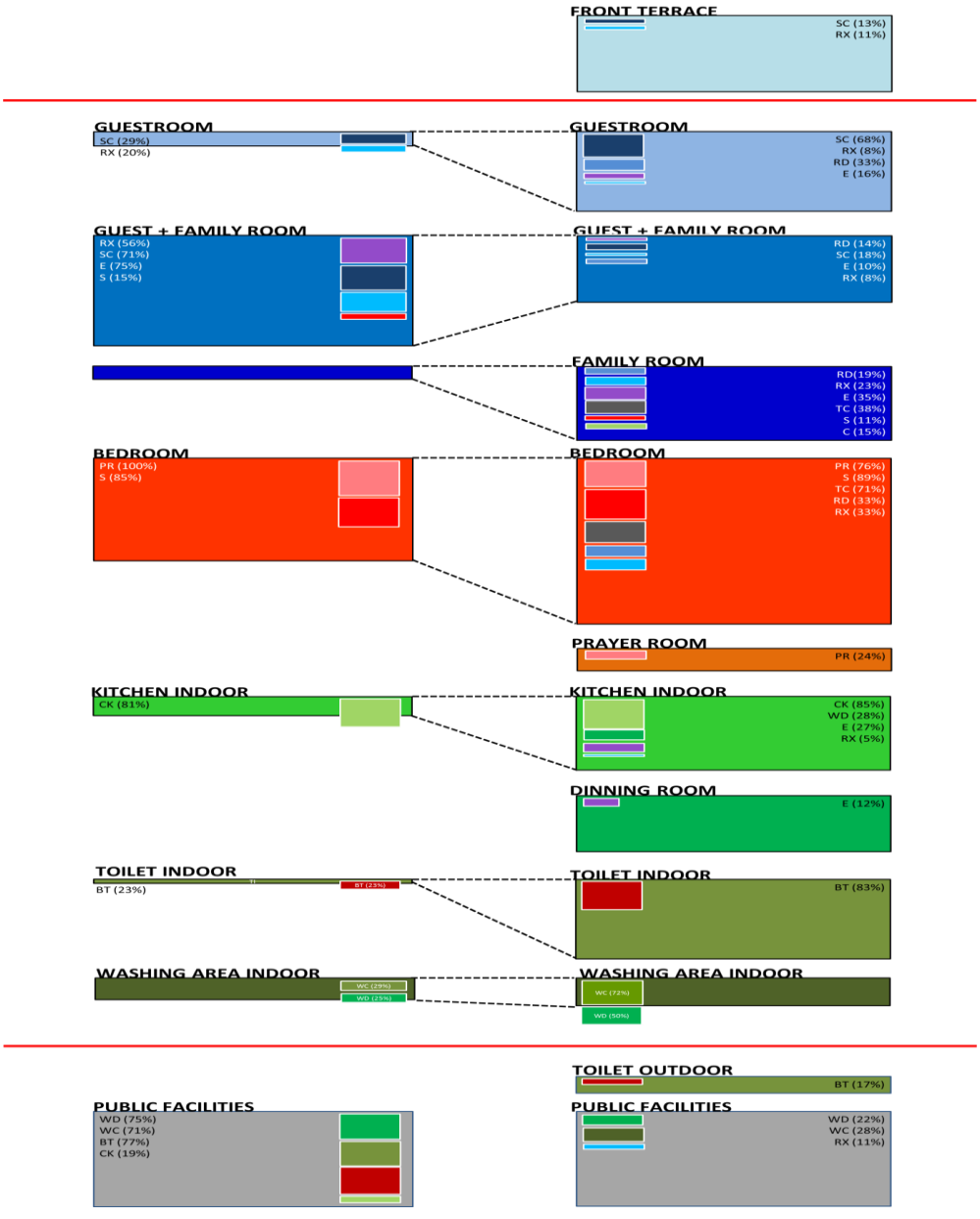


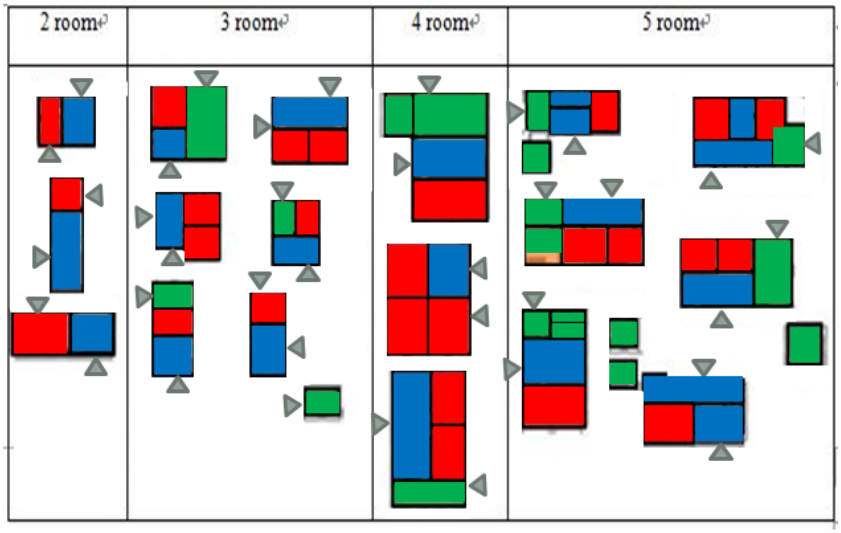
Figure 3.10 specific analyses on activities in basic spatial room in self-built housing

3.4.3 Relationship between Space Cognition and Room Arrangement.

a) Social-private space existence in self-built housing

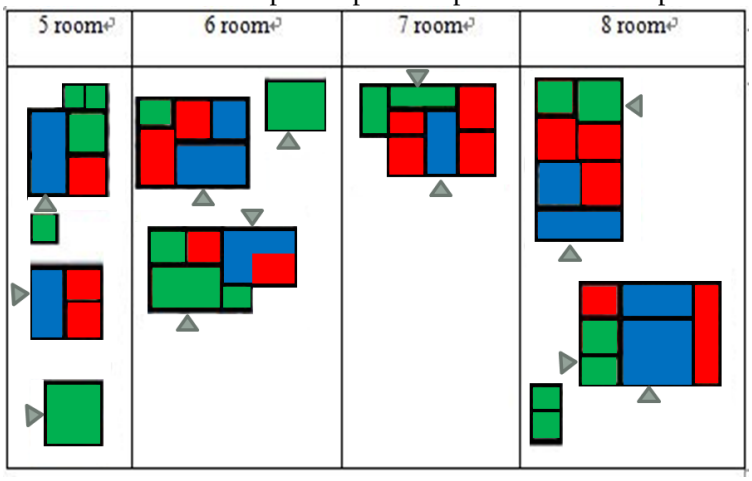
In both temporary and permanent self-built housing showed the existence of social-private spaces even in the simplest house plan by using semi fixed element to differentiate private/public space such as the use of furniture, semi fixed partition, etc. In table 3.2 and table 3.3 we can see examples of private-public space differentiation from self-built temporary until permanent housing. The simplest house plan can be observed is in temporary self-built housing with two room arrangement consist of GF (guest-family room)-B (bed room). In both temporary self-built housing, the composition of GF-B where GF as social space that separate from private bedroom can be found in 21% of temporary self-built housing. The composition GF can be found in 67% of temporary house and only 31% in permanent The addition of service area like kitchen and toilet is usually added after the social and private space need is fulfilled. The more complex and larger number of rooms in the house, usually the resident has the tendency to separate social space guest room with family room. The composition of separate guest room and family room or G-F in temporary house is 21% and in permanent house is 63%. .Beside the needs of social space in inner house as a formal guest acceptance area, social space outside the house is also facilitates in front terrace that also acts as guest acceptance area depends on the type of guest and occasion as explain in previous section. In temporary 11% and permanent self-built house 34% have front terrace. Example of existence of public-private space in self-built temporary and permanent housing can be seen in table 3.2

Table 3.2 existence of public-private space in self-built temporary housing



Blue area: social space guest room and family room; red area: private bedroom; prayer room, green area service room like kitchen, washing area, toilet or storage

Table 3.3 existence of public-private space in self-built permanent housing



Blue area: social space guest room and family room; red area: private bedroom; prayer room, green area service room like kitchen, washing area, toilet or storage

By looking through the existence of public-private space in self-built housing from temporary to permanent self-built housing we can make a diagrammatic existence of the spaces as follows:

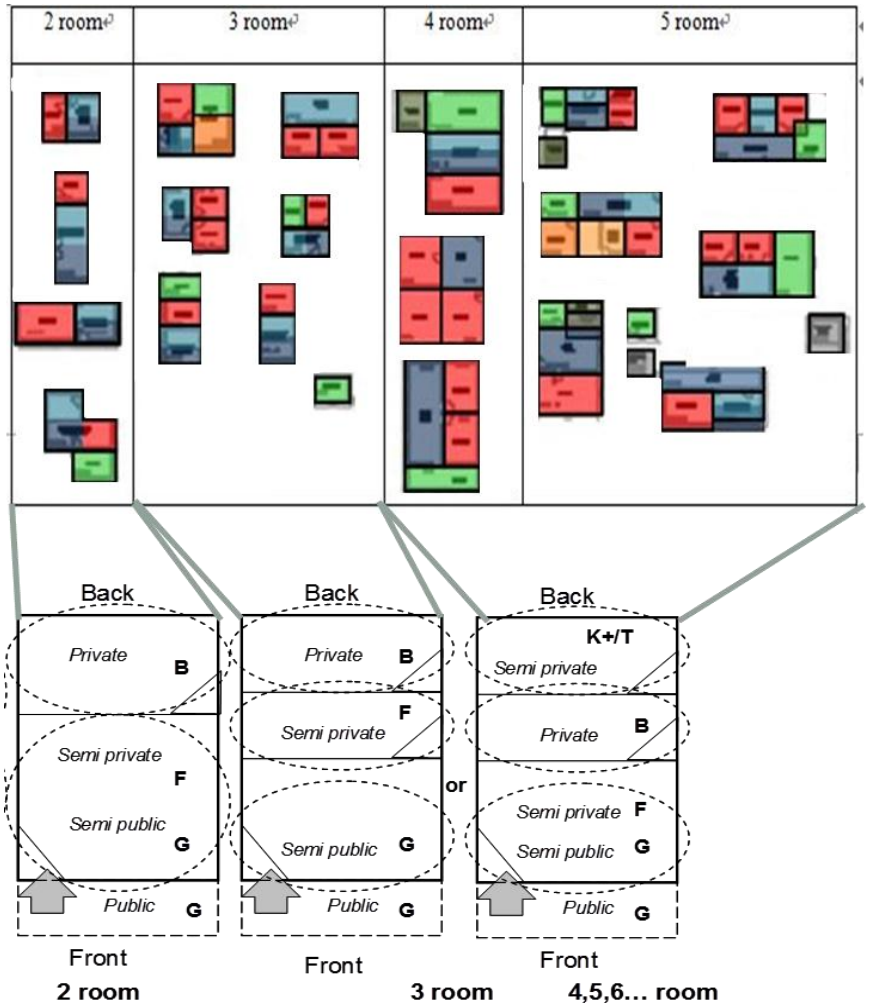


Figure 3.11 Diagrammatic existence of social-private area in self-built housing

b) Front-back relation to room arrangement

Based on residents answer in previous space cognition based on interview section, author try to see how front-back space cognition related to the room arrangement in the house plan. The rooms that considered front are usually either front yard that connects directly to the streets or passageways, front terrace and guest room (or guest-family room). From the outside front yard for both temporary and permanent house total of 45% connect to front terrace, 36% to guest-family room, and 16% to guest room.

Residents usually have social interaction by entertaining their guests in the house either in the formal guest room or guest-family room, although depends on the type of guest other rooms can also be used as a place to accept guest as explain in previous social interaction section. In general, they will certainly ask them to sit at the guest area and any guest can come without appointmentGuest-family room or a separate guestroom and family room are usually integrated or arrange next to each other. In both temporary and permanent house, guest-family room as an integrated room consist of 46% and connection of G-F as separate room next to each other is 45%. It is usually at the center of the house which also has the most connection to other rooms such as bedroom and service area in the back like kitchen and toilet. The dining room, storage and kitchen are either connected or combined located in the back area. Sometimes the use of corridor is as an open passage between the rooms from the front area to the back area. Example of type of room arrangement in self-built related to front-back area in figure 3.12

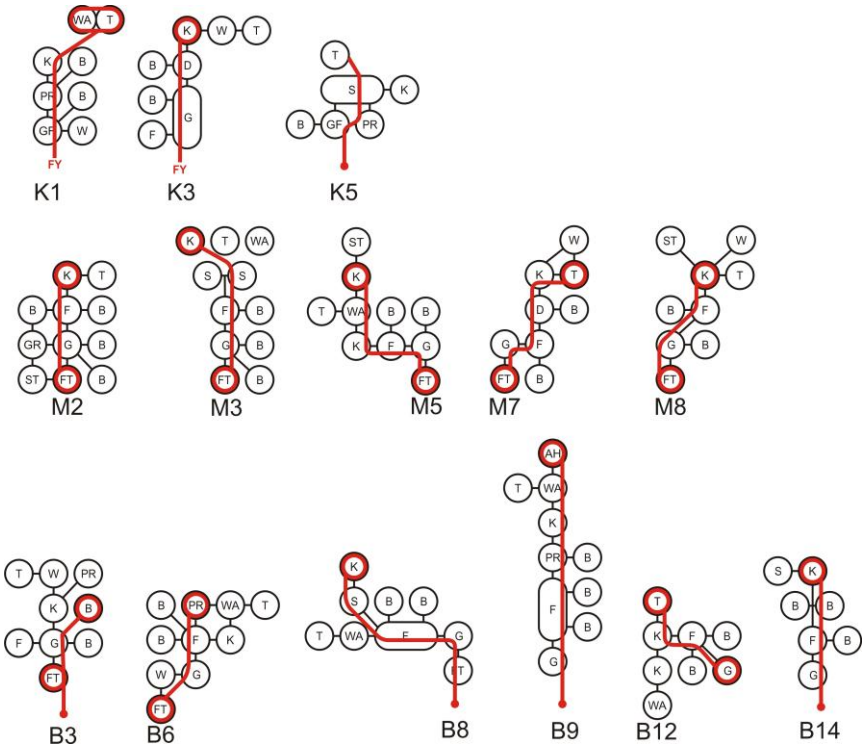


Figure 3.12 Guest-family rooms connection in self-built housing relate to front-back space

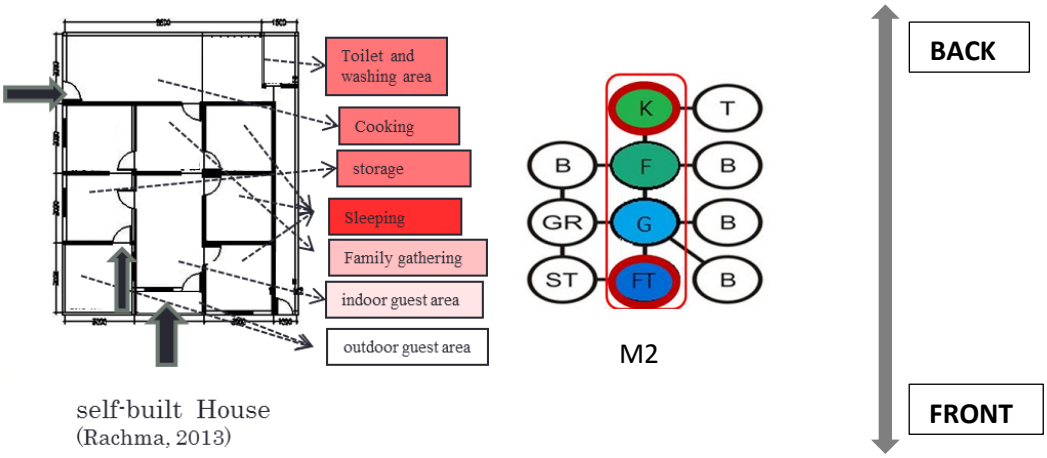


Figure 3.13 diagrammatic room arrangements in self-built housing and front-back relation

c) Multiple entrances in self-built housing

Most of self-built housing have multiple approaches/entrances to the house to facilitate the need of separate entrance of male and female in case of gathering as well as differences entrance appropriation for different the of guest. The order of approaching from outside is either first to entrance the guest room (for male gathering or formal guest such as stranger), then to inner rooms such as family room or bedroom. Other entrance is from the back yard to kitchen (for female gathering or guest such as friend/neighbor guests) then to dining and inner room. In some cases, there is also side entrance existence that have similar function like back entrances. Mostly used by the core family occupants and sometimes for guest such as relative/close friends.

Importance of private-public space is supported by residents' cognition of front/back area. Residents' spaces cognition of private/public, front/back, shown/hidden are much related with 'self' (personal) and 'other' (interpersonal) space domain that actualize in the arrangement and allocation of the spaces. It showed embodied principal ideas underlying the formation of a domestic setting as place to live and interact with others in their post disaster housing.

3.5 Conclusion

This chapter intends to reveal the community activities, social interaction and cognition of space in self-built housing that author presumed as the most ideal dwelling condition because the residents built and design their house from temporary to permanent condition based from their own design cognition and appropriate situation.

Results self-built housing shows that residents highly cherished their traditional Javanese living practices and community values such as *gotongroyong, kekeluargaan etc.* Residents' relationship with their neighbors is highly maintains not only in community activities participation but also in daily activities of accepting guests in the house and borrowing activities.

Related to how the residents have social interaction in self-built housing; residents received the information of their guest relative to them in order to be able to service in a proper way and place. The results shows that sex segregation as well as closeness gradient/familiarity in accepting guest has an important meaning for self-built residents' social interaction as well as the context of visiting importance, formal-informal and private-public space of conversation are also being considered.

From the results author can conclude that the consideration for social interaction in the house are as follows:

- "Sex differences in the location of accepting guest, which include different location of accepting guest for husband and wife as well as different location of accepting man guest and woman guest". In previous study about Javanese Kampong, Sullivan (1992) implied that men are dominant in the public sphere while woman are more in the private-domestic sphere. Based on the results, the different sphere in which husband and wife accept guest as well as different location of men and women guest are accepted is also found in self-built post disaster housing. Meeting with others in the front area such as guest room often associated with men as house representative that accept guest formally whereas female domain is inside and back part of the house as supported by Revianto (1997) that said that man association with more formal role, they are often accepted in more public space which is front area. On the other hand, domestic role associated with women made they tend to accept guest in more private area where is less formal.
- Sex differences in the behaviour of accepting guest which include different behaviour of accepting guest for husband and wife relate to the difference of accepting man guest and woman guest

- Difference in location acceptance for different closeness gradient/familiarity in relation to indoor and outdoor space". In traditional Javanese dwellings, importance and values of the *dalem* (as a term inside the house or indoor space) relate to consideration of the formality and dignifying the guest. Therefore it is understandable that the results shows that stranger categories is highly accepted in more formal guest room inside the house instead of outside area like front terrace. Most residents fell obligated to politely offer the guest to go inside the formal guest room and even offer drink or snack out of politeness to dignify the guest as well as to show the position of themselves as a host. Revianto (1997) said that people identified their partner's position relative to himself to be properly interacts with them. Information of people's social rank in particular communal activities needed to guide how to interact with them

From the results we also know that the importance of having social interaction is actually reflected in their perception of their house and actualization of their self-built housing which are as follows:

- "There is always an existence of private-public space to receive guest inside the house, with the division of space or semi-fixed attributes". The existence of guest area existed from the outdoor space like yard and terraces until indoor space like specific guestroom, family room, kitchen, etc. depend on the condition of the house. If the resident only have one room in the house usually outside space for terrace or yard is used as guest non formal guest area for social interaction by giving semi-fixed attributes such as benches, etc. though depend on the type of guest or visiting importance sometime will also invited inside the house. When residents' economy gets better they will provide guest room or an area inside the house that can be used to receive guest that is separate from their bedroom (in the case of two rooms house, this guest area usually also acts as family room, then so called guest-family room). In case residents have more than one rooms that can be occupied to received guest, they will choose the place considering their human-social relationship and contexts of conversation. If the visitor is relatives/close friends, they also could be received in private area like family room or even bedrooms.

- Respondents' cognitions of private/public, front/back, hidden/shown spaces are much related with the arrangement and allocation of 'self' (personal) and other' (interpersonal) space and it is interrelated in spatial arrangement of fixed and semi-fixed elements of the house. These findings are relevant to Java traditional housing that contains both interrelated `self` and `others` domains (Revianto, 1997). In self-built housing, the front-back area have relation in the arrangements of room in the house where we can find tendencies to have front area relate to social interaction space such as front terrace and guest room and back areas relate to service areas such as kitchen, toilet and well/washing area.

  The results about residents' activities also show that residents' appropriate certain activities according to the cognition of designated –functional space to be maximally utilized for daily living. Although sometimes the room is occupied for different type of activities but the divided spaces are coded by the residents with specific functional names for the main activities it is mainly facilitated.

CHAPTER 4 Physical Adjustments in Post Disaster Housing
4.1. Introduction
4.2. Physical Changes from Temporary or Core Housing to Permanent Housing
4.2.1 Room Addition and Extension
4.2.2 Changes in Room Composition
4.2.3 Types of Changes in Addition and Composition
4.3. Conclusions

4.1. Introduction

In previous chapter community activities, social interaction and space cognition in self-built housing was analyzed in order to understand residents' ideal situation. This chapter tries to find out what kind of physical changes made in temporary to permanent self-built post disaster housing as well as donated core-structure and dome post disaster housing from the donated core housing to permanent housing. Physical data of house plan were analysed to see the adjustments being made.

4.2. Physical Changes from Temporary or Core Housing to Permanent Housing

4.2.1 Room Addition and Extension

During two years periods from the first survey to the second survey in self built housing, significance size and number of room expansion from temporary to permanent houses increase more than two times its temporary size. For both self-built temporary houses and permanent houses, total size indicates that bedroom is the largest space in the house however guest room size had expanded the largest by more than five times its original size. Social interaction spaces have more variation not only guest room, front terrace, side terrace, family room, etc. Service areas such as kitchen, toilet and washing area also increase almost three times, which is understand considering residents used shared public facilities before (Figure 4.1). In self-built temporary and permanent structure that still being used simultaneously shows that social interaction space is the largest space as well as the earliest space provided in permanent structure (figure 4.2).

Changes from donated core-structure house to permanent condition being used shows significance size and number of room expansion increase more than two times its core-structure house size. When core-structure houses were donated, the multifunction guest-family room is the largest size room and then bedroom. By the time of the survey, the significant addition and changes were made to the addition of front terrace and service room such as kitchen, toilet and well, though mostly added because it's not available when donated. Previous multifunction guest-family room decreases by more than 40% because the need to have formal guestroom became necessary that influence the separation of guest room and family room.

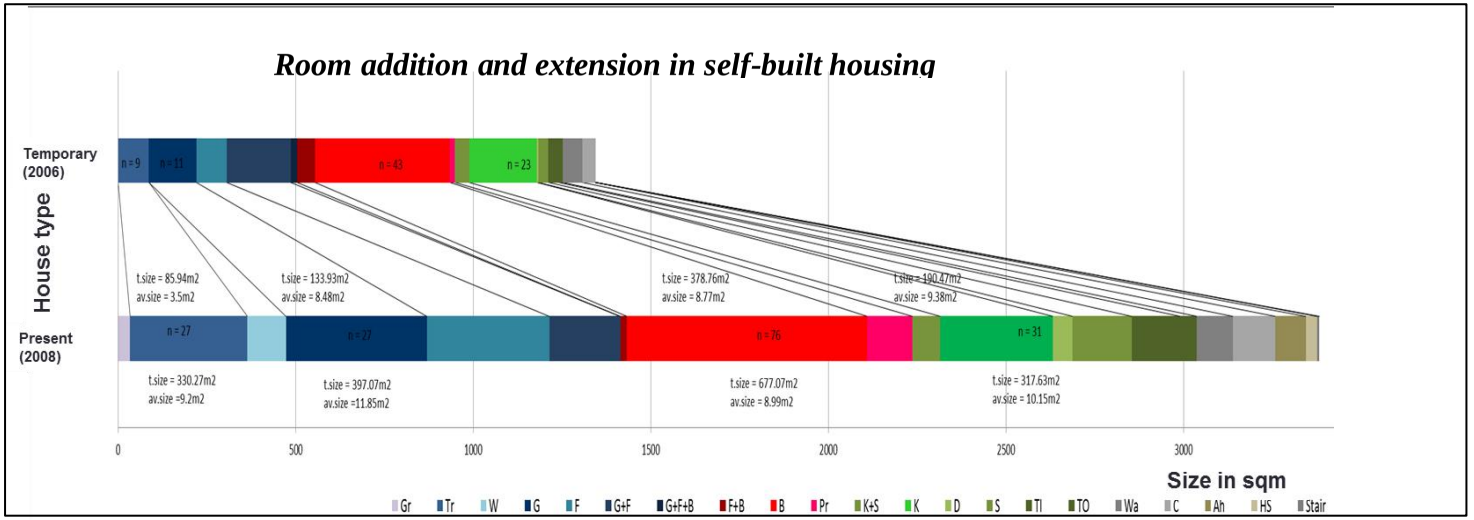
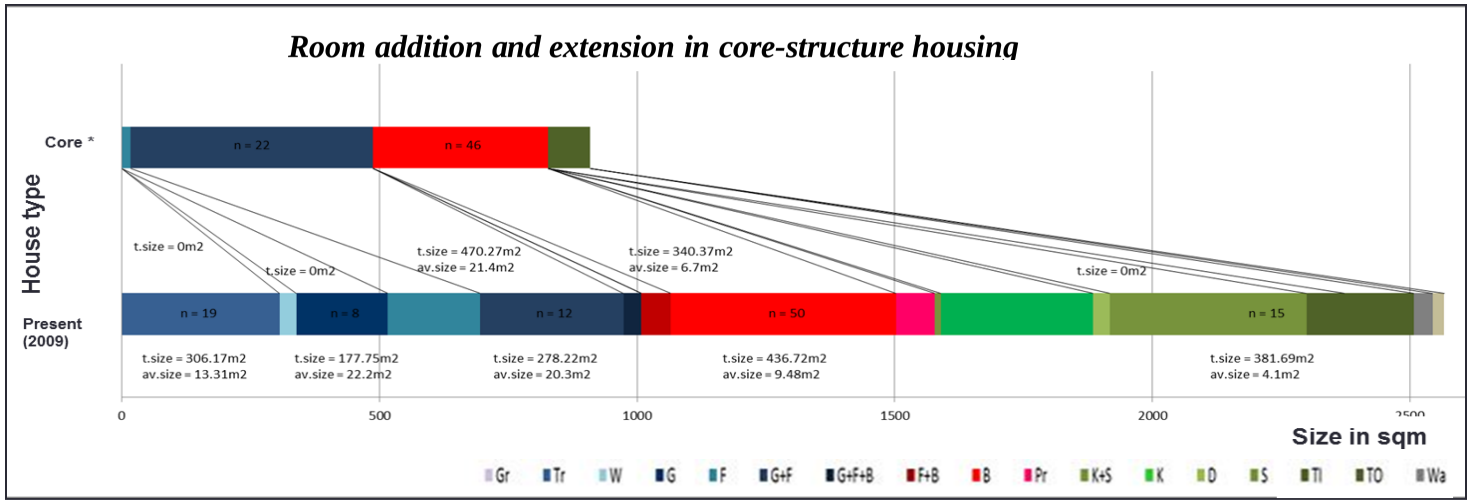


Figure 4.1 Self-built Room Additions and Extension



FY: Front yard, TR: Front Terrace, W: working area, G: Guest room, F: family room, B: bedroom, PR: praying room D: dining, K: kitchen, S: storage, T: toilet, Wa: well BY: back yard, AH: Animal house

FRONT **BACK**

Figure 4.3 Core-structure housing room addition and extension

From the total size indicates that bedroom is the largest space in the house however if adding up front terrace and guest room for social interaction then the size had expanded larger than bedroom (Figure 4.3). Moreover, integrated multifunction guest and family room had decreases more than 50 % but separate guestroom increase more than 50%. In core structure house social interaction spaces also have more variations. The finding both in self-built and core-structure physical adjustments finding emphasize the needs of guest room for interaction space with guests to be separated from family room as interaction space for family.

By the time of survey in dome housing, New Ngelepen village in August 2009, the physical changes from donated core dome house to permanent condition being used shows that there are not many physical changes made. By the time of the survey, the highest room addition was made to service area such as kitchen (44%) or storage which mostly by adding fully detached structure since it is not easy to add or adjust to the structure of dome house. Other significance changes made to the dome house are adding eaves/canopy (94%) for shading as well as social interaction space and personal water installation (44%) see figure 4.4.

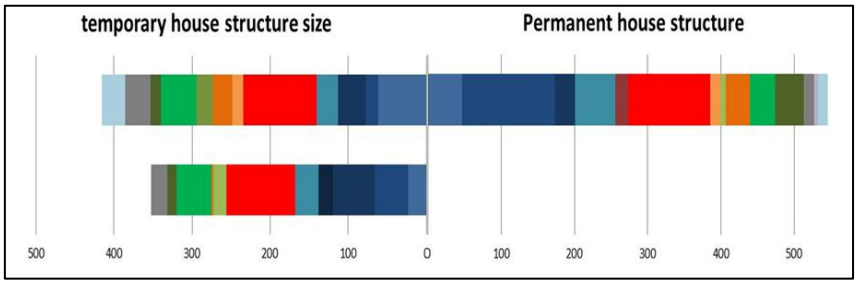
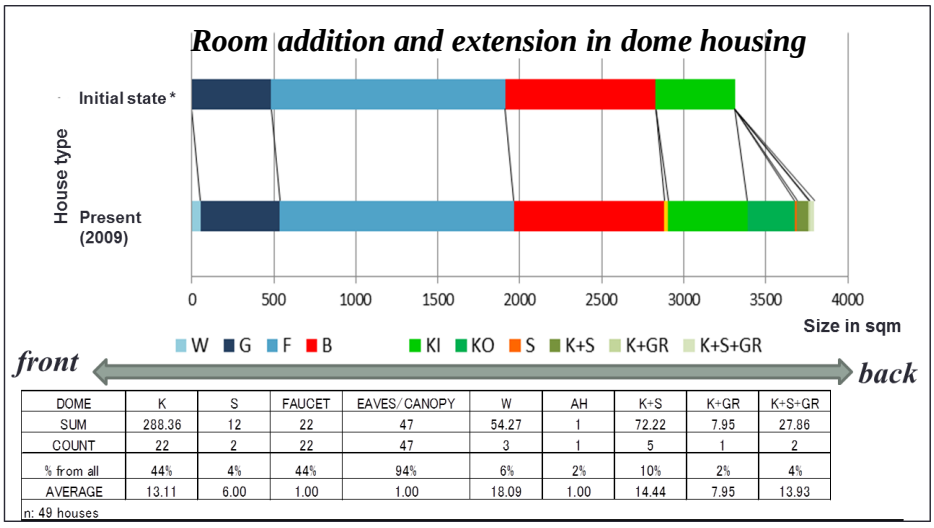


Figure 4.2 Self-built temporary and permanent structure used simultaneously



DOME	K	S	FAUCET	EAVES/ CANOPY	W	AH	K+S	K+GR	K+S+GR
SUM	288.36	12	22	47	54.27	1	72.22	7.95	27.86
COUNT	22	2	22	47	3	1	5	1	2
% from all	44%	4%	44%	94%	6%	2%	10%	2%	4%
AVERAGE	13.11	6.00	1.00	1.00	18.09	1.00	14.44	7.95	13.93

n: 49 houses

W: working area
G: Guest room,
F: family room,
B: bedroom ,
Ki: kitchen indoor,
Ko: kitchen outdoor,
S: Storage,
K+S: kitchen storage,
K+Gr: kitchen garage,
K+S+Gr: kitchen-storage-garage

Figure 4.4 Dome housing room addition and extension

4.2.2 Changes in Room Composition

The self-built and core-structure house is not constructed in one go. In general, the house is gradually completed by additions and alterations according to the resident's needs.
Finding from figure 4.5 and 4.6 shows that in both self-built and core-structure housing basic spatial units of the dwelling are as follows:
Fr: *ruang depan*- front terrace
G: *ruang tamu* — guest room
F: ruang keluarga- family room
B: *ruang tidur* — bed room
K: *dapur* — kitchen
T: *kamar mandi* — bathroom or toilet
Additional room unit that usually can be integrated into the basic room units above in case it is not necessary enough to make separate room are as follows:
P: ruang sholat- prayer room (usually can be integrated with bedroom or family room)
D: ruang makan-dining room (usually can be integrated with family room or kitchen)
S: *ruang pennyimpanan*- storage room (usually can be integrated with kitchen)
Wa: *ruang cuci*- washing well area (usually can be integrated with toilet area)

Although the adjustment of temporary to permanent self-built housing and changes in original core-structure to its permanent condition house in Tembi are varied, but there are similar space composition that can be concluded by the analyzing the adjustment made to the physical condition of the houses. Similarity is brought partly because the similarities to rectangular shape of plan of the rooms. The basic room composition is as follows:

1) Type front terrace-inner GFB(guest-family room, bedroom)

   One room house is the minimal. One room is basically used as *bedroom* but also used as *guestroom*, *dining room* and *family room*. Other activities like bathing, washing are done outside the room. Small *front terrace* is often used as *guest room*

2) Type front terrace- inner GF (guest-family room)- bedroom

   This type consists of *guest-family room* and *bedroom. Guest- family room* is used also as *dining room,* sometimes also as *praying room* and *storage* therefore it also can be considered as multi-purpose use.

3) Type front terrace- inner Guest room-Family room- bedroom

This type is the type that separate guest room with family room in GF composition because the needs to have formal guest area that separate from family room as living space for family.

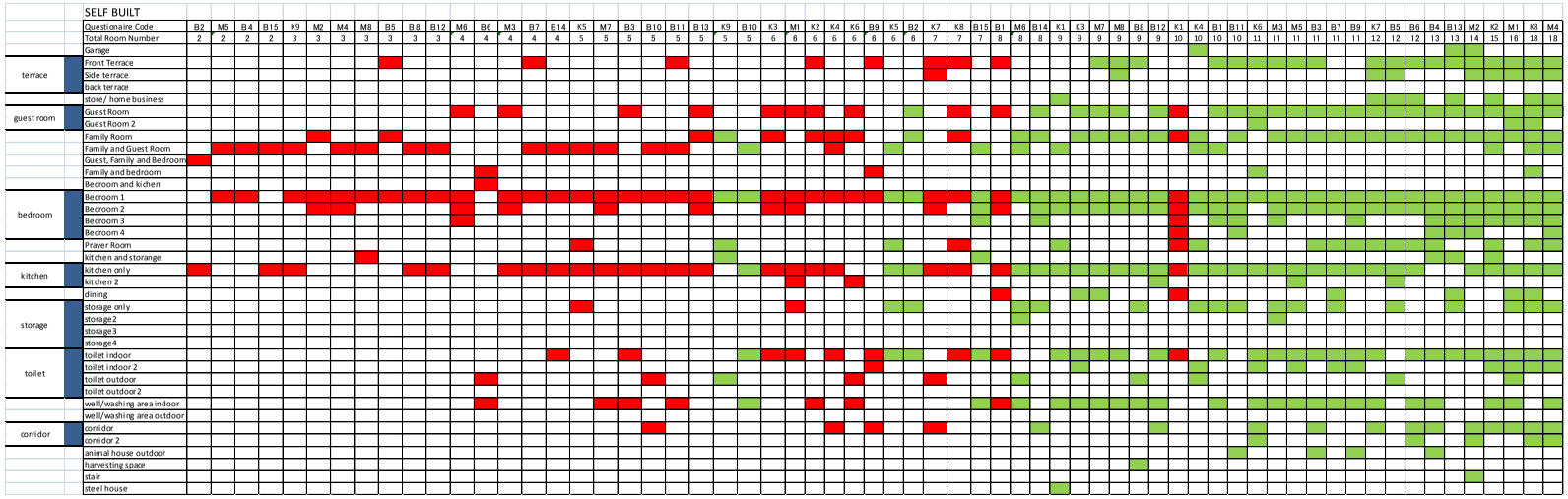
4) Type front terrace- inner Guest room-Family room- bedroom-kitchen-toilet

This type house basically add service area such as kitchen and toilet from the previous composition, though the formation of kitchen and toilet does not always be in inner/inside the house, sometimes the addition of kitchen and toilet space can be a separate structure but still part of resident' dwelling space

After above four basic composition, an additional rooms usually a duplication of basic room units or additional unit that usually the activities facilitate in the basic unit but become separate such as praying room, dining, etc.

Guest room is usually the first room that is laid along the access road after front terrace. It usually interrelated with family room as a flexible space and make up the living room and is connecting to other rooms in the house. In the rear, there are bedroom and kitchen, followed by /toilet bathroom then well/washing area. It is also common that utility space is laid at the end of the house.

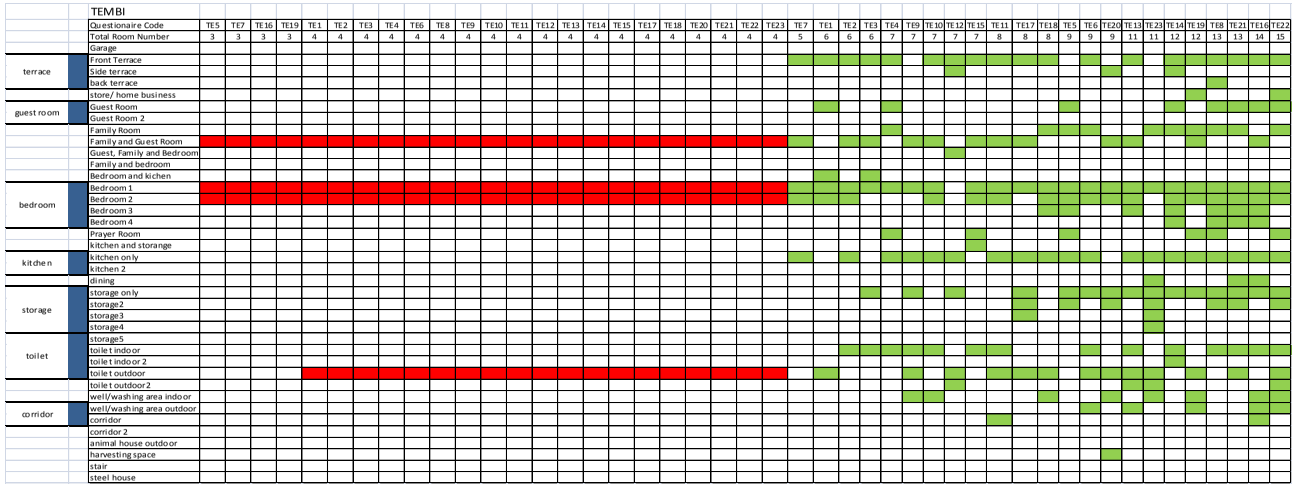
Comparing room composition between dome houses with similar size self-built and core-structure house show that the varieties of room composition are high. This means that residents divided the rooms based on their needs. Furthermore, family room in dome house is the largest room size and then bed room, unfortunately family room is located in the second floor and rarely used, in many cases residents use it as storages. see figure 4.7



Red: temporary self-built housing

green: permanent self-built housing

Figure 4.5 self-built housing room composition in temporary house and permanent house



Red: core-structure housing when donated

green: permanent core-structure housing

Figure 4.6 Core-structure housing room compositions in core house and permanent house

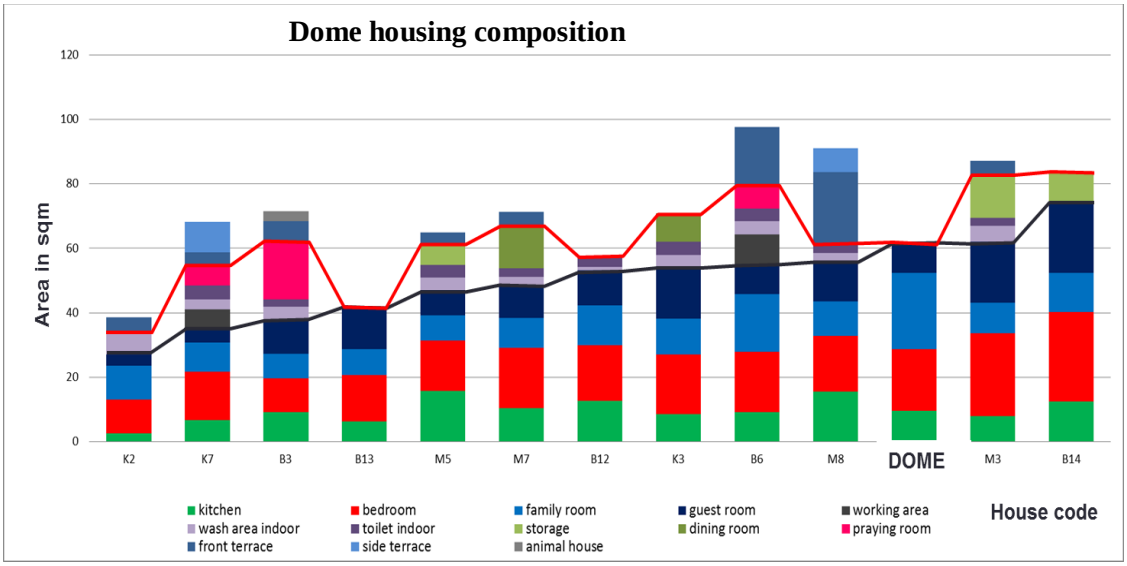


Figure 4.7 space compositions in dome housing compare to those with similar composition

4.2.3 Types of Changes in Addition and Composition

Author has to emphasize the fact that self-built and core-structure houses are not built as completed house at once from the temporary or core-structure condition. They are later enlarged according to the needs of the inhabitants step by step. Likewise the structure of the self-built and core-structure houses is changed from temporarily structure using bamboos or timbers to permanent structure using bricks and reinforced. People tend to build barrack like wooden house at first (especially for kitchen area), and then alter the materials when the family can afford to pay. The walls can be made of bamboo mats and bricks, though residents prefer brick wall. There are many houses with *brick* wall in the front area such as guest room but bamboo mat in the rear such as kitchen.

Type of changes or adjustment of room addition and extension is as follows:

1. Adjustment of social interaction space in the house that can be achieved by three steps.

    a) Multifunction GF (guest and family room in the same room, differentiate only with semi-fixed elements such as furniture or time arrangement)

    b) Front terrace+ GF: An addition of front terrace became necessary to provide a separate guest area, its construction considered

    c) Front terrace + G + F: a separation GF for formal guest area that differentiate from family room as living space for family

2. Adjustment of private space bedroom

The adjustment for private space which is bedroom is usually by addition or extension. Addition of bedroom is made especially if the household already have children with 'baliqh' status that need a separate sleeping area with the parents. The needs of additional bedrooms also importance in case the children consist of daughters and son, when they reach a 'baligh' years a separate sleeping quarter become necessary. After the needs of social-private space have been fulfilled, the next step of addition usually relate with making an additional income, this is expressed in the additional room for workshop (in case wife work as tailoring), integrated shop, etc. since residents have very good social networks and connection between family members within the same neighborhood or even not in the same villages, it is not rare that extension are done with corporation between neighbors, relative or friends.

3. Adjustment of service area such as kitchen and toilet

In many cases service area such as kitchen, toilet, well are built as sub-houses structure that is added and connected at the back or side of the main house, or at the back of main house at two position: either at the center or at the side. There are five ways of adding and connecting the houses

a) Integrated: The main core house and sub structure house are integrated in to own structure

b) Attached: The main house and sub structure house is attached either by wall or parallel eaves with gutter that is set under eaves to drain rainwater out of the house and to make it an interior space.

c) Detached with roofed corridor or courtyard: usually a long or wide roof is place on the space between the main house and the sub structure house to create an interior or semi interior, corridor like space.

d) Detached fully: the roof and wall between main core house and service area are fully separate.

4. Adjustment of additional of working space to raise household income such as tailoring room, animal house, etc.

In core-structure housing in Tembi, physical adjustments were made by the residents' through fitting out wall to make the partition of space inside the house, a front terrace and kitchen are the first made to the house because there is a need of front terrace for social interaction as well as kitchen became necessary as it weren't built at initial occupation. The room partitioning were

mostly made with brick wall for the main core house, an additional eave ranging 1-3m depth with opening wall and concrete or ceramic flooring for the front terrace and semi-permanent structure that made of half brick half bamboo weave wall for the kitchen. The addition of kitchen usually made as sub-structure by using method attached, detached fully or detached with roofed corridor and none with integrated since its harder to changes the hip roof structure in the donated core-structure house.

While in dome housing the addition of additional service area such as dirty[iv] kitchen, personal toilet, etc. mostly made by using fully detached structure since it is not easy to add or adjust to core dome structure

Addition of rooms in the houses is carried out in various ways. Sometimes changes to the house also depend according to the changes in the members of a family. A minimum addition of the house is by the enlargement of a room. We see many cases that enlarge *guest room*. There are some examples in self-built housing that add working area in the house. Usually the time of addition of rooms is when there is an increase in the family members or need to differentiate old-young, man-woman rooms. If the area of house lots have no room to carry extension at the back or at the front, additions are then made to the existing longitudinal sequence of rooms. Inhabitants may expand to any direction when they have enough space in the lots.

4.3 Conclusions

In self-built as well as donated core structure post disaster housings, physical changes and development from temporary to permanent such as size and room number expansion, space modification, function changes, apparently show social interaction space is inevitably important and needed to be provided in the house with variety kind of social interaction space in both self-built and core-structure. The expansion and separation tendency of guest area in self-built and core-structure have relevant founding with public housing complex in Yogyakarta where most `core house` alteration cases started with the expansion of guest room to the front area and had doubled its original size (Yoyok, 1993). On the other hand, total room number and addition of bedroom is still the highest overall adjustments which also indicate a high need of personal space although its average room size actually decreases. These show that both needs of social interaction space and personal space are simultaneous exists and these finding is supported by their cognition of spaces in previous chapter.

The basic spatial units of the rooms in the post disaster housing consist of social interaction space (front terrace, guest area and family room), more private area bedroom and service area of kitchen and toilet. The composition of the rooms is varies even for houses that have similar floor areas. This shows that addition or extension of rooms really depends on the situation of the residents although in all cases room composition include the arrangement of front terrace, guest room, family room, bedroom, kitchen and toilet either through fixed elements partitioning like walls or semi-fixed partitioning such as furniture, etc. to differentiate the spaces.

In dome post disaster housing room compositions is already fixed and from results also shows that it is hard to have physical adjustments to the core dome house. I mostly only adding kitchen detached from the dome structure or addition of canopy or eaves to provide social interaction spaces outside that not facilitate inside the house. These conditions make it hard for the residents to changes the condition for their needs based on their condition. The family space that is the largest space in dome housing is also not function properly as its location in second floor could not provide the flexibility as an extension of social space with guest room that found in the majority of self-built and core-structure housing.

CHAPTER 5 Activities and Cognition in Outdoor Spaces of Dome Housing
5.1. Introduction
5.2 Behavior Mapping Method
5.3 Results of Survey
5.3.1 Characteristic of Activities in the Outdoor Spaces
5.3.2 Relationship between type of Activities and Locations
5.3.3 Activity Differences between Weekday and Weekend
5.3.4 User Characteristics in relation with Location
5.3.5 Usage Characteristic in relation with Time
5.4. Residents' Cognition of Their Outdoor Spaces around House
5.5. Conclusions

5.1 Introduction

In order to cope with serious housing shortage after the 2006 earthquake in Java, post disaster housing reconstruction projects were accelerated by rapid increase prefabricated housing such as the dome housing in New Ngelepen. It has planning ideas and principles both for the design of the dome housing and settlement which is imported from other countries with little respect for the unique tradition and culture in housing life that local Javanese has long fostered.

The investigation into actual outdoor usage in dome housing settlement is necessary to understand the effect of limitation design in the dome house to residents activities whether it have influenced to the usage of its house outdoor and neighborhood space since such space may affect residents' lives as their core houses themselves do. So far a number of studies on residential issues in post disaster housing after Java 2006 earthquake have been undertaken however studies related to its residential environment and to outdoor spaces in particular are few. In previous chapters 3 and 4, results had shown that social interaction for Java people have an important meaning in their housing and actualized in their behavioral and physical adjustments in order for them to maintain their lifestyle. In the case of dome housing these social activities (and some of personal activities) is hardly can be facilitated inside the house therefore author presumed that residents make adjustments to their behavior as well as physical condition of their outdoor space to facilitates the activities

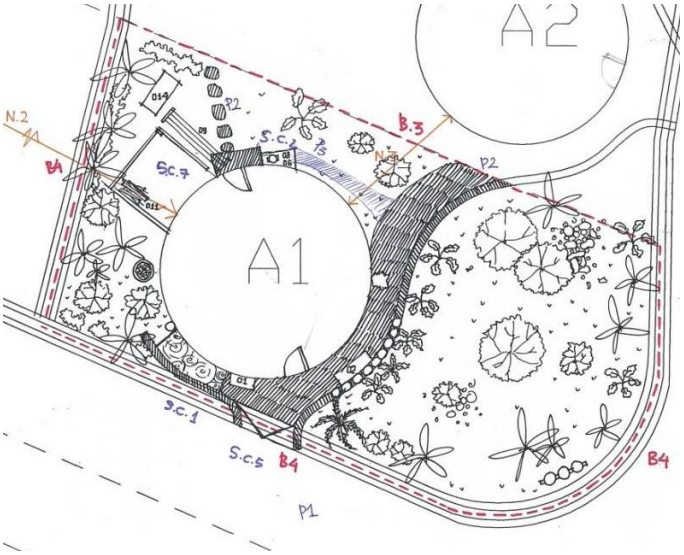
In this chapter, author tries to clarify how dome residential house outdoor and neighborhood spaces are perceived and used by the inhabitants by analyzing the usage characteristics of house outdoor and neighborhood space through behavior mapping as well as residents' cognition of their house outdoor space.

5.2 Behavior Mapping Method

The steps in making behavior mapping in New Ngelepen area are as follows:

The first step in making behavior observation and analyzing house outdoor usage as well as neighborhood space usage in dome housing settlement is meeting the head of RT (there is two RT in dome settlement) to find out basic information of the settlement relate to land use, residents general information and dome housing information as well as permission to do behavior mapping in the area.

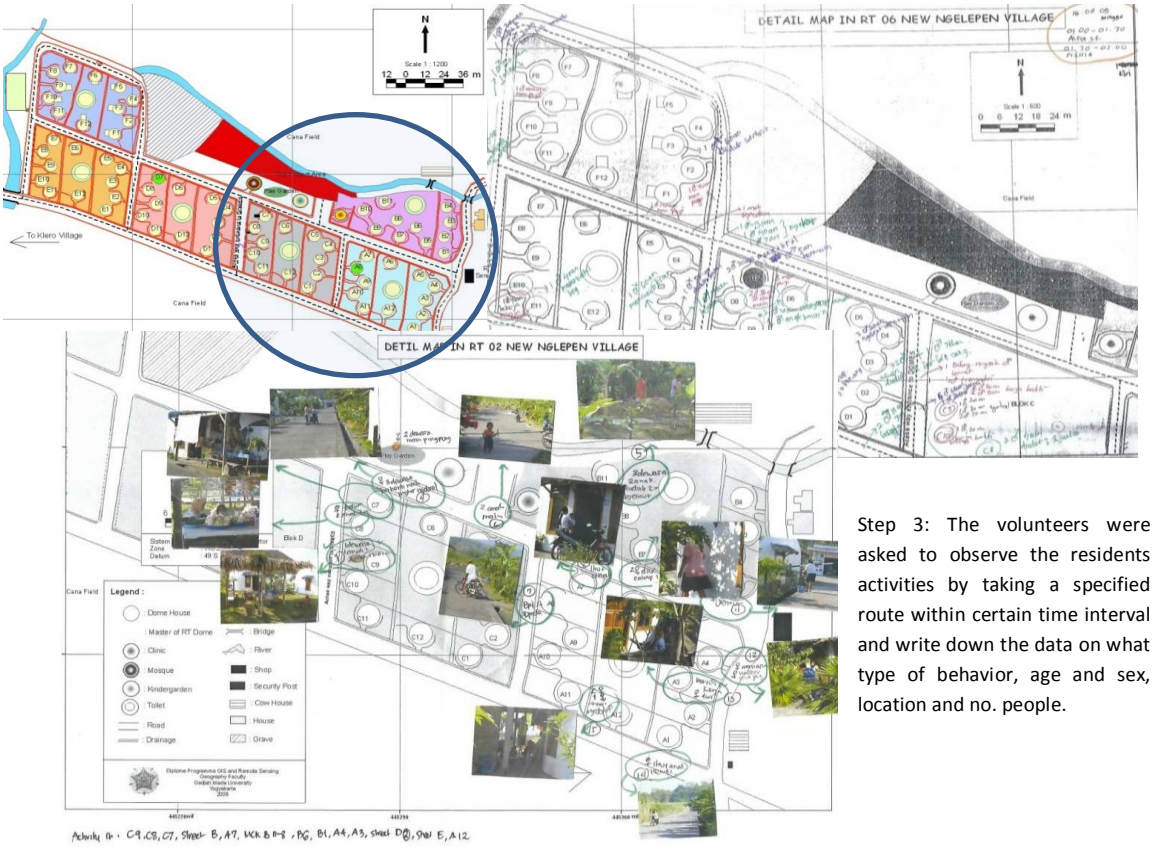
The second step is to make detail physical data observation in every house outdoor space of dome housing that is being lived in (a total of 50 dome houses out of 71).



Step 2: Details of physical condition of house outdoor space such as greenery, surface covering, objects, etc. as well as the residents activities such as household, leisure, socialization, storage, etc. on the plot were recorded and plotted

Figure 5.1 Example of data for physical condition in dome house outdoor space

Third step, a behavior mapping observation was carried out. In order to coverage different types of outdoor activities in various time, the observation were made to assure a full span time of 8:00 a.m. to 07:00 p.m for weekday and weekend. The item being observed include the followings: detail of residents activities for both personal and social activities in house outdoor space as well as neighborhood spaces, the number of users performing the activities, users' gender, users' age range, location of activity, and type of activity.



Step 3: The volunteers were asked to observe the residents activities by taking a specified route within certain time interval and write down the data on what type of behavior, age and sex, location and no. people.

Figure 5.2 Example of data for behavior mapping in dome house outdoor space

At the same time, a questionnaires survey and in-depth interviews was conducted to the residents of dome housing, 68% of the residents in 34 occupied dome house participated though only a total of 28 household data are valid for analyses.

The questionnaires and interview inquired information related to

- *Dwelling conditions and usage:* Previous and current house conditions, living situation, etc., residents' recognition of room/space availability, future preferences to add or alter the condition, 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, residents' agreement to situations related to the outdoor space of the house, neighborhood streets, and cluster facilities. Related to evaluation questions, the question items were derived based on intensive field observations and
- *Participation in community activities:* Heads of households and their spouses participation in community activities were assessed.

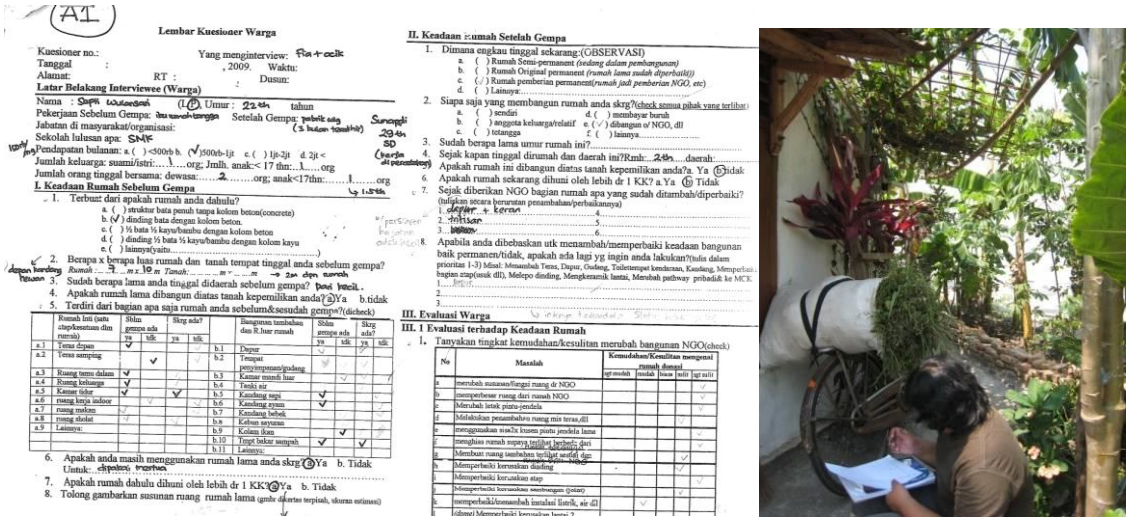


Figure 5.3 Example of data forquestioneirres for dome house residents

In order to analyze behavior mapping data, a variety of activities and users, types of activities and users' age were simplified further in some categories. The age of participants was judged by their appearance and classified into: elderly age over 50 years old, adult man, adult woman and youth age less than 15 years old. As for the type of activity were divided into 5 categories: 1) household activities, 2) relaxation, 3) economy related activities, 4) religious and 5) community activities (details of types of activities are listed in table 5.3). In this study, social activities were referred to as the observable behavioral interaction of two people or more, including nodding, talking, waving, and friendly physical contact etc.

Dot analysis behavior mapping in the site plan of dome settlement for weekdays and weekend was made based on the age categories and type of activities above to give visual understanding for qualitative analysis of the situation. For quantitative analysis, the statistical data is used

In New Ngelepen Dome housing, the outdoor spaces being observed include; public area (main village street), semipublic area (neighborhood streets, corner streets, facilities like playground, field, musholla/mosque, etc), semi-private pathway and private courtyard. The categorization of the spaces can be seen in Figure 5.4. As for the definition of public, semi-public, semi-private and private was made based on the type of ownership the area was built for from the residents' point of view.

Figure 5.4 Outdoor spaces categorization in dome housing settlement

The total area in New Ngelepen settlement in around 2 hectares which include public area main village street 11%, semipublic area with total 47%; neighborhood and corner streets 15%, block communal 14%, kindergarden 1%, open area kindergarden/playground 6% , field 1%, musholla/mosque 1%, clinic 1%, graveyard 8%, semi-private pathway 5% and private courtyard 25% and the 71 dome houses which take 12%. See table 5.1

Table 5.1 Space area in Dome housing settlement

area type	area	weekdays no.activities (%)	weekend no.activities (%)	area of neighborhood(%)
private	Dome Courtyard	51(10.7)	89(12.2)	5494.9(25)
semi-private	DOME Pathway	277(58.2)	379(52.1)	1015.1(5)
semi-public	Blok Communal	16(3.4)	12(1.7)	3157.96(14)
	Kinder-garden	4(0.8)	36(5.0)	127.69(1)
	open area kinder-garden	16(3.4)	11(1.5)	1425.59(6)
	Musholla	5(1.1)	9(1.2)	206.6(1)
	Field	13(2.7)	8(1.1)	307.4(1)
	clinic	4(0.8)	11(1.5)	245.74(1)
	graveyard	1(0.2)	13(1.8)	1745.77(8)
	nearby facilities	32(6.7)	19(2.6)	
	Neighborhood street	27(5.7)	75(10.3)	3263.7(15)
	corner street	20(4.2)	45(6.2)	
public	main street	10(2.1)	20(2.8)	2539.8(11)
DOME house				2731.01(12)
Total f (%)		476(100)	727(100)	22261.26(100.0)

From the recorded data of behavior mapping, dot analysis of behavior frequency in site plan of dome settlement behavior mapping activities was made and used for qualitative analysis. Differentiation of user type was done by shape categorization where adult man (circle shape), adult woman (triangle shape), youth (square shape) and elderly (tree shape). For activities type is done using color differentiation household activities (blue), relaxation activities (red), religious activities (yellow), economy related activities (green) and community activities (purple). This analyses is use to see the characteristic of activities and describe the outdoor house and neighborhood spaces. See Figure 5.5 for dot analysis of behavior frequency in weekend and figure 5.6 dot analysis of behavior frequency in weekdays

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CANA FIELD

RESIDENCE
SENGIR VILLAG

TO KLERO VILLAGE

U

CANA FIELD

TO SENGIR HILL

LEGENDA

Y	AH	AW	E		
				HOUSEHOLD	
■	●	▲	◆	AH10	TAKING OF CHILDREN
■	●	▲	◆	AH5	MERAWAT SEPEDA/ MOTOR
■	●	▲	◆	AH5	MENYIRAMI TANAMAN
■	●	▲	◆	AH6	MEMBERSIHKAN PEKARANGAN/ TERAS
■	●	▲	◆	AH8	MEMBUANG SAMPAH
■	●	▲	◆	AH4	BERSEBUN UNTUK PRIBADI
■	●	▲	◆	AH9	MAKE FIREY, COOKING
■	●	▲	◆	AH11	WASHING DISHES
■	●	▲	◆	AH1	MENCUCI PAKAIAN DILUAR
■	●	▲	◆	AH2	MENGERINGKAN CUCIAN DILUAR
				RELAKSASI	
■	●	▲	◆	ALB1	TAKE A REST DOING NOTHING (SUNBATHING,WATCHING AROUND,TALKING,SLEEPING)
■	●	▲	◆	ALB2	TAKE A REST DOING SOMETHING (READING,LISTENING MUSIC,WIFI-ING,USING PHONE,EATING RELAXATION)
■	●	▲	◆	ALB3	PLAYING
■	●	▲	◆	ALB4	SPORT
				RELIGIUS	
■	●	▲	◆	AR1	WYCKAR
■	●	▲	◆	AR2	WUDHU
				ECONOMY ACTIVITY	
■	●	▲	◆	AE1	PURCHASE AND SALE STREET VENDOR
■	●	▲	◆	AE2	PURCHASE AND SALE AT STORE
■	●	▲	◆	AE3	WORK FOR INCOME (HARVEST,COLLECTING GRASS,ETC)
				COMMUNITY ACTIVITY	
■	●	▲	◆	AC1	MEETING/ GATHERING
■	●	▲	◆	AC2	MAINTENANCE PUBLIC FASILITIES
■	●	▲	◆	AC3	COMMUNITY EVENT
				MOBILIZATION	
■	●	▲	◆	AM1	WALKING TO/FROM SOMEWHERE
■	●	▲	◆	AM2	BYCICLE TO/FROM SOMEWHERE
■	●	▲	◆	AM3	MOTORCYCLE TO/FROM SOMEWHERE
■	●	▲	◆	AM4	AUTOMOBILE TO/FROM SOMEWHERE

LEGENDA

	DOME HOUSE		HOUSE
	MASTEP OF MY DR HOME		ROAD
	CLINIC		DRAINAGE
	MOSQUE		COW HOUSE
	KINDERGARDEN		GRAVE
	TOILET		SHOP
	BRIDGE		SECURITY POST
	RIVER		CHAIR

WEEKEND
YOUTH ADULT MANAGEMENT WOMEN FESTIVAL

CANA FIELD

TO KLERO VILLAGE

U

CANA FIELD

TO SENGIR HILL

RESIDENCE
SENGIR VILLA

LEGENDA

Y	AM	AW	E		
				HOUSEHOLD	
■	●	▲	♣	AH10	TAKING OF CHILDREN
■	●	▲	♣	AH3	MERAWAT SEPEDA/ MOTOR
■	●	▲	♣	AH5	MENYIRAM TANAMAN
■	●	▲	♣	AH6	MEMBERSIHKAN PEKARANGAN/ TERAS
■	●	▲	♣	AH8	MEMBUANG SAMPAH
■	●	▲	♣	AH4	BERKEBUN UNTUK PRIBADI
■	●	▲	♣	AH9	MAKE FIRE?, COOKING
■	●	▲	♣	AH11	WASHING DISHES
■	●	▲	♣	AH1	MENGUCI PAKAIAN DILIMAR
■	●	▲	♣	AH2	MENGERINGKAN CUCIAN DILIMAR
				RELAKSASI	
■	●	▲	♣	ALB1	TAKE A REST DOING NOTHING (SUNBATHING,WATCHING AROUND,TALKING,SLEEPING)
■	●	▲	♣	ALB2	TAKE A REST DOING SOMETHING (READING,LISTENING MUSIC,WIFI-ING,USING PHONE,EATING RELAXATION)
■	●	▲	♣	ALB3	PLAYING
■	●	▲	♣	ALB4	SPORT
				RELIGIUS	
■	●	▲	♣	AR1	KYEKAR
■	●	▲	♣	AR2	WUDHU
				ECONOMY ACTIVITY	
■	●	▲	♣	AE1	PURCHASE AND SALE STREET VENDOR
■	●	▲	♣	AE2	PURCHASE AND SALE AT STORE
■	●	▲	♣	AE3	WORK FOR INCOME (HARVEST,COLLECTING GRASS,ETC)
				COMMUNITY ACTIVITY	
■	●	▲	♣	AC1	MEETING/ GATHERING
■	●	▲	♣	AC2	MAINTENANCE PUBLIC FASILITIES
■	●	▲	♣	AC3	COMMUNITY EVENT
				MOBILIZATION	
□	○	△	♧	AM1	WALKING TO/FROM SOMEWHERE
■	●	▲	♣	AM2	BYCYCLE TO/FROM SOMEWHERE
■	●	▲	♣	AM3	MOTORCYCLE TO/FROM SOMEWHERE
■	●	▲	♣	AM4	AUTOMOBILE TO/FROM SOMEWHERE

LEGENDA

	DOME HOUSE		HOUSE
	MASTER OF RT 02 HOME		ROAD
	CLINIC		DRAINAGE
	MOSQUE		COW HOUSE
	KINDERGARDEN		GRAVE
	TOILET		SHOP
	BRIDGE		SECURITY POST
	RIVER		CHAIR

KEYEDAY
YOUTH,ADULT MAN,ADULT WOMAN,ETHICKY

5.3 Results of Survey
5.3.1 Characteristic of Activities in the Outdoor Spaces

a) Public area:

- *Main village streets*

The main village streets were originally existed before the New Ngelepen post disaster dome housing relocation area was built. It is the main streets that connect existed villages. The width of the streets is about 7-8m and made of asphalt that allows two directions transportation for cars and even trucks. The total area of this space is 2539 sqm.

Figure 5.7. Residents' activities in main village street

b) Semi Public area:

- *Neighborhood streets and street corners*

Neighborhood streets were built as part of New Ngelepen post disaster dome housing which includes main entrance street and blocks' streets between cluster blocks. All of the neighborhood streets were made of asphalt with wide around 5-7m and allow up to two cars pass-by at the same time. The main neighborhood street as entrance penetrating north to south and dividing dome housing settlement into two RT. Groups of housing compounds are arranged as cluster of 11-12 domes with a center communal facilities with front façade of each house of open to the neighborhood street. The total area of this space is 3263 sqm.

The main entrance street has very important roles not only as public transportation access but also one of the main public facilities for community gathering. There are three shops opened on the courtyard of the residents' dome house that sell foods and souvenirs. The residents had painted the main entrance street as badminton field so that every afternoon many people would gathering and play together or just hang around. Many outsiders who are interested in dome housing frequently come to New Ngelepen, therefore main entrance often used as parking spots and even some of the residents located on its sideways use this opportunity to opened stores. During night time, main entrance as the widest neighborhood street (7m), also frequently used a

gathering spaces for community meetings. Many of the young people and adult hang around on this entrance street dancing, skipping a rubber band, especially after school hours or even performing a play on weekend.

Figure. 5.8 Residents activities in main entrance neighborhood street

At the beginning of master plan, neighborhood streets were designed for automobile, unfortunately none of the residents have cars. Since the neighborhood streets frequently used as playing ground for the children as well as social interaction and community activities spaces, having cars passing by frequently considered dangerous by the residents, therefore the access to New Ngelepen were limitedly opened by the residents by giving barrier bar and only a main entrance located at the center of the neighborhood was publicly open.

Blocks' neighborhood streets ranged from 5-6m wide. On its side ways, public facilities such as mosque, playground, meeting hall, field, clinic even grave yard are available. Gutter were used as a border between the block streets and dome houses, though it is frequently dry in the summer time and sometimes used as sitting places for relaxation by the passer-by or parents when they looked after their children playing on the streets. During most of the day time, little children were playing freely on the streets, while housewives chat on side of the streets or dome pathways. Much domestic work, such as hanging food staple for sell, to sunbathing bed, etc. is extended over from the courtyards and usually is conducted on the neighborhood street on front of their house. A considerable number of the elderly sit at the gutter of their dome house to spend time by watching people passing by alone or with their grandchildren. Street corners are also became an important part of daily activities for the residents in New Ngelepen especially street corners that connect to the main streets usually used as informal hang-out areas especially for youth and man to chat, play cards, or chess with others, mainly in the afternoon. Gathering on the streets corners were usually facilitates by using the available environment condition such as under the big trees, or by placing benches to provides sitting areas.

Figure 5.9 Residents activities in blocks neighborhood streets

Figure 5.10 Residents activities in corners of neighborhood streets

- *Semi-Public facilities*

In the master plan of New Ngelepen, the public facilities were built include musholla(smaller version of mosque/prayer place for Moslem), playground with installed children play equipment, public clinic, and kinder garden. By the time behavior mapping were conducted in August 2009, some of the public facilities were not actually used, while some other adjacent areas near the dome housing settlement were used by the residents for their daily activities. Clinic and kinder garden, which are also built in the shape of dome structure with a diameter area of 14m, were actually closed to the public and its used was suspended (due to management control problem). On the other hand, adjacent areas which are not in the master plan such as open field, nearby village's mosque and nearby facilities such as store were used by the residents of New Ngelepen. The total area of this space is 7216 sqm.

The open field were basically an adjacent open area near the dome housing that use by the residents as soccer field and hang out spaces especially by the youth and man, another open space that is used by the residents is near kinder garden here Brought to this park by their parents, preschool children play at the playground under their parent's surveillance. School-age children come to play at this park chasing each other or playing the provided equipment. Adults accompany their preschool children to this park particularly in weekend on the afternoon or

morning when the temperature is not so high. Sometimes the adults gather at the musholla near kinder garden playground to have chats while watching their children.

Nearby village's mosque are used by the residents especially during Friday prayer because built in site musholla is not large enough to provide large gathering prayer space, while nearby facilities such as stores, etc. basically help fulfill residents daily needs.

Figure 5.11 Residents activities in semipublic facilities

c) *Semi private house courtyard and* Private *house pathway*.

The dome houses in were built in similar design but the outdoor landscape design were different between each dome house. House courtyard area were fundamentally rectangular spaces surrounded, no explicit territorial border such as fences, though each residents understand the territorial border with their neighbor houses, in many cases the border is done by the gutter or plantation. In some cases dome houses that had extensions added including kitchens and storage are made on the back courtyard.

Figure 5.12 Residents' activities in private courtyard

House pathways and courtyard are different between each dome houses even in the same cluster. Some houses have large front courtyard while other almost have no front courtyard at all. Some houses have private pathways while others have shared pathway (see figure 5.13).

These differences also give influence to the usage of the courtyard and pathways by the residents as well as availability of space for additions and extensions for example those that does not have outdoor space in front area could not add a front terrace, etc. Those dome houses that have large front courtyard have tendencies to have front terrace or social interaction spaces. Especially for those dome houses that connect directly to the main entrance street where most daily evening gathering as well as outsiders came, they frequently built temporary stores on their house front courtyard.

Activities on dome courtyard and pathway include; children play in various ways such as chasing each other and dancing etc., household activities such as washing and drying laundry are mostly carried out on the back courtyard although block communal washing area is provided, additional dirty kitchen were made for cooking that use corkwood stoves, other household activities such as cleaning motorcycle or repairing things is done on the courtyard.

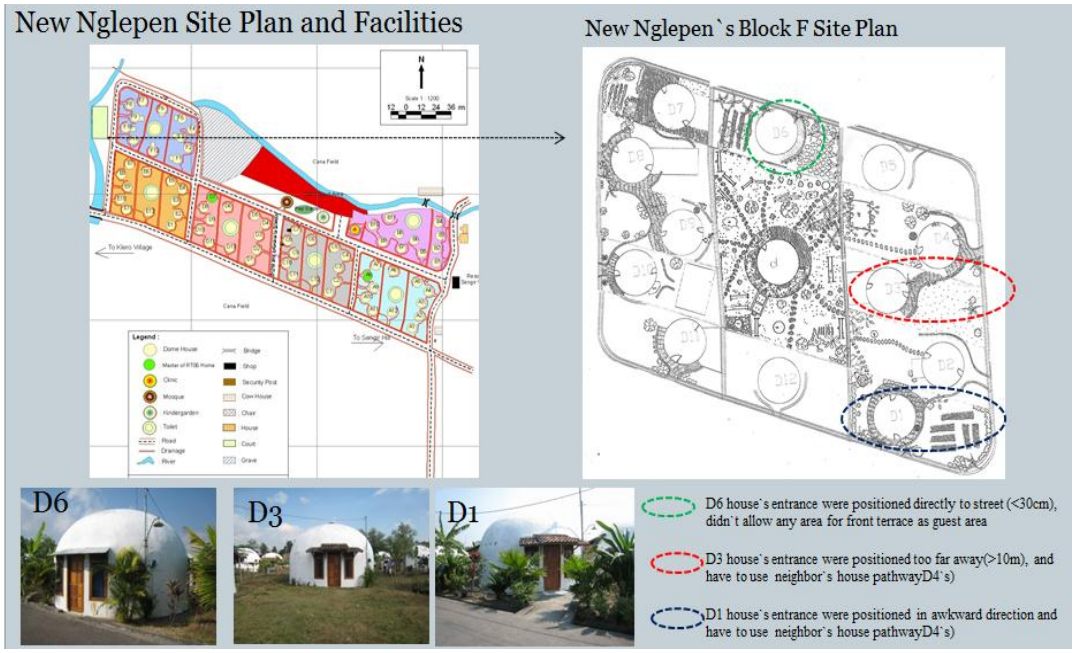

Figure 5.13 differentiations of dome housing approaching pathways in the same cluster

Figure 5.14 Resident's activities on dome semi private pathway

5.3.2 Relationship between type of Activity and Location

a) Relationship between type of Activity and Location

The outdoor space categories are divided into 4 spaces: public, semi-public, semi-private and private. Among the categories, the semi-public dome pathway is the most commonly use in both weekdays and weekend with 656 activities or 55% of total activities observed, the next one is private dome courtyard with 140 activities (12%) and semi-public neighborhood street with 102 activities (8%) see table 5.2.

This implied that outdoor area directly connected to residents' house have the most role in facilitating residents' activities. Unfortunately dome pathway which is the highest used space is actually a semi-private as area that also use shared with the neighbors, this only means that tolerance and understanding between neighbors is necessary and the usage of this semi-private space will have influenced in the non-formal social interaction with the neighbors.

Table 5.2 Frequency of activities on dome settlement outdoor space

	private	semi-private	semi-public										public	Total f (%)
Activities all social-personal	Dome Courtyard	DOME Pathway	Blok Communal	Kinder-garden	open area kinder-garden	Musholla	Field	clinic	graveyard	nearby facilities	Neighbor hood street	corner street	main street	
activities weekdays	51(10.7)	277(58.2)	16(3.4)	4(0.8)	16(3.4)	5(1.1)	13(2.7)	4(0.8)	1(0.2)	32(6.7)	27(5.7)	20(4.2)	10(2.1)	476(100)
activities weekends	89(12.2)	379(52.1)	12(1.7)	36(5.0)	11(1.5)	9(1.2)	8(1.1)	11(1.5)	13(1.8)	19(2.6)	75(10.3)	45(6.2)	20(2.8)	727(100.0)
total	140	656	28	40	27	14	21	15	14	51	102	65	30	1203
total %	12%	55%	2%	3%	2%	1%	2%	1%	1%	4%	8%	5%	2%	100%

Activities in observed dome housing are divided into 5 categories: a) household activities, b) relaxation, c) economy related activities, d) religious and e) community activities (details of types of activities are and its relation to the location is listed in table 5.3).

Major activities in the outdoor spaces in dome house settlement are relaxation activities of taking rest and socializing and children play around, domestic household activities of parents taking care of children and economy activities of purchase and sale at dome house store.

Among the activities observed, activities in semi-private dome pathways are the most observed with relaxation activities as the highest. The highest relaxation activity type is taking a rest such as social exchange chatting with 179 activities that occurred mostly in dome pathway with 64.6% compare to other space.

Table 5.3 Details Relationship between type of activities and location

Activities weekdays-weekends ALL social-personal		private	semi-private	semi-public										public	total f(%)
		Dome courtyard	dome pathway	block communal	kinder garden	open area	mushol a	field	clinic	graveyard	closed by facility	neighbor hood st	corner st	main street	
household	play with/take care	7(4.6)	101(66.4)	4(2.6)		10(6.6)	2(1.3)	2(1.3)	4(2.6)	1(0.7)	5(3.3)	7(4.6)	9(5.9)		**152(12.6)**
	maintenance	5(16.7)	22(73.3)									1(3.3)	2(6.7)		**30(2.5)**
	gardening/watering	17(77.3)	3(13.6)	2(9.1)											**22(1.8)**
	home	7(33.3)	10(47.6)	1(4.8)		2(9.5)				1(4.8)					**21(1.7)**
	trash	1(50.0)										1(50.0)			**2(0.2)**
	farming for own self	28(90.3)	1(3.2)					2(6.5)							**31(2.6)**
	cutting wood,collecting wood	4(40.0)	5(50.0)					1(10.0)							**10(0.8)**
	washing dishes		2(100.0)												**2(0.2)**
	washing clothes, carpet		4(57.1)	2(28.6)								1(14.3)			**7(0.6)**
	drying clothes/taking	11(61.1)	3(16.7)	2(11.1)										2(11.1)	**18(1.5)**
	work (harvest,collecting	6(14.6)	4(9.8)			1(2.4)		2(4.9)			8(19.5)	8(19.5)	3(7.3)	9(22.0)	**41(3.4)**
relaxation	take a rest(sunbathing,watchin	5(7.4)	35(51.5)		1(1.5)	2(2.9)	2(2.9)	4(5.9)			1(1.5)	8(11.8)	6(8.8)	4(5.9)	**68(5.7)**
	take a rest (talking with	12(4.3)	179(64.6)	1(0.4)	1(0.4)	10(3.6)	9(3.2)	4(1.4)	7(2.5)	3(1.1)	12(4.3)	24(8.7)	10(3.6)	5(1.8)	**277(23.0)**
	take care of animals		2(66.7)									1(33.3)			**3(0.2)**
	smoking, shaving, eating,washing face etc	4(16.0)	19(76.0)									1(4.0)		1(4.0)	**25(2.1)**
	wi-fi-ing(browse		4(66.7)			1(16.7)			1(16.7)						**6(0.5)**
	eat/drink		4(40.0)		2(20.0)				1(10.0)		1(10.0)	1(10.0)		1(10.0)	**10(0.8)**
	parking	1(100.0)													**1(0.1)**
	play around (children)	29(10.0)	160(55.0)	7(2.4)	8(2.7)	21(7.2)	3(1.0)	6(2.1)	4(1.4)		6(2.1)	23(7.9)	22(7.6)	2(0.7)	**291(24.2)**
	play sports					3(60.0)		1(20.0)			1(20.0)				**5(0.4)**
religious	nyekar'									7(100.0)					**7(0.6)**
	wudhu		4(36.4)	7(63.6)											**11(0.9)**
economy related	purchase and sale street		4(11.8)								3(8.8)	11(32.4)	11(32.4)	5(14.7)	**34(2.8)**
	purchase and sale at store (closing the shop)	1(1.0)	81(84.4)								14(14.6)				**96(8.0)**
community	gathering)		8(100.0)												**8(0.7.)**
	event/game (for the freedom day		1(5.9)									14(82.4)	2(11.8)		**17(1.4)**
	kerja bakti'/ 'rewang'	2(25.0)		2(25.0)		2(25.0)						1(12.5)		1(12.5)	**8(0.7)**
TOTAL(%)		**140(11.6)**	**356(54.5)**	**28(2.3)**	**12(1.0)**	**52(4.3)**	**16(1.3)**	**22(1.8)**	**17(1.4)**	**12(1.0)**	**51(4.2)**	**102(8.5)**	**65(5.4)**	**30(2.5)**	**1203(100.0)**

From table 5.3, the results show that the second highest activity is children playing activities with 160 activities observed that occurred mostly in with 55% occurrences in dome pathway. Private dome courtyard is the second area with high activities with 140 or 11.6% activities of all observed. The activities in this area mostly relate to domestic activities such as farming crop yard for own consume, gardening and drying clothes as well as relaxation activities such as children playing around and taking a rest just talking with each other.

In semi-public area result shows that corner street and neighborhood streets usage for activities are a lot higher than the semi-public facilities such as block communal, kinder garden area, open area, musholla, field, clinic and graveyards. In neighborhood streets a total of 102 activities (8.5% of all activities) were observed, the highest activities relate to children playing around, residents talking with each other/socializing, community events and working such as drying harvest or food staple. In corner street notable activities include children playing around and purchase-sale on street that usually consist of moveable food stall. Community activities that usually happen inside the house are also observed on outdoor space of dome pathway and neighbor streets because unavailable space inside the house to accommodate large number of people gathering.

Considering the close distance proximity between original and new site which only about 1-1.5km near their original village, from behavior mapping results in table 5.3 show that 51

activities observed where residents still use some of the nearby facilities that are located in the neighboring village's area the same way they did before the earthquake. For example in buying items in nearby stores or from interview found that residents use Mosque that located in neighboring village because their musholla (small prayer room) is too small for Friday prayer.

b) Detail relationship between type of activity and dome pathway area

Dome pathway is only 1015 sqm or only 5% of the total New Ngelepen dome settlement, but it has the 656 activities (54.5% of total activities) which is the largest number activities observed. As shown in figure 5.15, the design arrangement of dome pathway as an entrance to the house as well as the first space that connect to inner dome house is various between dome houses. Therefore more detail analysis to the usage of this space is made. Basically there are two type of pathway based on how the residents can use it to approach their house which is direct and indirect pathway. In indirect pathway basically the residents' have to pass in front of their neighbors' house to get to their house. There are 14 dome houses with indirect pathway but only 35% being lived in and 57 with direct pathway with 75% lived in.

There are different types of direct pathway based how close the pathway from the neighborhood streets to the house, for this analyses author differentiate the dome houses that being lived in by the residents into four categories; under 1m (8houses), 1-2m(2 houses), 2.01-3m(14 houses) and over 3 meter(21 houses). Because the number of pathways type is different, for the analyses the data frequencies of activities in each location divided by the number houses of each type. The result shows that direct access pathway with distance less than 1m have an average of less than 1.5 activities per houses while other direct pathways have larger frequencies ranging from 4-7 activities per house which is two-three times the amount of frequencies activities observed in direct pathway under 1m distance. See Figure 5.15.

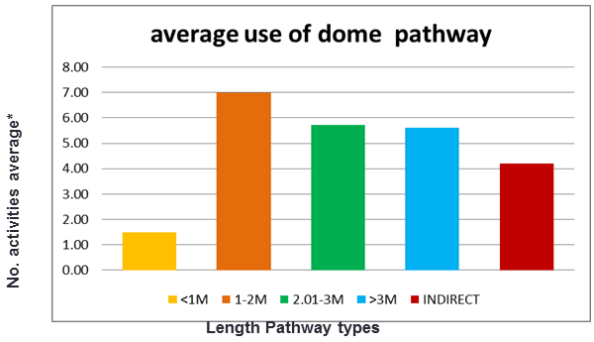

Figure 5.15 average frequency of activities observed in different type of dome pathway

The results shows that for the type of activities observed in dome pathway with distance under 1m are play around, take a rest and take care of children, though each activities occurs in average only less than 1 activities occurrence/house, see figure 5.15.

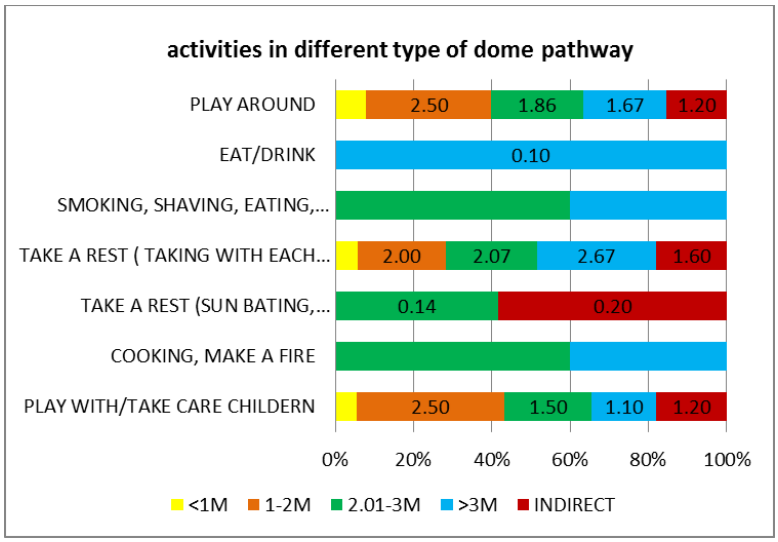

Figure 5.16 Type activities observed in different type of dome pathway

5.3.3 Activities Differences between Weekday and Weekend

Result shows that activities in dome house settlement in weekend is higher than in weekday with 727 activities (60%) in weekend compare to 476 activities (40%) in weekend. The highest location for activities observed in weekdays and weekend relatively similar which is on semi-private dome pathways where activities took 277 activities(58%)of overall weekdays activities and 379 activities(52%) of overall weekend activities), though there is slight differences in the type of activities occurred. In dome pathway, for weekend activities in order from the highest activities occurred are taking a rest talking with each other than children play around whereas for weekdays the order is the opposite with children play around higher than taking a rest talking with each other. This is caused because on weekend the number of adults not working and having social interaction became significantly higher. Similarities for both weekdays and weekend, dome courtyard as the second area with largest activities have household activity relate to farming for family consumption/food staple as the highest activity observed, these activities usually done by housewives/elderly that does not have formal occupation, in order to fulfill their need or raise household income.

While in neighbourhood streets as the third highest area being used, the highest activities observed is similar to the dome pathway which relate to children play around and taking rest which implicitly reflect the usage of neighbourhood streets as an extension of activities that usually done in dome pathway.

The interesting result on the observed activities is the usage of neighborhood streets for community activities relate to event or game that only observable in weekend table 5.4 and 5.5

Table 5.4 residents' activities in weekdays

Weekdays Activities Social and personal		private	semi-private	semi-public										public	Total f (%)
		Dome Courtyard	DOME Pathway	Blok Communal	Kinder-garden	open area kinder-garden	Musholla	Field	clinic	graveyard	nearby facilities	Neighborhood street	corner street	main street	
household	play with/take care children	2(3.2)	44(71.0)	3(4.8)		4(6.5)		1(1.6)	1(1.6)		4(6.5)		3(4.8)		62(13)
	maintenance motorcycle/bicycle		5(83.3)									1(16.7)			6(1.3)
	gardening/watering plants	7(87.5)		1(12.5)											8(1.7)
	cleaning yard,cleaning home	3(37.5)	3(37.5)	1(12.5)		1(12.5)									8(1.8)
	farming for own self	11(91.7)						1(8.3)							12(2.5)
	cooking, make a fire, cutting wood,collecting wood		1(50.0)					1(50.0)							2(0.4)
	washing clothes, carpet		1(33.3)	1(33.3)								1(33.3)			3(0.6)
	drying clothes/taking the dried clothes	6(66.7)	2(22.2)	1(11.1)											9(1.9)
	work (harvest,collecting grass,drying something, etc)	4(20.0)	4(20.0)								5(25.0)	3(15.0)	1(5.0)	3	20(4.2)
relaxation	take a rest(sunbathing,watching around,sit around/standing)		9(52.9)				2(11.8)	3(17.6)			1(5.9)	2(11.8)			17(3.6)
	take a rest (talking with each other)	4(4.3)	66(71.7)	1(1.1)		3(3.3)	3(3.3)	1(1.1)	1(1.1)		6(6.5)	3(3.3)	2(2.2)	2(2.2)	92(19.3)
	take care of animals											1(100.0)			1(0.2)
	smoking, shaving, eating,washing face etc	2(14.3)	11(78.6)											1(7.1)	14(2.9)
	wi-fi-ing(browse internet),using phone								1(100.0)						1(0.2)
	eat/drink		2(66.7)											1(33.3)	3(0.6)
	play around (children)	12(8.6)	84(60.0)	3(2.1)	4(2.9)	7(5.0)		5(3.6)	1(0.7)		3(2.1)	11(7.9)	9(6.4)	1(0.7)	140(29.4)
	play sports					1(33.3)		1(33.3)			1(33.3)				3(0.6)
religious	nyekar'									1(100.0)					1(0.2)
	wudhu		3(37.5	5(62.5)											8(1.7)
economy related	purchase and sale street vendor		3(18.8)								1(6.3)	5(31.3)	5(31.3)	2(12.5)	16(3.4)
	purchase and sale at store (closing the shop)		36(76.6)								11(23.4)				47(9.9)
community	meeting (tahlilan,rapat, gathering)		3(100.0)												3(0.6)
TOTAL activities		51(10.7)	277(58.2)	16(3.4)	4(0.8)	16(3.4)	5(1.1)	13(2.7)	4(0.8)	1(0.2)	32(6.7)	27(5.7)	20(4.2)	10(2.1)	476(100)

Table 5.5 residents' activities in weekdays

ALL weekend social and personal		private	semi-private	semi-public									public	total f (%)
		Dome courtyard	dome pathway	block communal	open area	mushola	field	kinder garden	graveyard	clinic	closed by facility	neighborhood st	corner st	main street	
household	play with/take care children	5(5.6)	57(63.3)	1(1.1)	6(6.7)	2(2.2)	1(1.1)		1(1.1)	3(3.3)	1(1.1)	7(7.8)	6(6.7)		90(12.4)
	maintenance motorcycle/bicycle	5(20.8)	17(70.8)										2(8.3)		24(3.3)
	gardening/watering plants	10(71.4)	3(21.4)	1(7.1)											14(1.9)
	cleaning yard,cleaning home	4(30.8)	7(53.8)		1(7.7)				1(7.7)						13(1.8)
	burning trash,throwing trash	1(50.0)										1(50.0)			2(0.3)
	farming for own self	17(89.5)	1(5.3)				1(5.3)								19(2.6)
	cooking, make a fire,cuting wood	4(50.0)	4(50.0)												8(1.1)
	washing dishes		2(100.0)												2(0.3)
	washing clothes		3(75.0)	1(25.0)											4(0.6)
	drying clothes/taking the dried clothes	5(55.6)	1(11.1)	1(11.1)										2(22.2)	9(1.2)
	work (harvest,collecting grass,drying something, etc)	2(9.5)			1(4.8)		2(9.5)				3(14.3)	5(23.8)	2(9.5)	6(28.6)	21(2.9)
relaxation	take a rest(sunbathing,watching around,sit/standing)	5(9.8)	26(51.0)		2(3.9)		1(2.0)	1(2.0)				6(11.8)	6(11.8)	4(7.8)	51(7.0)
	take a rest(and talking with each other)	8(4.3)	113(61.1)		7(3.8)	6(3.2)	3(1.6)	1(0.5)	3(1.6)	6(3.2)	6(3.2)	21(11.4)	8(4.8)	3(1.6)	185(25.4)
	take care of animals		2(100.0)												2(0.3)
	smoking, shaving, eating, washing faace,etc	2(18.2)	8(72.7)									1(9.1)			11(1.5)
	wi-fi-ing(browse internet),using phone		4(80.0)		1(20.0)										5(0.7)
	eat/drink		2(28.6)					2(28.6)		1(14.3)	1(14.3)	1(14.3)			7(1.0)
	parking	1(100.0)													1(0.1)
	playaround	17(11.3)	76(50.3)	4(2.6)	14(9.3)	3(2.0)	1(0.7)	4(2.6)		3(2.0)	3(2.0)	12(7.9)	13(8.6)	1(0.7)	151(20.8)
	play sports (table tennis)				2(100.0)										2(0.3)
religious	nyekar'								6(100.0)						6(0.8)
	wudhu		1(33.3)	2(66.7)											3(0.4)
economy related	purchase and sale street vendor		1(5.6)								2(11.1)	6(33.2)	6(33.3)	3(16.7)	18(2.5)
	purchase and sale at store (closing the shop)	1(2.0)	45(91.8)								3(6.1)				49(6.7)
mmunity activit	Meeting ('tahlilan'/'rapat/'gathering)		5(100.0)												5(0.7)
	join/coordinate event/game (for the freedom day remembrance)		1(5.9)									14(82.4)	2(11.8)		17(2.3)
	kerja bakti'/ 'rewang'	2(25.0)		2(25.0)	2(25.0)							1(12.5)		1(12.5)	8(1.1)
TOTAL		89(12.2)	379(52.1)	12(1.7)	36(5.0)	11(1.5)	9(1.2)	8(1.1)	11(1.5)	13(1.8)	19(2.6)	75(10.3)	45(6.2)	20(2.8)	727(100.0)

5.3.4 User Characteristics in Relation with Location

a) User size group characteristic relate to location

Results in figure 5.17 show that activities by group size with more than 10 people are the highest in neighborhood and corner streets instead of designated semi-public area for social interaction. As for group size 2 person and 3-5 person activities observed in more variable areas such as in the usage of semi-public facilities in the open area, kindergarten, field, musholla, clinic, etc. These results implicitly shows that the designated semi-public area for social interaction cannot facilitate large gathering activities, therefore residents of dome settlement use the streets as their social interaction space. For one person activities observed not only in area private courtyard, semi-private pathway, and semi-public block communal but also in main, neighborhood and corner street where incidental informal social interaction can occur.

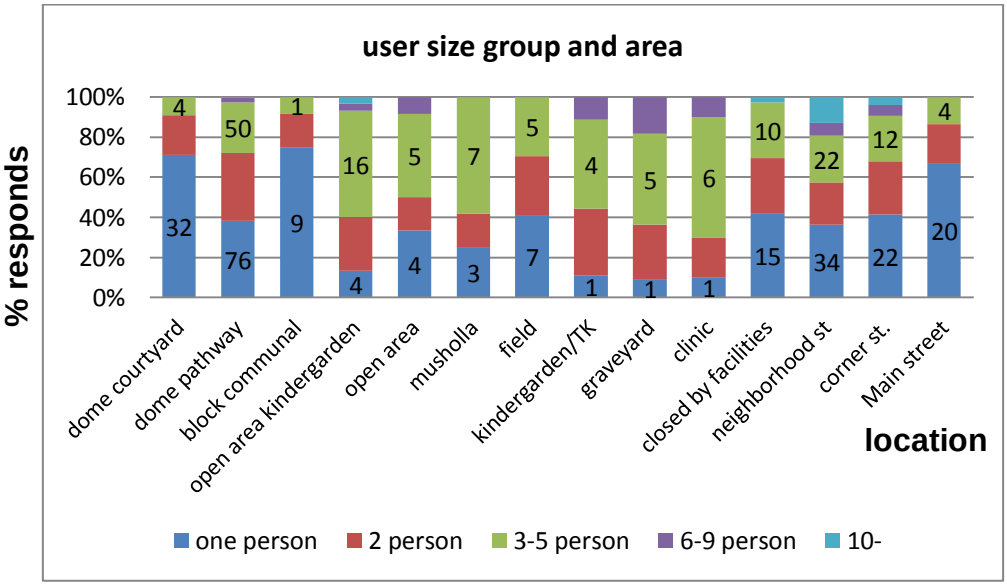

Figure 5.17 user group size relations to location type

b) User age group characteristic relate to location

From results in figure 5.18 for user characteristic relate to age group and the location of activities, it shows that youth and adults group have the highest activities in semi-private dome pathway where parent usually take care of their children in the house area. Youth age group also do activities by themselves not only in nearby pathway and courtyard of their dome house area but it is also have the highest activities observed in semi-public open area, kinder garden and the second highest activities observed in all streets area. For adult man age group, it has the highest activities observed in all neighborhood, corner and main streets while adult woman age

group have more variety although the frequency is not as many as adult man age group. Relate to elderly age group, it tends to have more activities on dome pathway and courtyard.

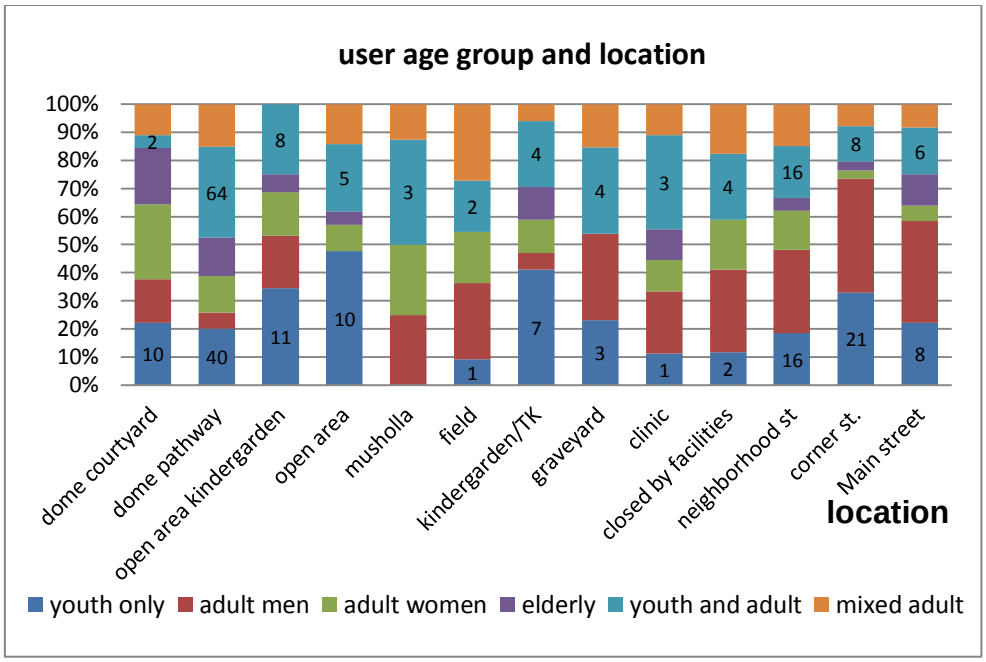

Figure 5.18 User characteristics age group and its relation to location

5.3.5 Usage Characteristics in Relation with Ti me

a) User age group characteristic relate to time

Result in figure 5.19 for user age group characteristic and its relation to time shows that youth age group is the highest from 8:00-9:00 and 13:00-18:00, adult man age group is the highest in 9:00-11:00 and 18:00-19:00. See figure 5.19

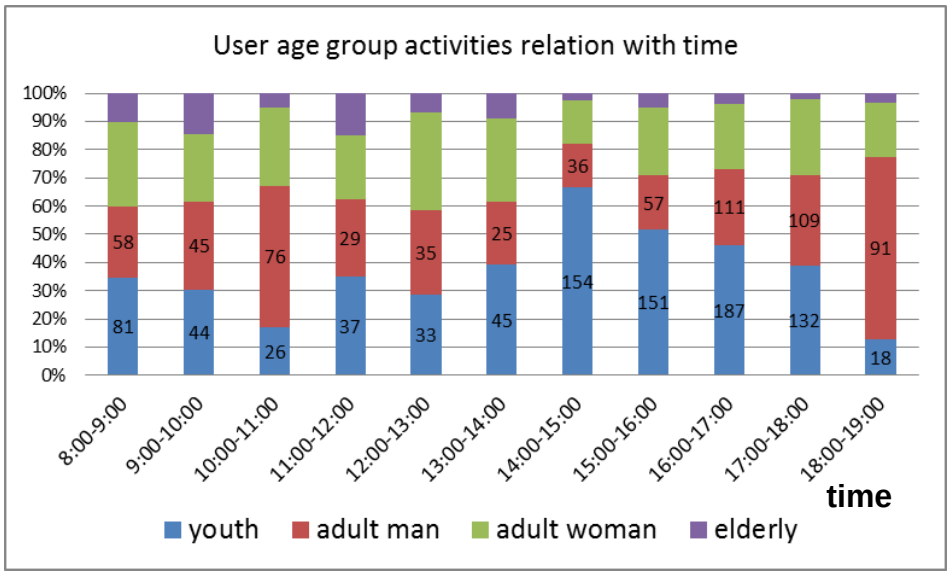

Figure 5.19 User characteristics age group and its relation to time

b) Activities location and its relationship with time

Semi-private dome pathway area is the highest space used from 8:00-19:00 with result ranging from 40-70% of total area used for every hour which implicitly means that dome pathway that directly connected with the inner house have the tendency to be used as a space extension for residents' daily activities throughout the day. The same condition happens in neighborhood streets area that its usage is relatively similar throughout the day. On the other hand, the usage of the space of dome courtyard that facilitates the second largest amount of activities is at morning 8:00-11:00 and afternoon 13:00-18:00. See in figure 5.20

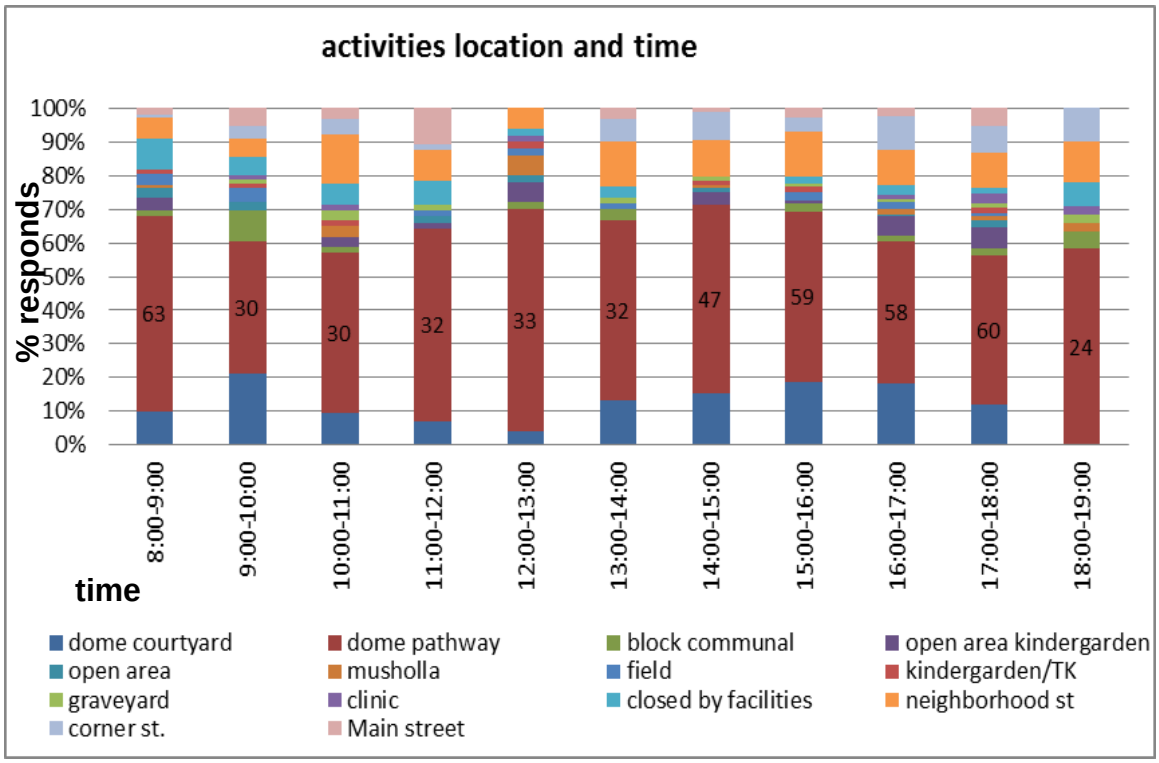

Figure 5.20 Usage of location and its relation to time

c) Type of activities and its relationship with time

Results in figure 5.21 for type of activities observed in relation to time, the highest activities is relaxation activities that occurred throughout the day from 8:00-19:00 with an average of 60% from total activities observed in every hour. The highest peak for relaxation occurs around 15:00-18:00, compare to other time, the significance of rise in activities because around this time school-age children already went back home and adult also came back from works. The second highest activities observed is household activities that also occurs throughout the day with an average of almost 30% from total activities observed in every hour

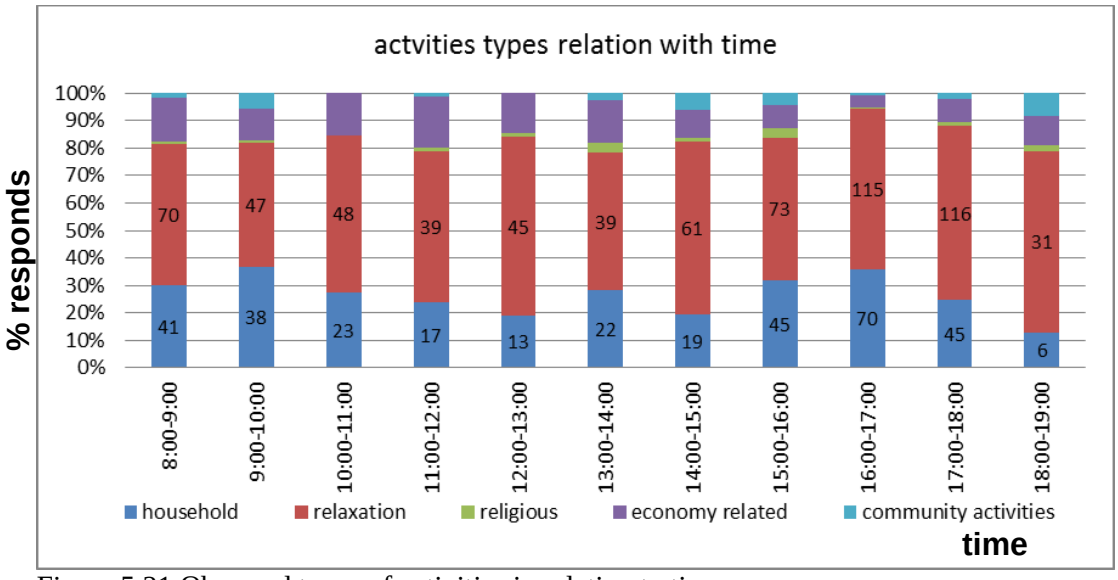

Figure 5.21 Observed types of activities in relation to time

For the type of household activities observed in relation to time, the highest activities is to taking care of children that occurred throughout the day from 8:00-19:00 with the highest peak around 17:00-18:00, and takes almost an average of 50% from total activities observed in every hour. Farming for own consumption/staple mostly happen during 9:00-11:00 and 16:00-17:00 when the temperature not so high. See in figure 5.22

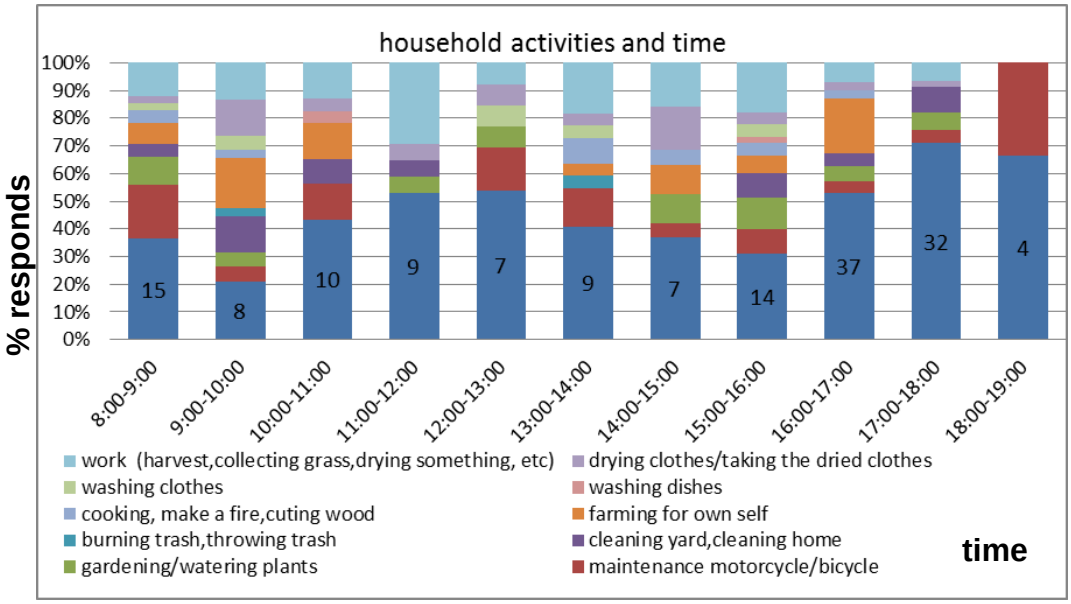

Figure 5.22 Observed types of household activities in relation to time

For the type of relaxation activities observed in relation to time in figure 5.23, highest activities is children play around and take a rest talking with each other that occurred from 8:00-19:00 with the highest peak for both activities around 16:00-18:00 and both activities if add up takes more than an average of 90% from total activities observed in every hour.

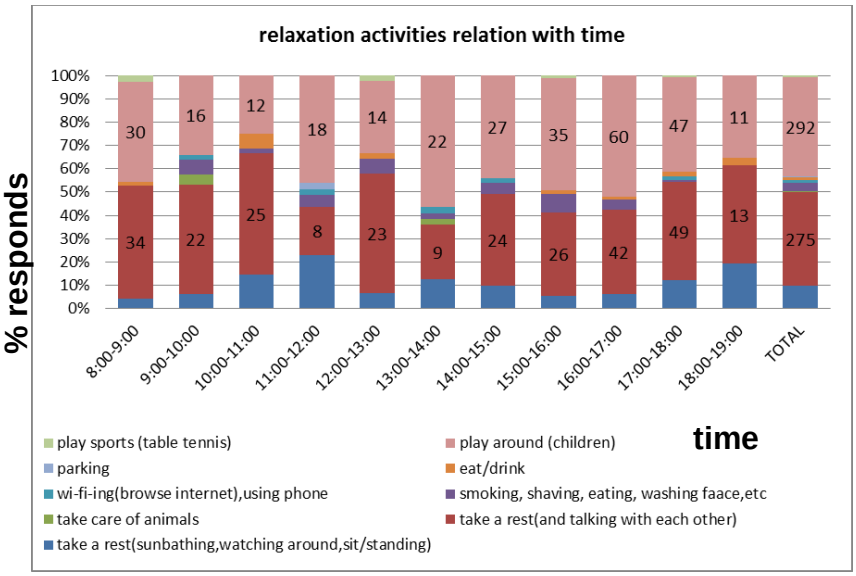

Figure 5.23 Observed types of relaxation activities in relation to time

Economy related activities purchase-sale at store happen throughout the day from 8:00-18:00 and decreased drastically on 18:00-19:00 when some of the store at dome house closed, but for purchase and sale by street vendor the time more varies. Community activities relate to coordinate event or game observed from 14:00-18:00 with the highest peak around 17:00-18:00, by this the time outside is the outside temperature not so high and easier to gather after work hours. As for community gathering that relate to formal gathering such as RT meeting, etc. usually happen after Maghrib praying for Muslim that is shown from the results at 18:00-19:00. Religious activities on serve for wudhu(cleaning before payer) is observed near the Muslim praying time of dhuhur (12:00-14:00), ashar (15:00-16.00) and maghrib(18:00-19:00). See in figure 5.24

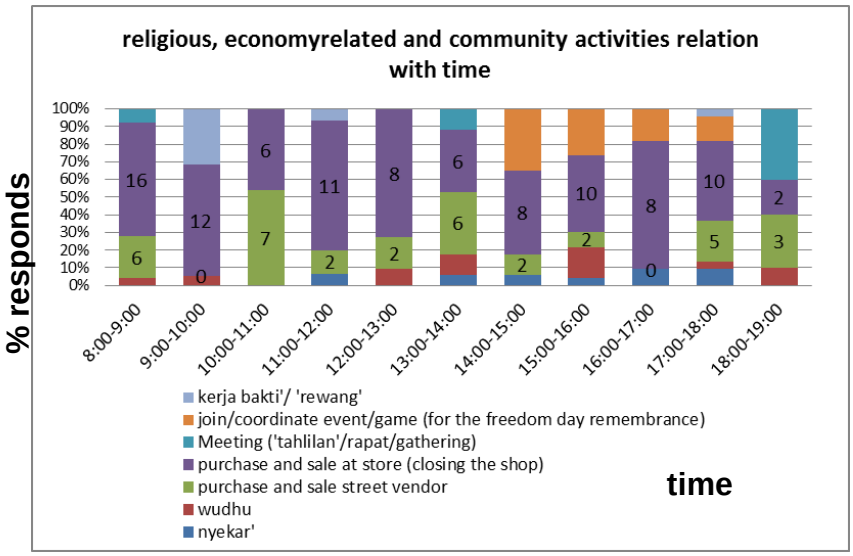

Figure 5.24 observed religious, economy related and community activities in relation to time

5.4 Residents' Cognition toward Their Outdoor Space around House

In order to understand residents perception toward their dome outdoor space, the residents were asked questions relate to the space that they considered as front-back, shown-hidden, family occasion, personally like and always cleaned by pointing out the location of the space on the house map that already prepared before. They were also asked to point out the location of their daily outdoor activities for domestic household activities (AH) such as washing and drying laundry, farming or gardening, take care motorcycle/bicycle, etc. and relaxation activity that include (Arel.) which is a combination of socialization activities where they have social interaction and leisure activities such as children play around, take a rest, doing hobby, etc.

To analyze the data, author divided dome house outdoor area in space categories which are front yard, front terrace, side yard, side terrace, back yard, back terrace and addition of extra kitchen for perception question. Since dome house actually does not have real terrace like the conventional Javanese dwelling, for this analyses author pointed house pathway that have concrete pavement as the terrace space whereas for yard is other space surrounding the house with no pavement. As for differentiation of front-side and back, author pointed the space based on residents' recognition of front and back entrance by making a alignment to the entrance door. Another important rule relate to acknowledgment of front yard in case of unique arrangement of dome house that is on the corner of the cluster is by making one meter demarcation distance from the street (See figure 5.25). This categorization of space and activities was done in order to make the same categorization for data from behavior mapping to compare how residents' perception and activities appropriation in the house outdoor space based on interview with the actual usage from the behavior mapping

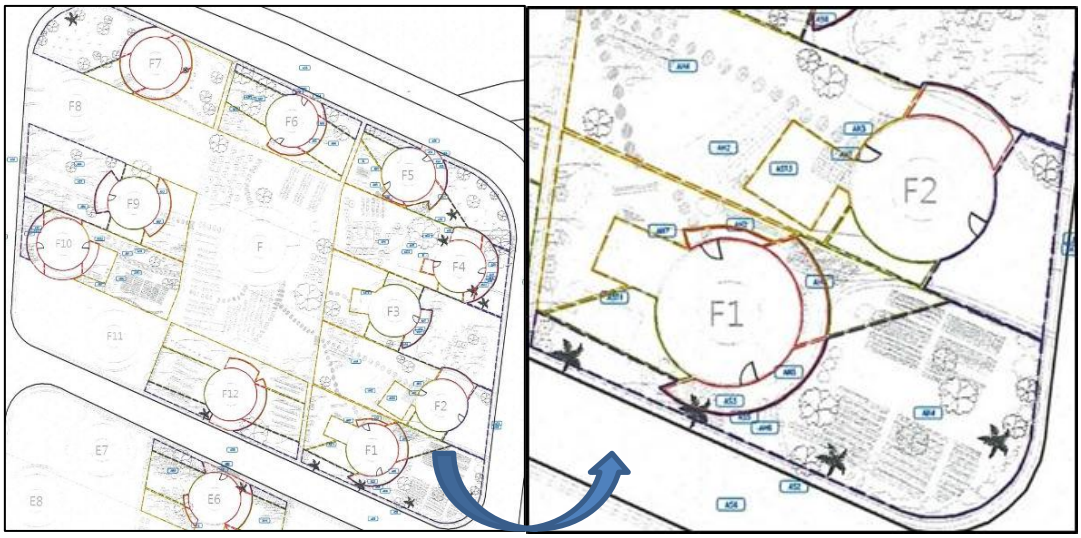

Figure 5.25 assigning the space categories for analysis

The result for residents' perception of dome house outdoor space shows that they acknowledge a differentiation of front-back that also relate in the agreement to area considered for shown-hidden. Front terrace also have the highest recognition as a space for family occasion, personally liked and mostly cleaned although this space is limited. See in figure 5.26

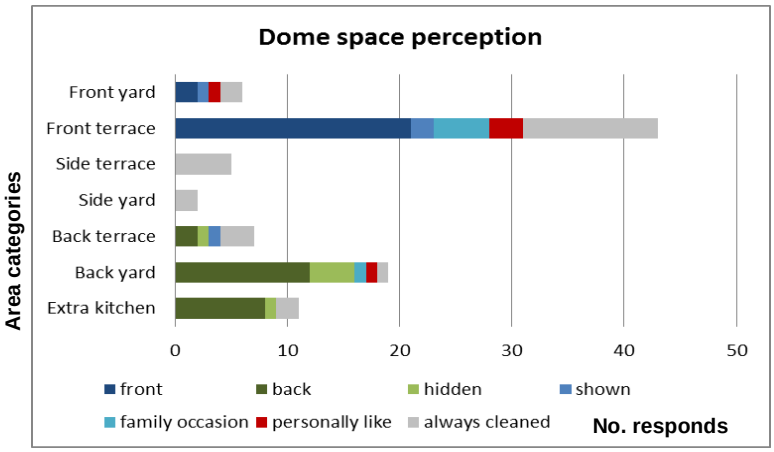

Figure 5.26 residents perception toward their dome house outdoor space

Result in figure 5.27 for residents' activities appropriation in house outdoor space based on the interview shows that residents acknowledge relaxation activities highest on the front terrace area which relate to children playing, doing hobby, relaxing. Relatively similar amount of acknowledgement for relaxation activities for front and back yard but different of activities whereas activities in front yard mainly children playing around, relaxation in backyard are taking care of pet such as birds or chicken and also hobby relate to making items. As for household activities residents resident acknowledge highest on the backyard which relate to activities such as washing, drying laundry and farming and they also do house hold activities cleaning and gardening that mostly happen on the front terrace or yard while in the side yard mostly relate to gardening/farming. Detail of residents' perception of house outdoor space relation to the appropriated activities can be seen in table 5.6

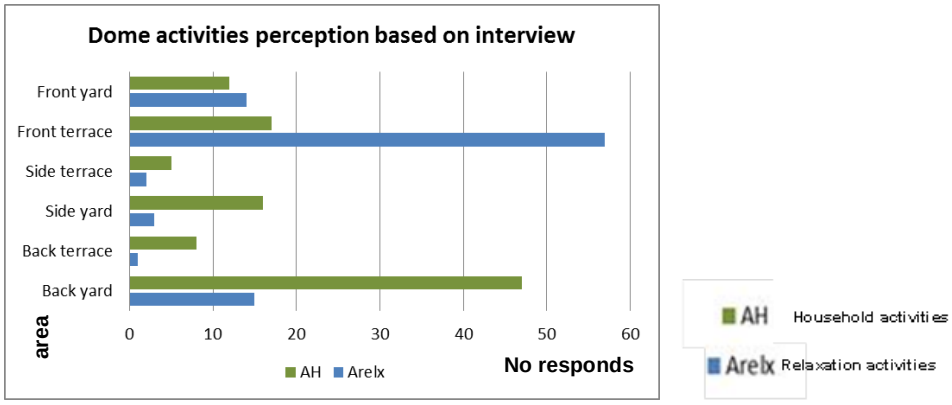

Figure 5.27 residents perception toward their activities appropriation in outdoor space based on interview

Table 5.6 detail of residents' perception of house outdoor space relation to the appropriated activities

	FRONT/BACK DISTINCTION	FRONT		SIDE		BACK		EXTRA STORE	EXTRA KITCHEN
	OVERLAPPING PRECEPTION	FT	FY	ST	SY	BT	BY		
RESIDENT'S PRECEPTION	area considered as front								
	area considered as back								
	area prefered hidden from others								
	area prefered to shown to others								
	area for family occasion								
	area that mostly liked								
	area that always cleaned								

RESIDENT'S ACTIVITIES		FRONT		SIDE		BACK		STORE	ADDITIONAL ROOM	FRONT STREET
		FT	FY	ST	SY	BT	BY			
SOCIALIZATION	accepting stranger	83%	0%	0%	0%	0%	0%	11%	0%	6%
	accepting neighbors	44%	4%	8%	4%	0%	16%	4%	0%	20%
	accepting friends	70%	0%	0%	0%	0%	10%	10%	0%	10%
	accepting relatives	50%	0%	0%	0%	0%	0%	50%	0%	0%
	accepting own family members	63%	0%	0%	0%	0%	19%	6%	0%	13%
	accepting large gathering/event	0%	17%	0%	0%	0%	0%	0%	0%	83%
HOUSEHOLD ACTIVITIES	washing laundry	0%	0%	0%	13%	13%	75%	0%	0%	0%
	drying laundry	0%	0%	0%	6%	0%	94%	0%	0%	0%
	maintenance motor/bicycle	11%	0%	11%	11%	22%	44%	0%	0%	0%
	gardening (berkebun)	0%	20%	0%	36%	4%	40%	0%	0%	0%
	watering plants	0%	0%	0%	50%	0%	50%	0%	0%	0%
	cleaning terrace/yard	52%	28%	16%	0%	0%	4%	0%	0%	0%
	working in house	17%	0%	0%	11%	22%	50%	0%	0%	0%
LEISURE ACTIVITIES	let children play outside	38%	15%	0%	8%	8%	0%	0%	0%	31%
	take care pets	0%	0%	0%	0%	0%	67%	0%	33%	0%
	doing hobby	33%	0%	0%	33%	0%	33%	0%	0%	0%
	making something	0%	0%	0%	0%	0%	50%	0%	0%	50%
STORAGE	storage unneeded item ex garbage	0%	0%	0%	13%	25%	50%	0%	13%	0%
	storage rarely use item	33%	0%	0%	0%	0%	33%	0%	33%	0%
	storage frequently use item	0%	0%	0%	17%	17%	67%	0%	0%	0%

In order to cross check the residents' activities appropriation in house outdoor space based on the interview with the actual usage of residents' house outdoor space, data from behavior mapping related to dome pathway and dome courtyard is analyzed. Result in figure 5.28 shows a similar tendency toward activities related to relaxation whereas less significant amount of household activities observed in the backyard compare to how the resident appropriation for the household activities based on interview. The reason for this might be explained by the possibility of not observable household activities such as washing or drying laundry at the time behavior mapping were undertake although there are similarities on the type of activities observed with the location between interview and behavior mapping data. For example, activities observed in front terrace and yard relate to cleaning or gardening as well as taking care children and back terrace and yard relate to washing/drying laundry, farming

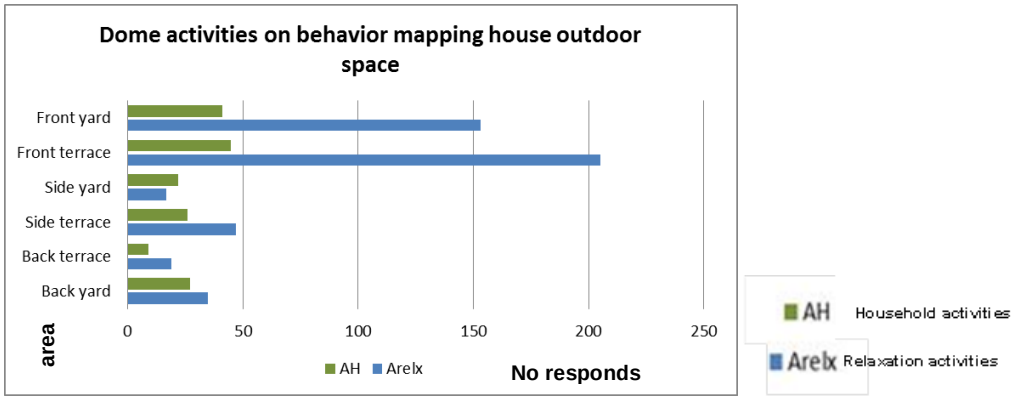

Figure 5.28 residents activities appropriation in outdoor space based on behavior mapping

5.5 Conclusion

In this chapter, author tries to clarify how dome residential house outdoor and neighborhood spaces are perceived and used by the inhabitants. Results are as follows:

- Outdoor spaces in dome housing settlement for both the house outdoor as well as neighborhood settings function as essential places for the residents' daily lives and a wide variety of activities are found there. The spaces play an important role not only to facilitates residents daily activities that is not facilitates in the inner dome house but also as a spatial medium of social interaction between members of the communities. Activities take place in various spaces from private until public space although whether or not it designed to be used as such social interaction spaces. There were also finding where residents still use some of the nearby facilities that are located in the neighbouring village's area the same way they did before the earthquake.
- The outdoor spaces as a whole hold a clear spatial hierarchy from public, semi-public, semiprivate, and down to private regions. The spaces perceived as semiprivate and private are in many cases most preferred and used by the residents as their open spaces around their own houses. Outdoor spaces complement the indoor spaces of housing that offers the residents various opportunities to live their daily lives with their families and neighbours. It is especially act as an extension of social space that it is not facilitate enough in the dome house. It is shown by the highest usage of the outdoor space actually relates to the distance to the inner part of the house with the highest frequency of outdoor space usage from the largest is dome pathway, dome courtyard then neighbourhood streets. The dome pathways as the location with highest observable activities have differences in the design that influenced the activities it can facilitate.
- Residents cognition toward the outdoor space around their house shows differentiation of front-back that also relate in the agreement to area considered for shown-hidden. The cognition of spaces correlated with how residents appropriate their activities in either interview or behaviour mapping results where front area is mostly for social interaction and relaxation. These results also similar with how the residents appropriate their activities in self-built housing. Interestingly, cognition of activities for household activities on back area were found to be quite different with results from behaviour mapping, where household activities varies in locations

CHAPTER 6 Residents' Evaluation on Donated Post Disaster Housing
6.1. Core-structure Housing Before-After Earthquake and the Evaluation
6.1.1 Residents' Perception of and Participation in Community Activities
6.1.2 House Condition Before and After the Earthquake
6.1.3 House Evaluation on House Design
6.2. Dome Housing Before-After Earthquake and the Evaluation
6.2.1 Residents' Perception of and Participation in Community Activities
6.2.2 House Condition Before and After the Earthquake
6.2.3 House Evaluation on House Design, Outdoor and Neighborhood Spaces
6.3. Conclusions

The aspects on how post disaster housing especially the donated housing are used by the residents on their behavioral and physical adjustments in order for them to maintain their lifestyle had been explained in chapters three and four, whereas chapter five shows how dome residential house outdoor and neighborhood spaces are perceived and used by the inhabitants. In this chapter resident' community activities, existence of space in the house before and after the earthquake and their evaluation is analyzed. The data were acquired through questionnaires and interview

For evaluation, because it is hard to have direct and honest answer from the residents on their donated house since its contradict to their Javanese custom to criticize something that was given or donated, therefore in order to get the evaluation data of the house residents were asked about their capability to control their house design, including flexibility, personalization, and maintenance (12 five-point scale questions), residents' agreement to situations related to the outdoor space of the house, neighborhood streets, and cluster facilities (10 five-point scale questions). Related to evaluation questions, the question items were derived based on intensive field observations.

6.1. Core-structure Housing Before-After Earthquake and the Evaluation

6.1.1 Residents' Perception of and Participation in Community Activities

In core-structure housing and dome housing, questionnaires in multiple question relate to how residents' willingness to participate in community activities and how they percept community activities are being asked. The questions are:

1. How is your participation in community activities:
   a) I am actively participating in community activities.
   b) I will try my best to participate in community activities although sometimes time and energy is limited.
   c) I will participate if I am invited personally.
   d) I am not interested in community activities, so I would not join any if not obligated
   e) As a part of community I feel that I must participate in community activities
2. How do you feel about community activities in your neighbourhood?
   a) I feel that community activities is very important
   b) Although there are some exceptions, I think community activities is quiet important.
   c) I am neutral, does not have specific feeling toward community activities
   d) I believe community activities is quite important but I am personally not interested to be involved
   e) Community activities have nothing to do with me so I am not interested at all

In core-structure house, data shows that approximately more than 90% (both heads of household and spouses) said that they participate in community activities with their own willingness, while only less than none feel obligated to participate and null for no participation. High participation to community activities is supported by their perception on the importance of the value and existence of community activities in their neighborhood. Approximately 80% head of household and 83% of spouses response is "I feel that community activities are very important" and approximately only about 10% for both heads of household and spouses said that "they are neutral, don't really have certain feeling". See Figure 6.1

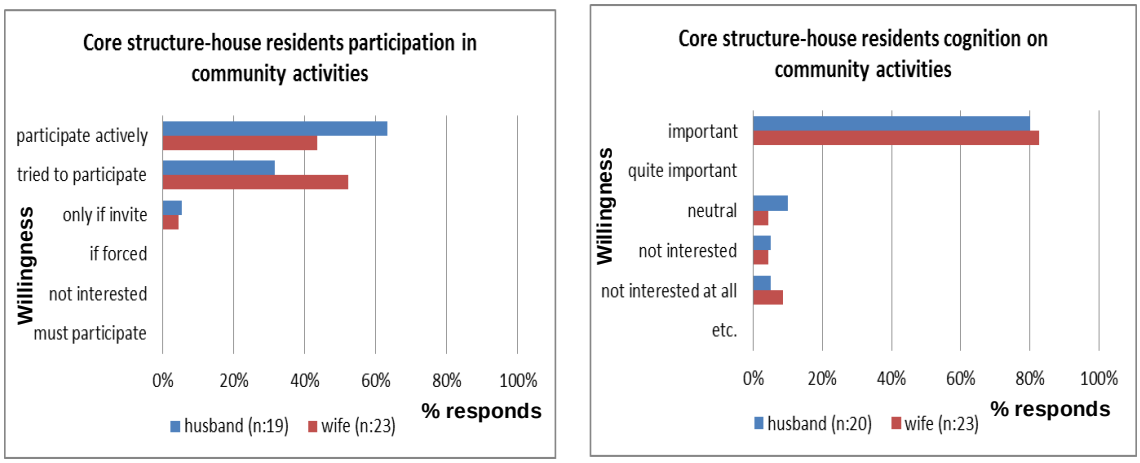

Figure 6.1 Core-struture residents' participation and cognition of community activities

In core-structure housing, from figure 6.2 can be seen that residents' participation in community activities at residents' house such as such as neighborhood meetings (*RT*'s meeting, *Block* meeting,etc), housewives' meetings (*PKK meetings, Dasa Wisma, Posyandu, etc)*, religious gathering (*Wiridan ,Tahlilan,etc.)* shows 84% husbands and 83% wive participation. Community activities at Community Meeting Hall (*Pendopo/Balai Pertemuan*) such as General meeting, *Karang Taruna* meeting, etc. shows higher participation for husband with approximately 80% while only 40% of wives participation. Community religious activities at neighborhood's musholla such as *Jum'at* prayer, *Tarawih*, preaching, etc. show 85% of head households and 87% of wives participation. Neighborhood aesthetics and maintenance activities surround the neighborhood such as cleaning up the cemetery, *Sunday* neighborhood clean-up, etc. shows 80% of head households and 57% of spouses participation. Health and sport activities at neighborhood's field such as badminton, soccer, etc. show 35% of head households and 17% of spouses participation

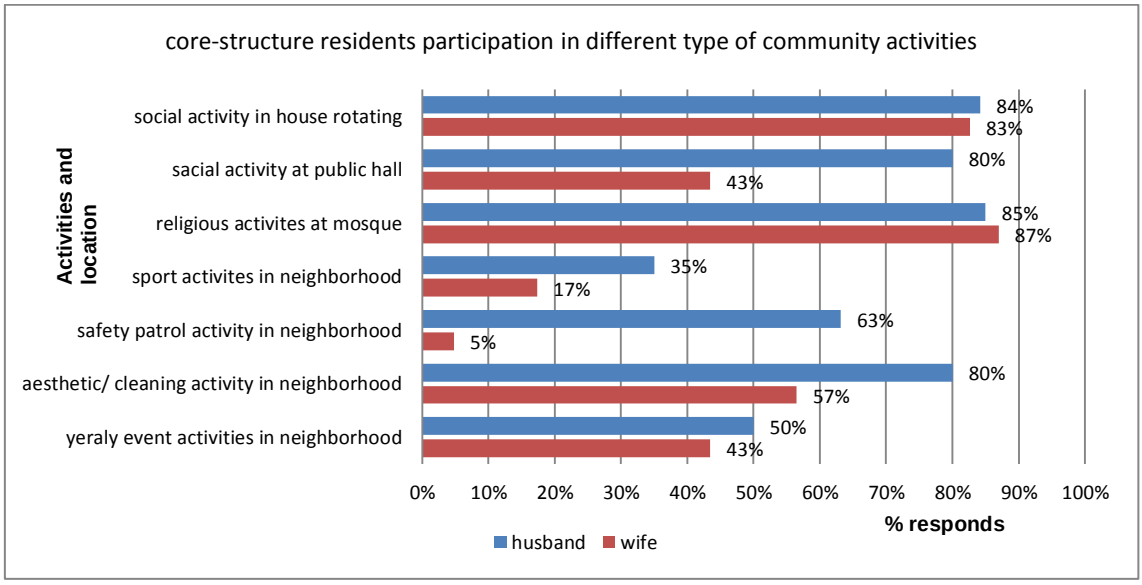

Figure 6.2 Core-structure residents' participation in different type of community activities.

More details community activities data were obtained to see the differences of the activities before and after the earthquake and compare the differences of the activities in core-struture housing settlement that reconstruct in its own original neighborhood with the activities in dome housing settelement that is a totally new neigborhood since it is a relocation area. The results in core-structure neighborhood in Tembi village shows that all community activities restarted within 6 months period after earthquake. More than 50 types formal routine community activities documented (50% routinely at least once in a month, 70% in Tembi facilities and 30% within house area). More than 50% involving more than 25 people.

6.1.2 House Condition Before and After the Earthquake

Residents' were asked about the recognition of their house spaces; whether they think they have/use the spaces (being asked) in their previous house and in their current post disaster house. Results show that there are not many differences (range less than 10%) that resident recognize similar spaces between before and after the earthquake. The largest differences are on the availability of chicken/cow house which is more than 20% (Figure 6.3).

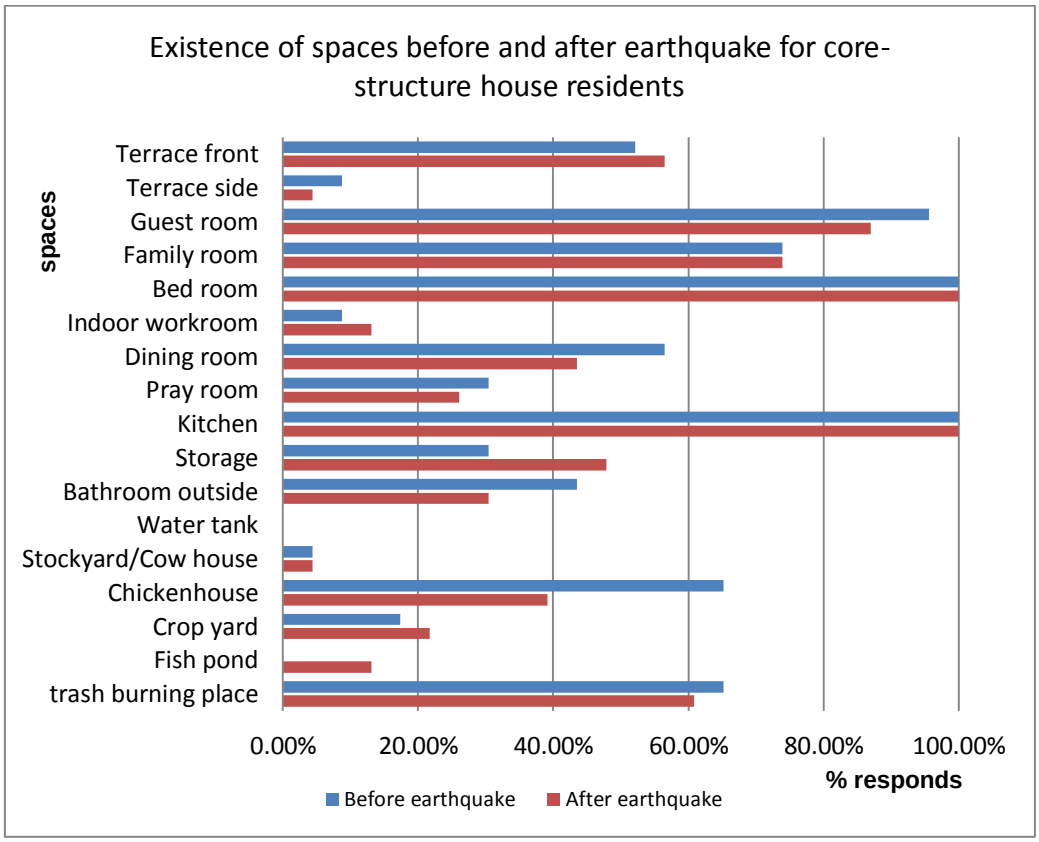

Figure 6.3 Dome residents dwelling space before and after the earthquake

6.1.3 Residents' Evaluation on House Design

The result in figure 6.4 on evaluation of core-structure house in Tembi indicates the house design have flexibility in its core-house design that make it easy for the residents to change the situation of the house for example, changing the function/order of a room, relocating doors/windows and add room, the highest disadvantage is on the flexibility to enlarge the space of the house.

Evaluation details for house flexibility shows "hard" capability of residents to *"to change the order/function of the rooms"* (26%), *"to expand the room"*(34.7%), and *"to change the location of the doors or windows"* (17.3%). 69.5% for capability *"to give rooms addition"* shows *"regular"* capability.

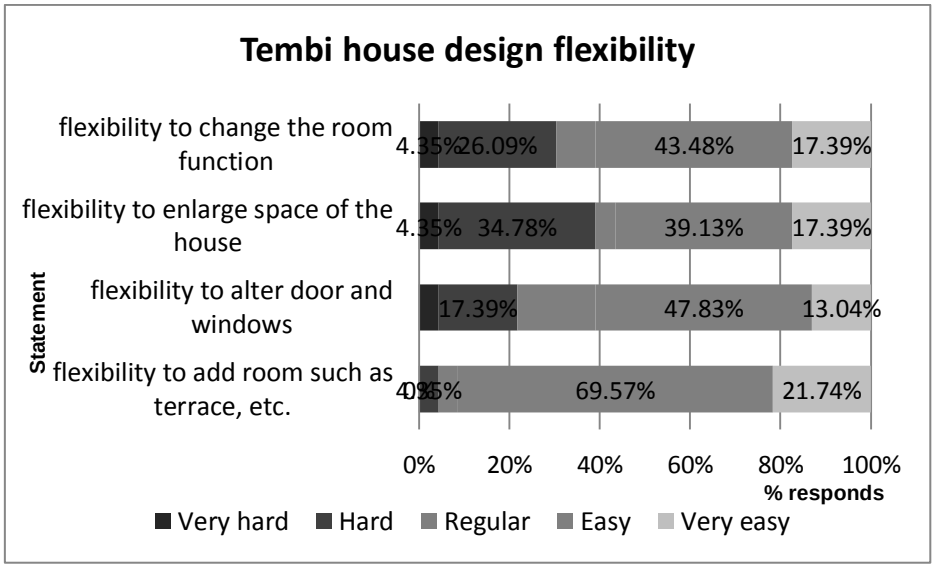

Figure 6.4 Residents' evaluation for core-structure house design flexibility

Evaluation details for personalization in figure 6.5 shows less than 5% *"hard"* capability for the residents to both *"to reuse or recycle previous doors and windows frames"* and none find it hard *"to make additional room that compatible with original donated house"* and less than 5% capability for *"to decorate own house to look different from the others"*

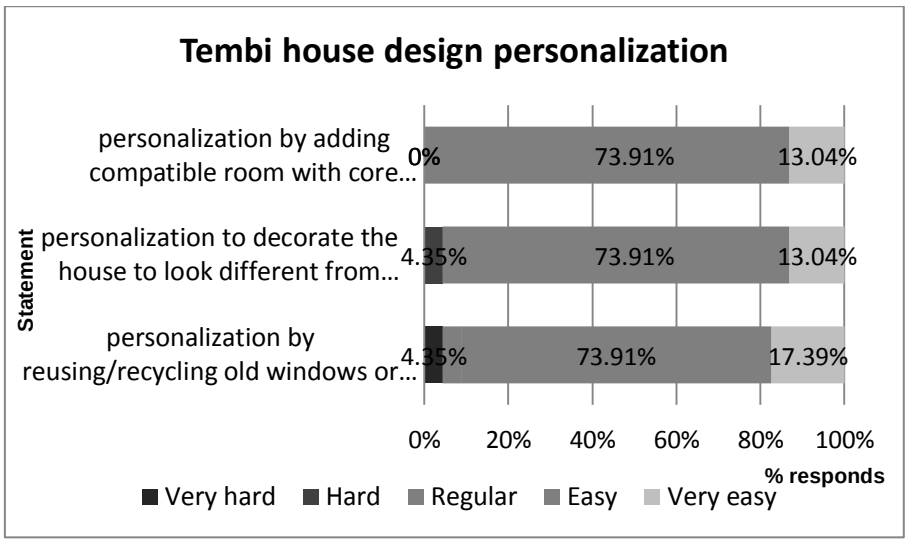

Figure 6.5 Residents' evaluation for core-structure house personalization

Evaluation for maintenance results in in figure 6.6 related to *"to fix any damage to roof" and "to fix any damage structure joints"* shows *"hard"* capability for less than 15%. None shows an hard capability *"to fix any damage to wall"*, *"to fix/add installation for electricity, water, etc."*

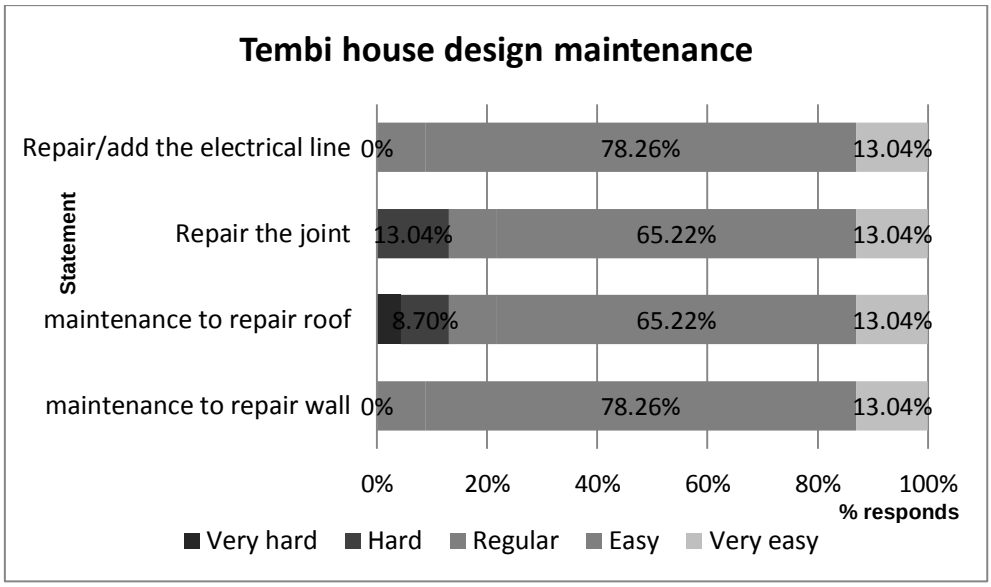

Figure 6.6 Residents' evaluation for core-structure house maintenance

From residents evaluation can be concluded that there are basically no particular dissatisfaction for flexibility, personalization and maintenance in core-structure housing in Tembi.

6.2 Dome Housing Before-After Earthquake and the Evaluation

6.2.1 Residents' Perception of and Participation in Community Activities

In dome housing, in figure 6.7 data shows that the residents' willingness of participation in overall community activities, the most frequent response by both heads of household and spouses is A *"I am actively participate"*. If responses A, B, C are taken as *"do participate with their own willingness",* responses D and E are taken as *"do not participate"* and response F is taken as *"do participate as obligation",* then approximately more than 95% for both heads of household and spouses said that they participate with their own willingness, while only less than 5% feel obligated to participate and null for no participation

High participation to community activities is supported by their perception on the importance of the value and existence of community activities in their neighborhood. Approximately 65% head of household and 57% of spouses response is A "I feel that community activities are very important" and approximately only about 34% for both heads of household and spouses said that "they are neutral, don't really have certain feeling.

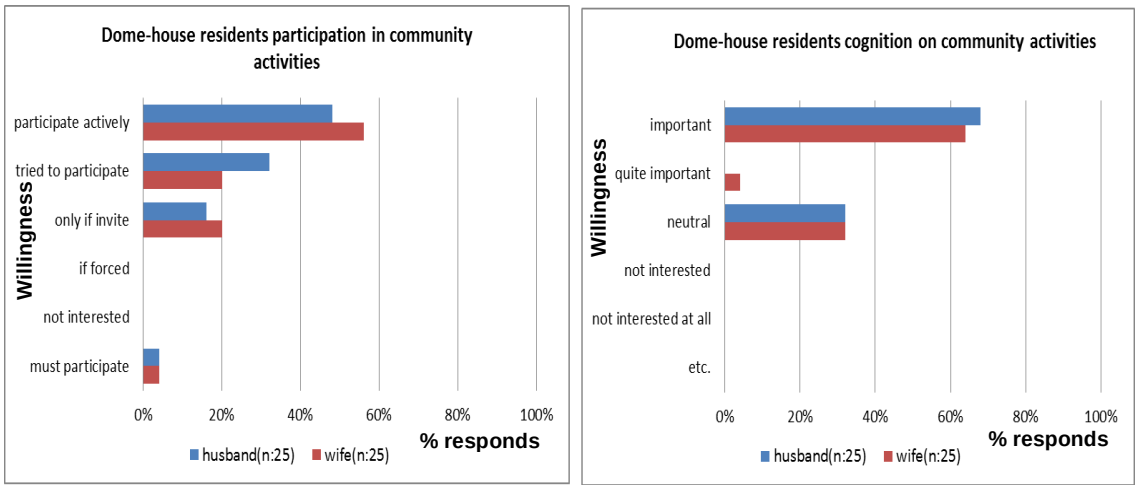

Figure 6.7 Dome housing residents' participation and cognition of community activities

In dome housing, in figure 6.8 residents' participation in community activities at residents' house shows 100% of head households and 96% of spouses' participation. Community activities at Community Meeting Hall (*Pendopo/Balai Pertemuan*) shows approximately 96% head households and 89% of spouses' participation. Community religious activities at neighborhood's mosque show 100% of head households and 96% of spouses' participation. Neighborhood aesthetics and maintenance activities surround the neighborhood shows 68% of head households and 62% of spouses' participation. Health and sport activities at neighborhood's field such as badminton, soccer, and etc. show 32% of head households and 7% of spouses' participation

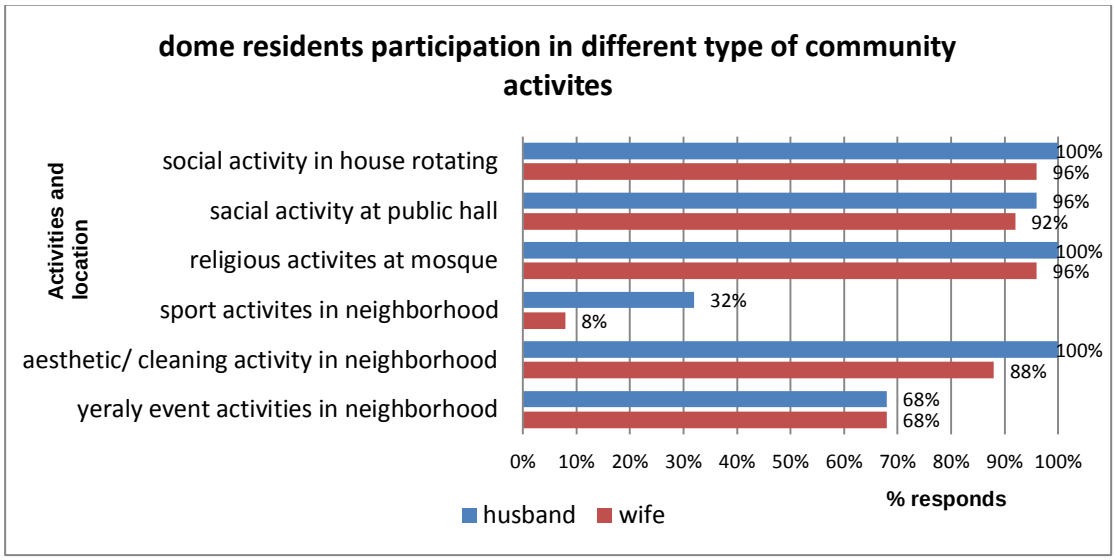

Figure 6.8 Dome housing residents' participation in different type of community activities.

The results in dome neighborhood in New Ngelepen shows that only 40% restarted within 1year after earthquake or within 6 month after reside in dome house, 60% restart 1-1.5yr after reside. More than 55 types formal routine community activities documented (45% routinely at least once in a month, 40% in neighboring village facilities, 35% in dome outdoor space, 10% in dome facilities, 15% within house area with 40% changed place and 10% suspended). 20% new community activities relate to management of dome areas and domestic tourism. More than 50% of the community activities involve more than 25 people.

6.2.2 House Condition Before and After the Earthquake

Analyses of residents' before and after disaster housing condition were made based on multiple choice and open ended questions concerning the house condition, comparison of rooms/spaces availability, their future preference to add or fix the condition of donated post disaster housing and the changes residents had made to the original donated house. Description on residents' before and after disaster housing condition is shown in Table 6.1

Table 6.1 before and after disaster housing condition.

Remarksc	Residents and House Condition	
	Original House (before disaster)	Dome House (after disaster)
House Type	Rectangular or square plan house with gable, hip or *joglo* roof type	Circular plan house with a hemispherical roof type
House Structure	50% brick with concrete column 25% brick without concrete column 14% ½ brick ½ wood/bamboo with concrete column 11% ½ brick ½ wood/bamboo with wood column	100% concrete cast dome monolithic
House space average	88 m2	38 m2 (7 m in diameter)
Land status	Personally owned 93%	Personally owned 0% (100% owned by Sleman regency goverment)
Occupancy	Lived by more than 1 household 35 %	Lived by more than 1 household 6%

Residents' in dome house also asked about their house spaces; whether they think they have/use the spaces (being asked) in their previous house and in their current post disaster house. Results show that the most drastic difference are on the existence of front terrace, dining room (usually integrated with kitchen), family room, praying room, chicken/cow house and water tanks (Figure 6.9). Interestingly, residents' acknowledgments to the availability/existence of the room/spaces implicitly show some design misfit where the intended available room or spaces in master plan for both site plan and house plan were actually not aligning with residents' usage or perception.

The findings suggest that the residents use and recognize some rooms/areas within the house and its outdoor space differently than the architects' master plan. Second floor in dome house was design as family room but only 44% of the residents acknowledged the availability of family room, instead most were used as storages. Moreover, 67% of house yard are used as a crop yard, fish pond, or chicken coop where in landscape master plan suggests yards to be aesthetically clustered fruits and flower gardens. These conditions are understandable, not only the fact that 2nd floor is hot during the day, but designer also missed the latent meaning of a 'family room'. In traditional dwelling, a family room used not only for private family gathering space, but also as an extension of social interaction space with others, therefore a continuity and accessibility with other rooms are important and that is why a secluded second floor were not recognized nor used as a family room. As for usage of house yard by residents, not only does it provides additional income but its existence is also part of their daily lifestyle because over than

75% of the residents' owned crop yard, stock yard and chicken house on their pre-disaster house yard.

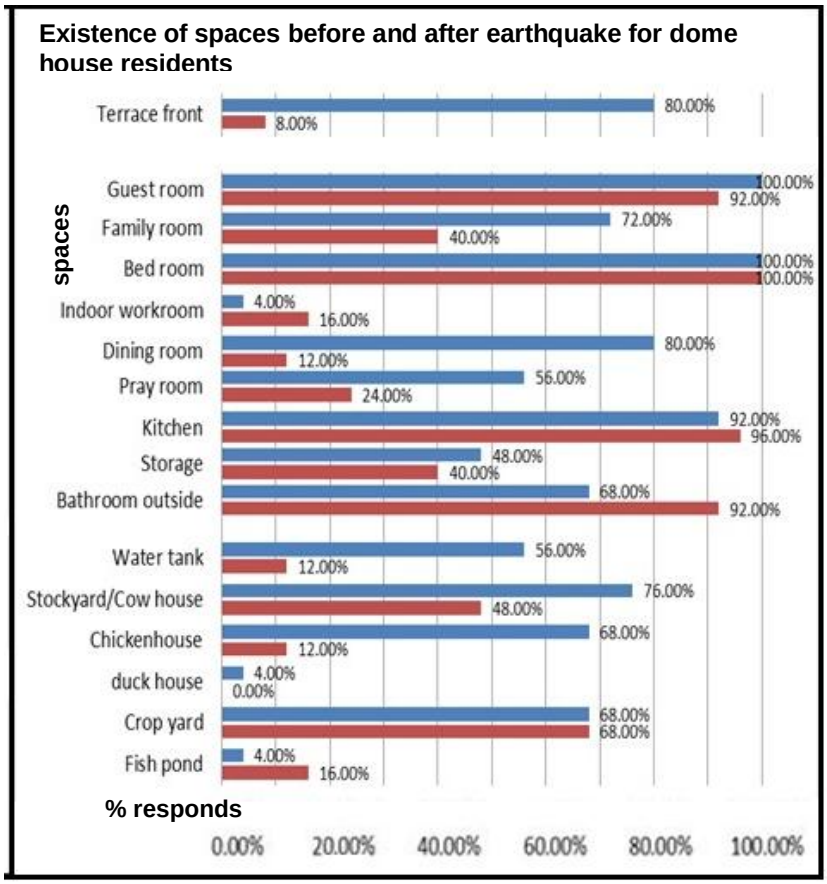

Figure 6.9 Dome residents dwelling space before and after the earthquake

Response to an open question of residents' future preference to add or fix the condition of donated post disaster housing shows the importance of adding either kitchen and private/individual bathroom for similar rooms available at *New Ngelepen* settlement. From the interview and observation in original *Ngelepen*, kitchen is one of the largest rooms in original dwellings that usually act as a multi-function area.

In conventional Javanese cooking, most of the people are still using cordwood[v] to cook and since Java food use various fresh spices and sometimes fresh from the yard crops, large preparation space and washing area are necessary. A socialization space such as dining room or just benches with preparation table are usually available as neighboring housewives or other family members usually chats together while preparing for cooking. Sometimes a kitchen also acts as storage area for the harvesting crops, equipment for farming and even as garage for bicycle or motorcycle. Most kitchens in original *Ngelepen* located in the back part and often

separated but still have a direct access to the main house. Because of the peculiar Javanese cooking habit and other above mentioned functions in the kitchen, that is why most Javanese people usually percept kitchen as *dirty* place. The high demand for another kitchen besides the one in the dome houses is understandable because the available kitchen in the dome houses could not facilitate Javanese cooking customs functionally and differ to the residents' perception.

Some of the largest demands of new additional rooms can be mentioned are garage for vehicle, shops and terrace (Figure 6.10). The importance of garage is due to the fact that motorcycle and bicycle are considered valuable items for the residents that 85% of their income only 100US$/month or less. However, the need for specific garage was not significance in original house because availability and spaciousness of other rooms to keep the vehicles contrasted to the room space inside dome house that is too limited to use as garage while also use for its functional purpose.

The importance to add terrace is to accommodate the residents' way of life which is not facilitated in dome house. As shown in Figure 2, in original house the existence of terrace was more than 80% but it decreases to only 7% in dome houses. For Javanese people, terrace has an essential value especially for social interaction. It functions as 'first' acceptance area for formal guest, family relaxation area and active-passive contacts interaction area with the neighbors.

The need for adding shops is new to the residents' lifestyle. It happened because dome houses have attracted many people to come and it becomes an opportunity to do home business. Although the above results shows the importance and needs of certain rooms/spaces in the house but the residents rarely add permanent rooms beside temporary kitchen, storage and shops (Figure 6.11).

The changes had been made to the original donated house within 3 years of occupancy were only adding canopy for protection in rainfall season, paving part of yard for social interaction spaces and installation of personal water valve (Figure 6.11). This condition could be caused by land status conflict; the fact that the land was only lent to them made them reluctant or postponed their needs to add permanent rooms.

An important note to mention is the incapability of the dome houses to accommodate the extended family in one house. In their original houses more than 34% were lived in by more than one household, but in dome houses it decreases to only 6%. Other finding shows that from the original house which had been repaired and still used, 56% of them were used by other family members. These implicit the situation in dome houses where nuclear families were

encouraged to each owns a separate house although whether it affect the closeness of family relations or not will need further study.

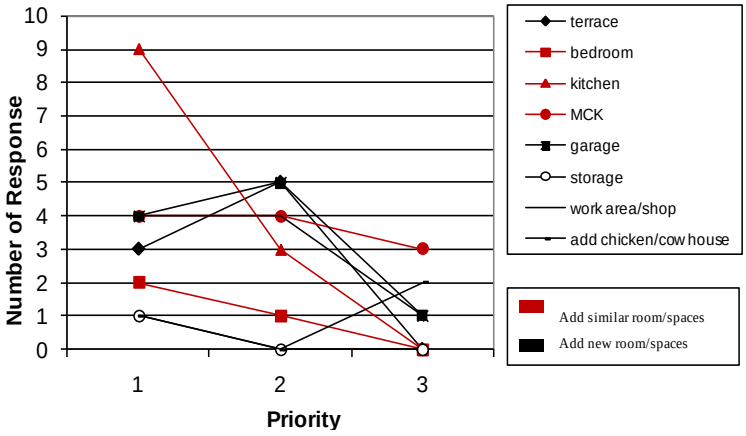

Figure 6.10 Residents' future preference to add or fix the condition of donated post disaster housing.

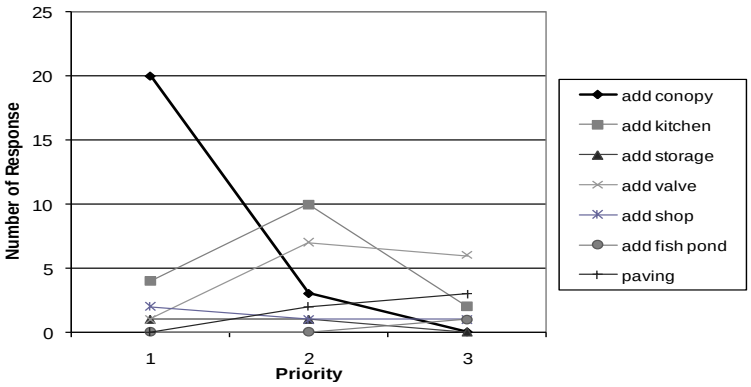

Figure 6.11 Changes had been made to the donated house

6.2.3 Residents' Evaluation on House Design, Outdoor and Neighborhood Spaces

a) Dome house design evaluation

The result on dome house evaluation indicates the house design has some limitations that cause dissatisfaction for the residents. For example, changing the function/order of a room, expanding rooms, and relocating doors/windows are 'very hard'. Moreover, adding extra rooms to the original dome house is 'neither easy nor hard' but adding a room compatible with the dome house is considered 'hard'

Evaluation details for flexibility in figure 6.12 shows "very hard" capability of residents to *"to change the order/function of the rooms"* (64%), *"to expand the room"*(57%), and *"to change the location of the doors or windows"* (76%). Only 61% for capability *"to add rooms addition"* shows *"regular"* capability.

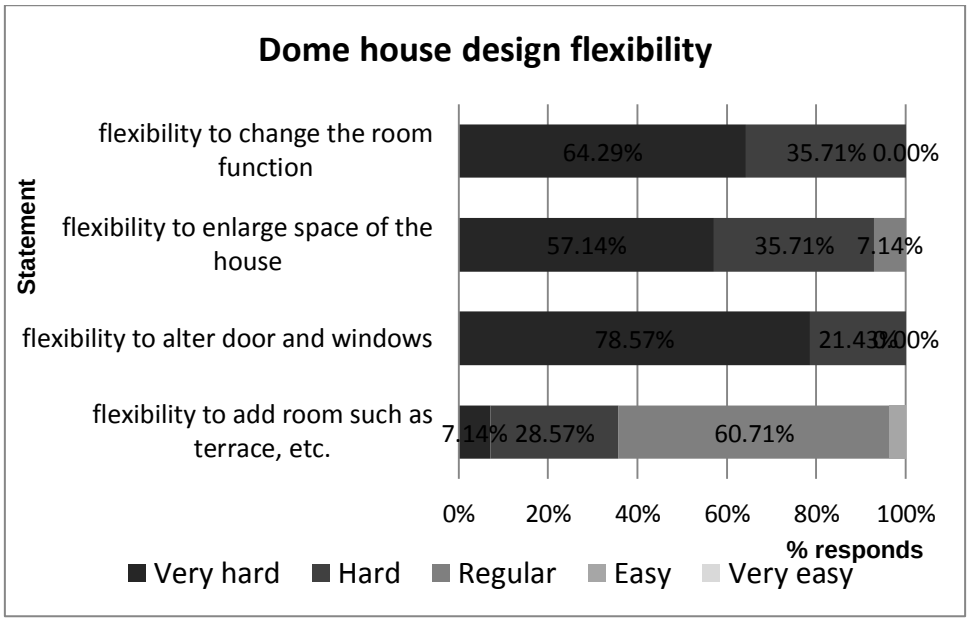

Figure 6.12 Residents' evaluation for dome house design flexibility

Evaluation details for personalization in figure 6.13 shows 63% *"hard"* capability for the residents *"to reuse or recycle previous doors and windows frames"* and *"to make additional room that compatible with original donated house"*. Only 58% shows a *"regular"* capability for *"to decorate own house to look different from the others"*.

Residents consider personalization using reused/recycle items from the previous house 'hard or very hard'. The only personalization considered 'neither easy nor hard' is to decorate the house to look different with paint or adding new elements without changing the house structure. Maintenance related to fix the damage to wall, roof and structure joints are considered 'hard '. Only to fix/add installation for electricity, etc. unrelated to structure is considered 'easy'.

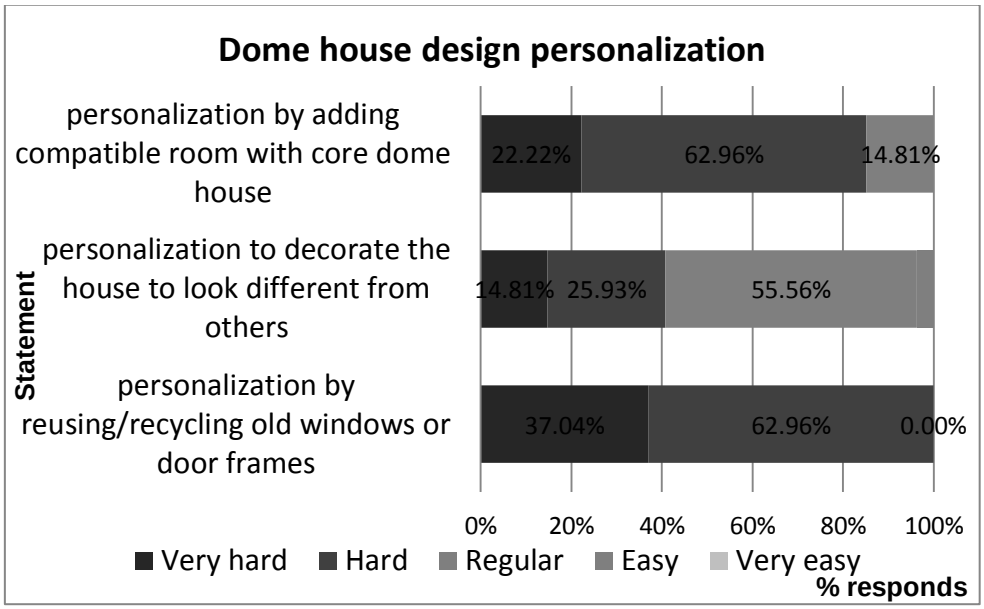

Figure 6.13 Residents' evaluation for dome house personalization

Evaluation for maintenance in figure 6.14 related to *"to fix any damage to wall"*, *"to fix any damage to roof" and "to fix any damage structure joints"* shows *"hard"* capability for 50% and less. Only 45% shows an *"easy"* capability *"to fix/add installation for electricity, water, etc."* (Figure 6.14).

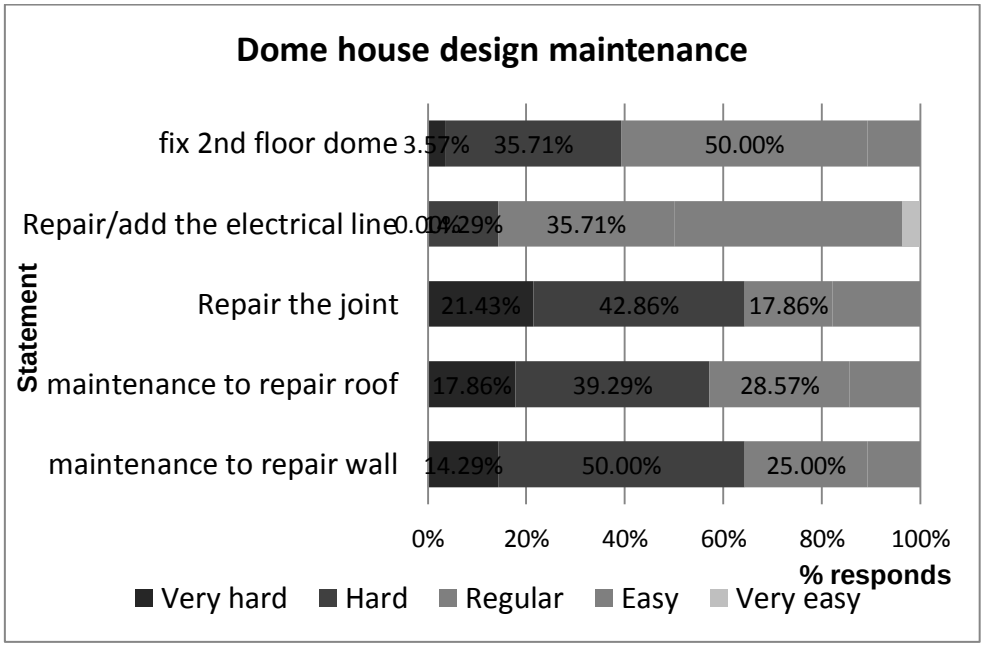

Figure 6.14 Residents' evaluation for dome house maintenance

From the residents' evaluation in figure 6.12 and 6.13 relating to addition or extension to dome house, we can make a conclusion that flexibility in dome houses is one of the most complicated problems for the residents except for capability *"to give rooms addition"*. However, in reality it is also hard for the residents *"to make additional room that compatible with original donated house".* Maintenance related to elements fixed to dome house structure such as wall, roof and joints also become a point of issues as the residents did not have the knowledge how to repair or maintain dome house structure.

b) Dome House Outdoor and Neighborhood Space Evaluation

Three aspects of residents' evaluation about their post disaster outdoor space conditions were studied; house outdoor space, neighborhood streets and cluster's facilities. Residents were asked in five points response score to evaluate their agreement to some of the problems related to those aspects of outdoor spaces.

Residents note dissatisfaction with many aspects of house's outdoor space, neighborhood streets, and cluster facilities. Evaluation details for house outdoor space shows *"very agree"* attitude toward statement *"it is better for each house to have private approach pathway"* (57%), *"there is not enough yard/room in the house to have social gathering"* (61%) and *"it is important to have a front terrace but the space available is not possible to made one"* (50%), while only 64% shows *"agree"* attitude toward statement *"each house should have own pathway from house to public toilet/washing area"* (Figure 6.15).

Evaluation for neighborhood streets shows that more than 96% of the residents are *"very agree"* to the statement *"the house front yard space should be larger instead of larger street for better social gathering space".* However evaluation for statement *"streets inside the neighborhood should not be too large so that cars and motors not easily pass by" were "disagree"* by more than 53% (Figure 6.16).

Evaluation for common facilities shows that more than 53% *"very agree"* that *"every house should have their own water installation and sanitation"* and only 32% to the statement *"every house should have their own toilet area"* (Figure 6.15).

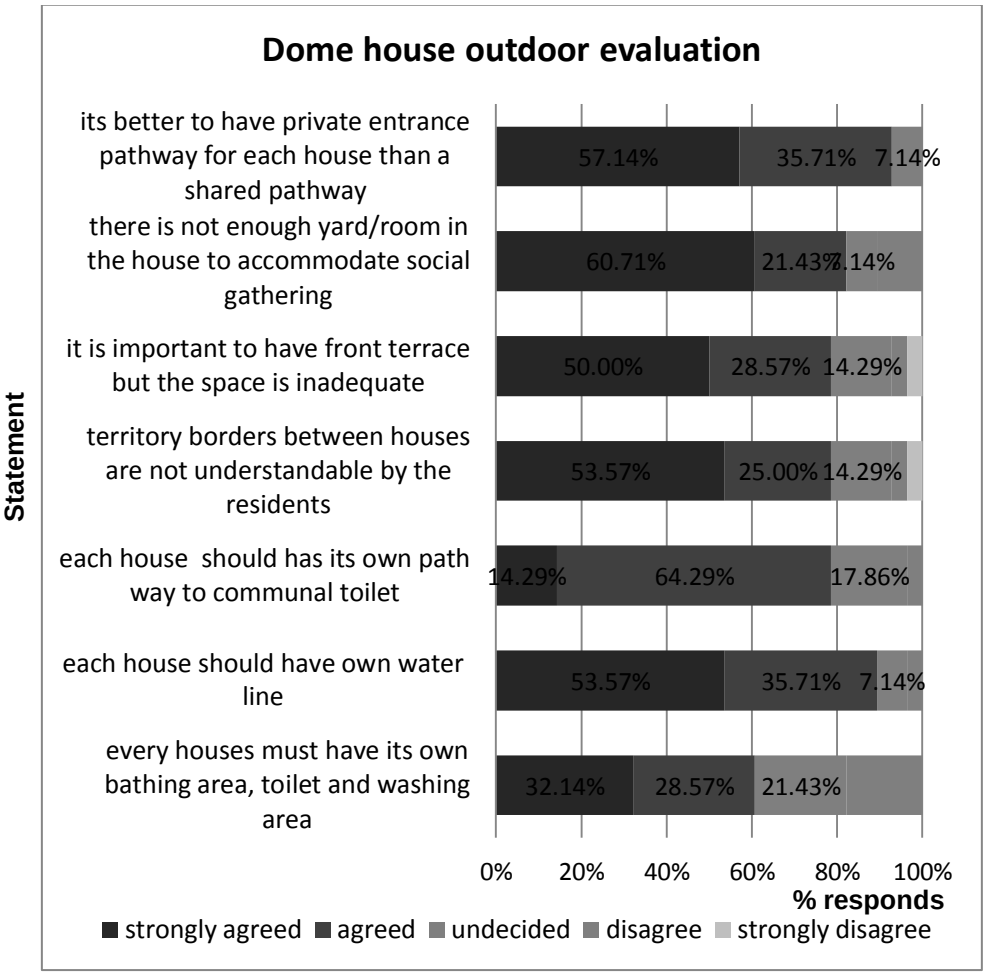

Figure 6.15 Residents' evaluation for dome house outdoor space.

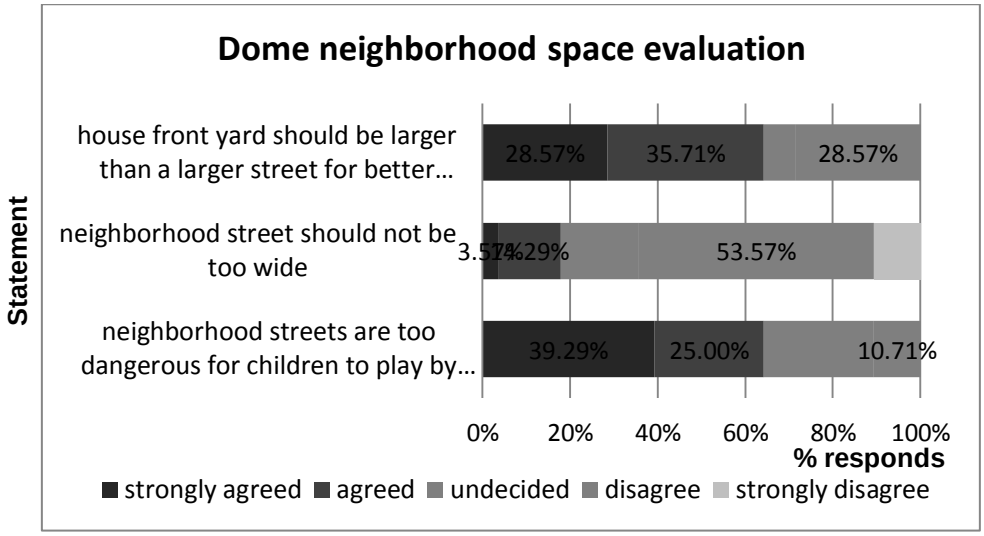

Figure 6.16 Residents' Evaluation for neighborhood streets.

From the residents' evaluation we can presume that house outdoor space hold an important role in their activities. Typical rural Javanese dwellings have multifunctional yards, which not only facilitate household activities such as doing laundry, harvesting crops, burning garbage, drying the corkwood, etc., but also serve as important socialization spaces where housewives chat, kids play, and social gatherings such as weddings, 'gatherings, etc. are hosted.

In daily life, housewives like to chats with the neighbors while looking after their little children playing in the house yard. Occasionally large social gathering are also done in house yard area such as wedding, 'trah' gathering, etc. The residents' agreement with the statement, "large front yards are better than large streets for social gatherings" is consistent with typical Javanese rural dwellings.

In *New Ngelepen*, because it is impossible to conduct certain social gatherings inside dome houses and due to the house's limited outdoor space, the residents have learned to use the neighborhood's streets for their activities. Therefore, the streets "act" as their yards and hang-out spaces. From the interview and observation, during the day little children were playing freely on the streets, while housewives chat on side of the streets. Although most consider the streets too dangerous to play unsupervised, the interviews and observations show that children play freely in the streets while their mothers chat on sides.

The ground surface of main street entrance is painted as a badminton field where youths and men gather in the evening. The streets were also used as social gathering spaces. Near neighborhood entrance, main entrance street was painted as badminton field where youths and man gather in the evening to play badminton or just to hang around. Social gathering that used to be facilitated in original dwellings but not possible in dome houses, now performed on the streets such as *ruwahan*[vi], etc. Even once the streets were closed for one of the resident's wedding ceremony because the house and its outdoor space are inadequate.

Unfortunately, residents' dissatisfaction not only shows their incapability to change the condition of the house design and outdoor spaces, but based on in-depth interview 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. Interestingly, although they responses show a high dissatisfaction toward the outdoor space condition, but when the residents were asked whether they planned to change it, most of their answers are not (Figure 6.17). These responses become questionable as to whether the residents were indeed does not want to change or they cannot change the situation. This may present other psychological problems. Because a house is the most fundamental base for one's personal life, an alternative,

long term solution is needed to give residents a sense of ownership and self-identity, e.g., rent to own payments, etc.

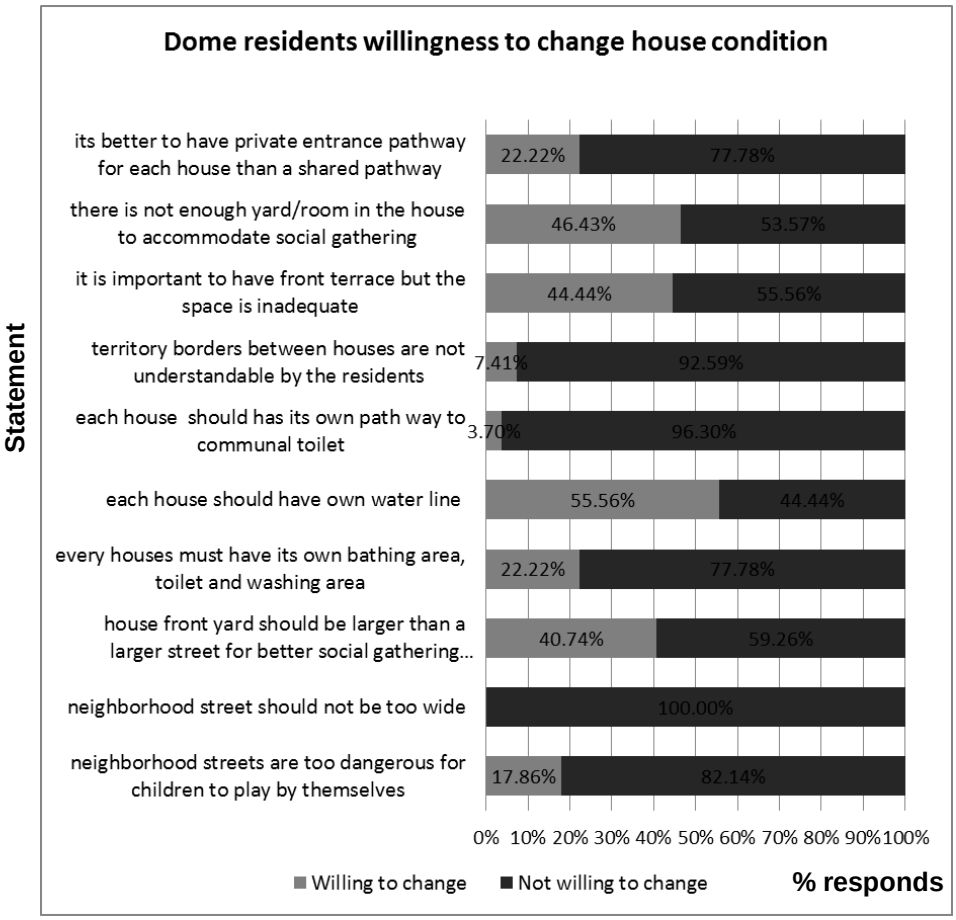

Figure 6.17 Intention to change outdoor space condition.

6.3. Conclusion

The results of the above surveys and analyses can be summarized as follows:

- Results in core-structure and dome housing shows that residents highly cherished their traditional Javanese living practices and community values such as *gotongroyong*, *kekeluargaan etc.* that residents also highly participate in community activities of their neighbourhood. These activities are ranging from routine social activities weekly, monthly, yearly and incidental activities in house rotating gathering and in other public places like the public hall, mosque, neighbourhood field etc. The activities also have varies types ranging from official meeting, religious meetings, age group meeting like housewives, man, youth meeting, etc.
- In core-structure housing, the comparison of rooms/spaces existence before and after disaster housing shows that there is not much differences. The result on evaluation of core-structure house indicates the house design have flexibility is greatly provided in its core-house design that make it easy for the residents to change the situation of the house according to their situation. Evaluation relate to personalization as well as maintenance also did not have any notable dissatisfaction since the design of the core-core is pretty similar to their previous housing which residents have the construction and maintenance knowledge.
- In dome housing, the results shows that the usage of some rooms in the house and planned areas of outdoor space contrary to the master plan shows that there are some misfit design where the "intended" usage are not use as it's supposed to. These conditions occur because the built environment could not facilitate the residents' way of life to fulfil their needs.
- In dome housing, residents' evaluation findings show that there is high level of incapability for the residents to change the condition in their post disaster house design. The need for flexibility, personalization and easiness for maintenance are inevitable as most of the residents used to fix or change their house condition on their own. The condition where misfit in house design and outdoor spaces are unchangeable had resulted in residents' dissatisfaction. Similar evaluations were made to the outdoor space where dissatisfaction is also high. However, the controversy toward their responses to the possibly to change the condition need a further study whether the residents were indeed does not want to change or they cannot change the situation.

CHAPTER 7 CONCLUSIONS

In defining dwelling (housing), one can not only compare the physical artifacts encounters. Different culture had different perception and actualization of their dwelling. (Rapoport, 2005). For most Java people, dwelling settings not only consist in the core house itself, but also the surrounding wells, streets, etc. as social space that accommodate various social interaction. To be Java people means to be a person who is civilized and knows his manners and place. Each individual serves in harmonious unity (Ronald, 2005). Results in all post disaster housing settlements after java 2006 earthquake shows that residents highly cherished their traditional Javanese living practices and community values such as *gotongroyong, kekeluargaan etc*. They have the social networks and varieties of community activities both routine and incidental. Residents' relationship with their neighbours is highly maintains by inviting guest in the house and participate in community activities. In self-built housing result shows that residents try to maintain their previous lifestyle where social interaction is reflected in the cognition of the house space, social interaction and usage of their housing. Similar tendencies also show in core-structure housing. Unfortunately not in the case of dome housing because sometimes certain social interaction needs cannot be facilitated in the house. The fixed condition of dome house means that those social activities (especially gathering in large number) which used to be facilitated in the house then needed to change place by facilitating it on the outdoor space or in some cases are suspended. In self-built or core structure case these type of social interaction gathering is still facilitated in the house by having combination expansion of guest room and family room which is not possible in dome situation

In self-built as well as donated core structure post disaster housings, physical changes and development from temporary to permanent such as size and room number expansion, space modification, function changes, apparently show that social interaction space is inevitably important to be provided in the house. There are also many variety of social interaction space in self-built and core-structure housing. On the other hand, total room number and addition of bedroom is still the highest overall adjustments which also indicate a high need of private space. These show that both needs of social interaction space and personal space are simultaneous exist and also actualize in their cognition of spaces. While in dome housing show very limited addition and extension, where mostly only adding kitchen detached from the dome structure or addition of canopy or eaves to provide social interaction spaces outside that not facilitate inside the house.

The importance of flexibility and open ended design in residential had widely researched. Environment that allow responses to cultural specifics (and its manifestations: lifestyle, activity systems, social networks, etc.) are more satisfying, avoid obsolescence longer than those that do not because they remain more congruent (Rapoport, 1990) and therefore such settings more supportive and to become an active component of the culture. In dome housing settlement, unchangeable house design and outdoor spaces have resulted in residents' dissatisfaction and inhibited some of their prior lifestyle. This is not the case with core-structure housing that is more flexible for the residents to make adjustments. Residents' evaluation in dome housing suggests that they are incapable of changing the condition of their donated dome house design and outdoor space. The need for flexibility, personalization, and ease for maintenance are inevitable as in original settlement residents routinely have social gathering within the house, and furthermore they used to repair or change the house condition on their own. Due to design limitations, dome houses and its outdoor spaces cannot facilitate prior gathering activities. In order to fulfill their needs, physical and behavioral adaptations and adjustments are necessary. This situation influenced residents' adjustments such as using neighborhood streets as gathering and sport area, going to nearby village's mosque for Friday prayer, etc. These means that the more inhibitive the housing environment (such as in dome post disaster housing), the larger consequences made to the neighborhood environment to facilitate residents' social interaction. Thus, streets, neighborhood open spaces and public facilities now have a bigger and more essential role in facilitating social interactions. In some cases, the unavailability of the original setting means certain community activities now occur less frequently or suspended indefinitely.

The relationship between people and the environment is due to a combination of cultural, environmental (physical planning), and perceptual aspects. Altman and Chemers (1980), specifically address the interaction between behavior, environment and culture that form a social system in an integrated way. The physical environment influences people and their cultures and in turn, is influenced by them. One needs to ask not only why environments should be culturally responsive but culturally responsive to whom (and hence how) (Rapoport, 1987). Implementation of 'clean kitchen[vii]', 'shared bathrooms', 'large but secluded family room', 'aesthetic landscape', 'shared pathway', etc. in dome housing settlement were actually designed to improve residents' quality of life. Yet, planners and designers seem to have failed to neither understand nor neglect the complex ways in which environment acts as settings for life as there are discrepancies between the intended usages in the master plan and actual usages. Consequently, the residents have had to adapt and adjust physical and behavioral aspects to maintain their previous personal and social lifestyles. Understanding latent function of services

needs to be considered so the intended design should not counter-indicated and became an inhibit environment for residents lifestyle such as in the presence of electric lighting (Rapoport, 1978), running water inside a dwelling or even so may an 'efficient' kitchen (Esber 1972). Hence, to create a settlement and house design that is close to the indigenous patterns, even for post-disaster housing, it is crucial that user lifestyle is fully investigated.

This research has once again highlighted the importance of social interaction that need to be facilitate in Java dwelling even at in constraint situation. Meaning, values and ideals of social behavior are reflected on their cognition of spaces in the dwellings as well as their physical-behavior adjustments. To aid in the post-disaster recovery process, post-disaster housing should be built not only for emergency situations, but also to accommodate the survivors' way of life and long term needs. As a dwelling, the house is not merely a shelter, but it's an actualization of meanings (Rapoport, 1969). For Java people, a house is living environment that represent the philosophical concept of the society itself. It is necessary that even in constraint dwelling such as temporary post disaster housing need to consider social inetraction importance in Javanese dwelling as culturally sensitive design for reconstruction recovery. This study shows that facilitating social interactions and flexible, open-ended design are vital for survivors to transition to a new environment.

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

[ii] In Bantul, the smallest community unit is RT *(Rukun Tangga)* that consist of 30-40 families. Rukun itself means social harmonious unity, which Mulder (1978 has described: "Rukun is soothing over differences, cooperation, mutual acceptance, quietness of hearth and harmonious existence." *Rukun Tangga* (the bond of household) is a social structure model of ideal community that the Javanese society has to be. In this study, the areas to be survey are 3 sub villages in Bantul and more precisely consist of two *RT* in each sub village

[iii] Gotong royong is a traditional practice of Java people mutual assistance among community member

[iv] Dirty kitchen is basically where all activities from storing raw materials, washing, preparing, cooking etc. are conducted. The area is preferred to be hidden from outsiders because it usually remain messy and dirty.

[v] Cordwood cooking method is traditional cooking method using fire-place stove with cordwood as fuel, which produces ashes and smoke

[vi] Ruwahan is tradition ceremonies on the ten days before Ramadhan (Islam's sacred month) which consists of various community activities such as cleaning up the neighborhood, recitation of Qur'an, etc.

[vii] Clean kitchen is rarely use as the 'actual' area for cooking rather it's a place where cooked food are prepared and storage, clean tableware are storages, etc. It's usually located near dining area and sometimes open to visitors