Post-disaster permanent housing: user participation and long-term satisfaction

Bee Lan Oo

1 Faculty of Built Environment, University of New South Wales Sydney, Kensington, NSW 2052, Australia
*Corresponding author: bee.oo@unsw.edu.au

Abstract. There is empirical evidence on varying levels of user satisfaction with the provided post-disaster permanent housing based on their levels of participation. This study compares non-participating and participating users’ long-term satisfaction with permanent housing constructed under the REKOMPAK (a community-based reconstruction program) after the 2010 Merapi volcano eruption. The results show that both groups have recorded highly similar levels of satisfaction with their permanent housing attributes with only four (out of 38) attributes that are statistically significantly different between the groups. These findings provide suggestive evidence on the maturity of the REKOMPAK program since it was created in 2005. This has implications for local authorities, humanitarian and other agencies in their decisions to adapt the REKOMPAK or other similar community-based programs for post-disaster reconstruction.

1. Introduction
The context of post-disaster housing reconstruction differs markedly from that which of routine construction as it is characterized by the need for speedy construction, the bureaucratic and community participation issues, the extraordinary financial requirements, and the resource challenges [1]. In a large collection of case studies on post-disaster permanent housing, authors have attempted to classify the project delivery methods in their evaluation of project successes and failures. For example, Bareastein [2] have documented four different approaches, namely: contractor-driven, subsidiary, participatory and owner-driven approaches. Dikmen et al. [3] classified the contractor, funding agency and owner-driven projects based on two divergent top-down and bottom-up principles. Although there are some variations in defining these approaches between authors, it appears there is a consensus among authors to broadly classify the respective project delivery methods into donor- and owner-driven approaches, as evidenced in a handful of literature that aimed to compare the strengths and limitations of these two approaches in delivering post-disaster permanent housing (e.g., [4, 5]). The other area of focus in previous case studies is the user, community, recipient, or beneficiary participation in the housing reconstruction processes. Davidson et al. [6] classified the level of community participation in post-disaster housing reconstruction into five levels, namely: manipulate, inform, consult, collaborate and empower. He indicated that an empowered community would be happy and satisfied with the housing and resettlement. Fanany [7] reported that the residents’ high level of involvement in the housing design and selection of materials, and the construction processes in the reconstruction helped them to deal with the devastation and loss caused by the tsunami in Aceh,
Indonesia. Mazza et al. [8], on the other hand, found that citizens were dissatisfied with the post-earthquake reconstruction in the city of L’Aquila because they have not been well informed about the reconstruction phases. In comparing donor- and owner-driven approaches, Karunasena and Rameezdeen [5] found that beneficiary satisfaction is higher in owner-driven approach. In terms of psychological needs and quality of interior spaces, Erinsel Önder et al. [9] found that those who participated in the design and construction processes were more satisfied than those who had not participated. Previous findings are mixed concerning the effect of user participation in post-disaster housing reconstruction, and this can partly be explained by the time frame when the evaluations were performed; and the different mechanisms in the respective project delivery methods. While authors have reported on changes in user satisfaction and permanency at post-disaster housing sites over time (e.g., [10, 11]), there is limited studies on objective evaluation of user satisfaction from a long-term perspective. This study aims to fill this literature gap by reporting the findings on user participation and long-term satisfaction in the REKOMPAK program.

2. The REKOMPAK program in Merapi
The October 2010 Merapi volcano eruption was an unusually large magnitude explosive eruption that caused over 350 fatalities and more than 300,000 people evacuated [12]. Close to 3900 houses were damaged in the affected areas, and more than 75% of all damaged housing were in the Slemen Regency in Yogyakarta Province [13]. Cangkringan district is one of the fourteen districts in the Slemen Regency, and was worst affected by the 2010 Merapi Eruption with over 2500 houses destroyed [14]. The post-disaster housing reconstruction was implemented through a scheme called REKOMPAK with funding from the Java Reconstruction Fund contributed by donors after Central Java earthquake in 2006 [15]. Under the REKOMPAK program, there are fifteen resettlement sites (called huntap, permanent settlements) with 1596 houses built in five villages that make up the Cangkringan district. These resettlement sites can be classified into five typologies based on the housing and infrastructure provisions and sources of fund, namely [13]: (A) collective resettlement sites; (B) independent collective resettlement, (C) combined support collective resettlement; (D) independent individual reconstruction; and (E) independently non-REKOMPAK supporter rebuilding. Type A was the typical type in most resettlement sites where the planning and construction of permanent housing were carried out by resident group representatives with the support from facilitators provided by REKOMPAK. The funding was in the amount of 30 million Rupiah for building a 6 x 6 meter reinforced concrete block house on 100m² lot of village-owned land for each household. With the mechanism of having resident group representatives in the reconstruction processes, this means not all the affected households had directly participated in the decision making.

3. Research method
This paper is part of a project on testing a conceptual framework on users’ long-term satisfaction with post-disaster permanent housing in Oo et al. [16-17]. Data was collected using a structured survey questionnaire written in Bahasa Indonesia. The results reported here are related to the users’ long-term satisfaction with permanent housing attributes. They were asked to indicate their level of satisfaction with 38 attributes based on a five-point Likert scale (1 = very dissatisfied and 5 = very satisfied). These attributes were adopted from a small collection of similar studies that investigated users’ satisfaction with post-disaster permanent housing on medium- to long-term perspectives (for e.g., [4], [10-11]). The field survey took place between Dec 2017 and Feb 2018. The resettlement sites in this study: (i) Batur, (ii) Pagerjurang; (iii) Gondang 2; and (iv) Dongelsari are all Type A collective resettlement sites. They are major resettlement sites as the total number of houses (738) built represents 46% of the 1596 houses built in fifteen resettlement sites in Cangkringan District [13]. This forms a strong basis to comparatively study the users’ long-term satisfaction with post-disaster permanent housing according to their levels of participation. With the focus on users’ long-term satisfaction, 285 (out of 297) sets of completed surveys were included in the data analysis. This selection criterion was based on the requirement that a household must have stayed in the provided
housing for at least 5 years (i.e., moved in before year 2014). This represents an average response rate of 38.62% (285/738) for the four resettlement areas, which is considered high and representative. For the data analysis, the respondents (or households) were classified into two groups according to their levels of participation in the reconstruction processes, namely: non-participating and participating groups. A non-parametric Mann-Whitney U test was used to test the equality of average satisfaction scores between the two groups.

4. Results and discussion
Table 1 shows the profile of the 285 respondents and about 67% of them were from Batur and Pagerjurang resettlement sites. The biggest age group (51%) is between 36 and 55 years old and about 80% of the respondents are either employed or self-employed. About 70% of the households have a typical family size of three to four members living in the housing permanently.

Table 1. The respondents’ profile.

| Characteristics                              | Frequency | %     |
|----------------------------------------------|-----------|-------|
| Resettlement site (Huntap)                   |           |       |
| Batur                                        | 96        | 33.68 |
| Pagerjurang                                  | 96        | 33.68 |
| Gondang 2                                    | 48        | 16.85 |
| Dongelsari                                   | 45        | 15.79 |
| Gender                                       |           |       |
| Male                                         | 172       | 60.35 |
| Female                                       | 113       | 39.65 |
| Age                                          |           |       |
| < 25                                         | 33        | 11.58 |
| 26 to 35                                     | 44        | 15.44 |
| 36 to 45                                     | 74        | 25.96 |
| 46 to 55                                     | 72        | 25.26 |
| 56 to 65                                     | 39        | 13.68 |
| > 65                                         | 23        | 8.07  |
| Employment status                            |           |       |
| Employed/ self-employed                     | 226       | 79.30 |
| Housewife                                    | 42        | 14.74 |
| Student                                      | 12        | 4.21  |
| Unemployed                                   | 5         | 1.75  |
| No. of people live permanently               |           |       |
| 1                                            | 15        | 5.26  |
| 2                                            | 44        | 15.44 |
| 3-4                                          | 198       | 69.47 |
| 5-8                                          | 28        | 9.82  |

Table 2 shows the respondents’ level of participation in the reconstruction processes. There are 94 respondents in the non-participating group, indicating that about one-third (i.e., 94/285) of the respondents had not directly participated in any of the reconstruction processes. While the remaining 191 (67%) households had participated in various processes, only about 10% of them were involved in more than three processes. The largest group (27%) had participated in at least two processes. The seven processes are: (i) selection of site location; (ii) selection of the housing type (traditional vs. modern); (iii) design of the housing (size, space, layout); (iv) selection of construction materials used; (v) selection of material suppliers; (vi) selection of subcontractors or labours; and (vii) supervision during construction stage.
Table 2. The respondents’ level of participation in the housing reconstruction processes.

| Level of participation | Frequency | %   |
|------------------------|-----------|-----|
| No participation       | 94        | 32.98 |
| Participated in different processes |           |       |
| 1 process              | 50        | 17.54 |
| 2 processes            | 76        | 26.67 |
| 3 processes            | 37        | 12.98 |
| 4 processes            | 14        | 4.91  |
| 5 processes            | 4         | 1.40  |
| 6 processes            | 3         | 1.05  |
| 7 processes            | 7         | 2.46  |

Table 3 shows the respondents’ average satisfaction scores and the Mann-Whitney U test results for comparing equality of means between the two groups. With the exception of one or two attributes, the average satisfaction scores for the remaining attributes for both groups are above 3 (i.e., the neutral level on a 5-point Likert scale). However, there is a rather wide spread in the respondents’ responses for some attributes in both groups as demonstrated by the high standard deviation values. Attributes related to the resettlement site locations scored low for both groups, including proximity to city centre (SC1) and public transportation (IS6) with mean values below or slightly above 3. The ‘neutral’ perceptions among the respondents could possibly be explained by the fact they were relocating within their own villages under Type A topology. Nonetheless, for both groups, the social environment (SE) attributes scored rather high mean values with most attributes ranked top on the list. These provide suggestive evidence that the resettlement programs had addressed the community social environment needs.

The test results show that the mean values of only four (out of 38) attributes are statistically different between the two groups at \( p < 0.05 \) level. These attributes are: size of bedrooms (PC7); shopping and conveniences (IS1); health facilities (IS3); and availability of job or business opportunities (SE5). Also, the participating group’s mean satisfaction scores for the first three attributes (i.e., PC7, IS1 and IS3) are lower than that of the non-participating group. For these observed differences between the groups, there are three possible explanations based on the present data. First, the small differences in mean scores for most attributes between the two groups can be partly due to the differences in perceptions among respondents from four different resettlement areas that have been reflected in the means. This phenomenon of differences in perceptions are not uncommon in similar past studies (e.g., [9], [11]). Indeed, Mei et al. [18] found that there are considerably differences in perceptions of the REKOMPAK program among respondents from another two Type A resettlement sites. Next, the lower mean scores from the participating group could also possibly be explained because those involved were more critical of the housing requirements or had higher expectations that cannot be met during the reconstruction processes. Thirdly, the findings, in general, provide suggestive evidence that the resident group representatives and the REKOMPAK facilitators were successfully in informing community during the reconstruction processes, although not all the households had directly participated. The third possible explanation is further supported by the average overall satisfaction scores of the two groups that is not statistically different at \( p < 0.05 \) level. The average overall satisfaction scores of the non-participating and participating groups are considerably high at 3.953 and 4.021 (close to 4 on a 5-point Likert scale), respectively. Above all, the highly similar levels of satisfaction between the two groups provide evidence on the maturity of the REKOMPAK program since it was created in 2015. The established mechanisms and expertise in the program contributed to its successful implementation in Merapi. Indeed, authors have attributed the success of the REKOMPAK program in Merapi to past experiences and lessons learnt from its implementation in Aceh post-tsunami and Central Java earthquake in 2006 ([13, 14]). The World Bank [15] has shared
this community-based reconstruction model and relayed the experiences and lessons learned in Aceh and Java due to its tremendous success.

**Table 3.** The respondents’ satisfaction scores and test statistics for comparing two groups

| Attribute                          | Level of participation | Sig. (Mann-Whitney U) |
|------------------------------------|------------------------|------------------------|
|                                    | No participation       | Participated in various processes | |
|                                    | Mean  | Std. Dev. | Rank | Mean  | Std. Dev. | Rank | |
| **Site characteristics**           |       |           |      |       |           |      |           |
| SC1 Proximity to city centre       | 2.968 | 0.921     | 37   | 3.168 | 0.873     | 36   | 0.105     |
| SC2 Proximity to workplace         | 3.564 | 0.665     | 27   | 3.508 | 0.787     | 27   | 0.603     |
| SC3 Convenience to livelihood      | 3.787 | 0.637     | 12   | 3.832 | 0.756     | 6    | 0.645     |
| SC4 Space between houses           | 3.840 | 0.627     | 8    | 3.764 | 0.822     | 12   | 0.464     |
| SC5 General cleanliness            | 3.819 | 0.548     | 10   | 3.770 | 0.710     | 11   | 0.572     |
| SC6 Landscaping (trees, garden areas) | 3.574 | 0.726     | 26   | 3.623 | 0.692     | 20   | 0.951     |
| SC7 Resilient for future disasters | 3.787 | 0.620     | 12   | 3.670 | 0.681     | 16   | 0.106     |
| **Physical conditions of housing** |       |           |      |       |           |      |           |
| PC1 Size of the house              | 3.287 | 0.887     | 36   | 3.157 | 0.850     | 37   | 0.170     |
| PC2 Durability of material used     | 3.766 | 0.679     | 15   | 3.780 | 0.770     | 10   | 0.745     |
| PC3 Quality of workmanship         | 3.734 | 0.706     | 16   | 3.796 | 0.751     | 9    | 0.546     |
| PC4 External appearance of the house | 3.628 | 0.639     | 20   | 3.634 | 0.769     | 19   | 0.761     |
| PC5 Internal layout of the house    | 3.628 | 0.656     | 20   | 3.513 | 0.717     | 26   | 0.117     |
| PC6 Number of bedrooms             | 3.479 | 0.729     | 33   | 3.372 | 0.770     | 35   | 0.228     |
| PC7 Size of bedrooms               | 3.606 | 0.609     | 23   | 3.419 | 0.763     | 33   | 0.038     |
| PC8 Toilets/ bath                  | 3.564 | 0.712     | 27   | 3.435 | 0.729     | 32   | 0.112     |
| PC9 Kitchen/ cooking space         | 3.511 | 0.684     | 31   | 3.450 | 0.772     | 31   | 0.373     |
| PC10 Access to utilities supply    | 3.777 | 0.642     | 14   | 3.707 | 0.731     | 14   | 0.462     |
| (water, electricity)               |       |           |      |       |           |      |           |
| PC11 Natural lighting              | 3.681 | 0.626     | 17   | 3.654 | 0.685     | 17   | 0.828     |
| PC12 Natural ventilation (fresh air) | 3.596 | 0.661     | 24   | 3.613 | 0.678     | 22   | 0.986     |
| PC13 Availability of space to meet your household needs | 3.670 | 0.709 | 18 | 3.586 | 0.741 | 23 | 0.455 |
| PC14 Visual privacy                | 3.415 | 0.679     | 35   | 3.471 | 0.753     | 29   | 0.491     |
| PC15 Aesthetic value               | 3.436 | 0.649     | 34   | 3.571 | 0.714     | 24   | 0.226     |
| PC16 Flexibility to incorporate changes (modification or improvement) | 3.500 | 0.699 | 32 | 3.503 | 0.774 | 28 | 0.958 |
| PC17 Fire and other safety measures | 3.660 | 0.648     | 19   | 3.571 | 0.684     | 24   | 0.269     |
| PC18 Easy to upkeep                | 3.628 | 0.604     | 20   | 3.649 | 0.724     | 18   | 0.951     |
| PC19 Feeling of home               | 3.851 | 0.621     | 7    | 3.806 | 0.732     | 8    | 0.415     |
5. Conclusions

This study examines users’ long-term satisfaction with post-disaster permanent housing attributes according to their levels of participation in REKOMPAK - a community-based post-disaster rehabilitation and reconstruction settlement program in Merapi, Indonesia. The results show that both non-participating and participating groups have recorded highly similar levels of satisfaction with their permanent housing attributes. The non-participating groups has not been disadvantaged in terms of the provided permanent housing. The REKOMPAK program was very successfully in addressing the users’ long-term social environment needs. These findings provide suggestive evidence on the maturity of the REKOMPAK program with established mechanisms and expertise since it was created in 2005. This empirical evidence has implications for local authorities, humanitarian and other agencies in their decisions to adapt the REKOMPAK or other similar community-based programs for post-disaster reconstruction. Nonetheless, it is recognized that local authorities and agencies should consider the cultural and local conditions as well as users’ needs in developing their respective models, guidelines and policies of community-based post-disaster reconstruction program. This forms the scope of the next stage of this project.

6. References

[1] Bilau A and Witt E 2016 An analysis of issues for the management of post-disaster housing reconstruction Int. J. of Strategic Property Management 20(3) 265-276
[2] Barenstein J D 2006 Housing Reconstruction in Post-Earthquake Gujarat: A Comparative Analysis (London: Humanitarian Practice Network at Overseas Development Institute) pp 54
[3] Dikmen N, Elias-Ozkan S T and Davidson C 2012 Comparison of post-disaster housing procurement methods in rural areas of Turkey Open House Int. 37(1) 28-39
[4] Andrew S A, Arlikatti S, Long L C and Kendra J M 2013 The effect of housing assistance arrangements on household recovery: an empirical test of donor-assisted and owner-driven approaches J. of Housing and the Built Environment 28(1) 17-34

[5] Karunasena G and Rameezdeen R 2010 Post-disaster housing reconstruction: Comparative study of donor vs owner-driven approaches Int. J. of Disaster Resilience in the Built Environment 1(2) 173-191

[6] Davidson C H, Johnson C, Lizaralde G, Dikmen N and Sliwinski A 2007 Truths and myths about community participation in post-disaster housing projects Habitat International. 31(1) 100-115

[7] Fanany I 2010 Towards a model of constructive interaction between aid donors and recipients in a disaster context: the case of Lampuuk Post-disaster reconstruction: Lessons from Aceh eds M Clarke and I Fanany (London: Taylor and Francis) pp 107-125

[8] Mazza M, Chiara Pino M, Peretti S, Scolta K and Mazzarelli E 2014 Satisfaction level on quality of life post-earthquake rebuilding Int. J. of Disaster Resilience in the Built Environment. 5(1) 6-22

[9] Erinsel Önder D, Köseoğlu E, Bilen O and Der V 2010 The effect of user participation in satisfaction: Beyciler after-earthquake houses in Düzce ITU A[Z. 7(1) 18-37

[10] Manatunge J M A and Abeyesinghe U 2017 Factors affecting the satisfaction of post-disaster resettlers in the long term: A case study on the resettlement sites of tsunami-affected communities in Sri Lanka J. of Asian Development 3(1) 94-124

[11] Snarr D N and Brown E L 1994 Post-disaster housing reconstruction: A longitudinal study of resident satisfaction, Disasters 18(1) 76-80

[12] Smithsonian Institution and US Geological Survey 2016 Global Volcanism Program, Report on Merapi (Indonesia) in S.K. Sennert (ed.) Weekly Volcanic Activity Report 26 October-1 November 2016

[13] Maly E, Iuchi K and Nareswari A 2015 Community-based housing reconstruction and relocation: REKOMPAK program after the 2010 eruption of Mt. Merapi Indonesia Institute of Social Safety Science Journal 27 205-214

[14] Samekto C B D and Nuh M 2017 Evaluation of community-based settlement reconstruction program: case study in post-disaster recovery of 2010 Merapi volcano eruption in Cangkringan district, Sleman Regency, Yogyakarta Province J. of Public Administration Studies 1(3) 64-70

[15] The World Bank 2012 REKOMPAK: Rebuilding Indonesia’s Communities After Disasters. Jakarta, Indonesia The Secretariat of the Multi Donor Fund for Aceh and Nias and the Java Reconstruction Fund

[16] Oo B L, Sunindijo R and Lestari F 2018 Users’ long-term satisfaction with post-disaster permanent housing programs: a conceptual model, Int. J. of Innovation, Management and Technology 9 28-32

[17] Oo B L, Sunindijo R and Lestari F 2018 Users’ long-term satisfaction with post-disaster permanent housing: a case study of 2010 Merapi Eruption, Indonesia Proc. of the Int. Conference on Engineering, Applied Sciences and Technology (Phuket) 192 (Paris: MATEC Web of Conference) 02066

[18] Mei E T W, Fajarwati A, Hasanati S and Sari I M 2016 Resettlement following the 2010 Merapi Volcano eruption Procedia-Social and Behavioral Sciences 227 361-369

Acknowledgment
This project was supported by the UNSW-Indonesia Seed Fund (Grant no.: RG162919). The author gratefully acknowledges the efforts of Dr. Riza Sunindijo in the questionnaire translation and research ethics application process, and Dr. Fatma Lestari and her research team for their invaluable help in completing the data collection and entry.