The level of satisfaction in construction of post-earthquake houses in Tanjung Sub-district, North Lombok Regency

B H Widayanti¹, A Yuniarman¹, S A P Lestari¹ and S R Yunianti²

¹Department of Urban and Regional Planning, University of Muhammadiyah Mataram, Jl. KH. Ahmad Dahlan No.1, Kota Mataram, Nusa Tenggara Barat, Indonesia
²PUPR Rekompak Provinsi Nusa Tenggara Barat, Jl. Melur No.1, Kota Mataram, Nusa Tenggara Barat, Indonesia

Corresponding author’s email: baiqharlywidayanti@gmail.com

Abstract. The earthquake disaster on Lombok Island in 2018 impacted 564 inhabitants, damaged 167,939 houses, and damaged infrastructure. This condition requires the community to live in temporary shelters. The government, stakeholders, and other social agencies have worked together to rebuild the houses during the rehabilitation and reconstruction phase. The government’s earthquake-resistant residential model consists of simple instant houses (RISHA), conventional instant houses (RIKO), and instant wooden houses (RIKA). The purpose of this research was to analyze the level of community satisfaction of these houses. The research used five variables, i.e., reliability, responsiveness, assurance, empathy, and tangible with 24 sub-variables. The analysis method used is the Customer Satisfaction Index (CSI). The research found that the CSI values for the RISHA and the RIKA model are 70.80% and 67.61%, respectively. Both models are in the satisfied category. Meanwhile, the CSI value for RIKO is 81.86% which is in the category of very satisfied.

1. Introduction
On July 29, 2018, a devastating 6.4 RS earthquake hit Lombok Island, followed by a 7 RS earthquake on August 5. On August 19, two more earthquakes with the magnitude of 6.4 RS and 6.9 RS hit the island. The National Disaster Management Agency (BNPB) recorded 1,005 aftershocks from August 5, 2018, to August 21, 2018, in eastern Indonesia. From all the earthquakes that occurred, 13 events were felt by the community that had a magnitude of above 4 RS [1]. Based on the BNPB data, the recorded impacts of the earthquakes on Lombok Island are [2]:

- A total death toll of 564 people in West Nusa Tenggara (NTB) Province, 82.8% of which or 467 people lived in North Lombok District. There were 1,584 people injured in NTB Province of which 52.3% or 829 people were from North Lombok Regency.
- A total of 167,939 houses were damaged.
- There were 214 cases of damage to infrastructures such as bridges, roads, bus terminals, harbors, and irrigation dams. The irrigation networks sustained most damage (45% or 97 cases), followed by roads (28% or 61 cases), SPAM (Drinking Water Supply System), and IPAL (Waste Water Treatment Plant - 15% or 32 cases). When accumulated the most infrastructure damage occurred in North Lombok with 85 cases.
North Lombok Regency sustained the most severe impact compared to other regions in West Nusa Tenggara Province. In the capital district of Tanjung Sub-District, 85% or 13,868 community housing units were leveled [3]. Meanwhile, 3,635 residential units were severely damaged, 3,299 units were slightly damaged, and 6,934 units were moderately damaged, based on the data from the Department of Public Works and Public Housing and the Environmental Agency of North Lombok Regency. The central and regional governments are helping the community to improve their occupancy, where the IDR 50 million of development assistance fund is available for housing that is severely damaged is, IDR 25 million for moderately damaged, and IDR 15 million for slightly damaged. The construction of these government-assisted houses will be provided through the model of Simple Healthy Instant Houses (Risha), Conventional Instant Houses (Riko), and Instant Wooden Houses (Rika).

Rekompak, Public Works and Housing Agency (PUPR) of West Nusa Tenggara Province in post-earthquake housing rehabilitation activities provides data on the realization of the construction and repair of severely damaged houses in Tanjung Sub District, which is the center of North Lombok Regency government. Based on this data, 129 units were constructed and repaired by the end of 2018. In early 2019, the housing development process was accelerated so that all people affected by the earthquake can immediately have a home again. As described above, the government builds three types of houses: Risha, Rika, and Riko. Several literature studies explain that Risha is a form of a healthy simple house using knockdown technology.

Risha’s technology uses reinforced concrete and does not use much natural material. It is very feasible because it is environmentally friendly and meets basic housing standards. The advantages of Risha’s technology [4], include: it is simple, fast, flexible, environmentally friendly, reliable, and durable. Whereas, the Riko model uses light steel or can utilize the remnants of the remaining building debris. Riko's houses include environmentally friendly building materials and have low construction costs. Moreover, the construction of one Riko unit takes only two weeks. The research by Rinaldi et al. (2015) found that traditional houses are constructed using mild steel, wood, and remaining building materials whereas the Rika model is made of wood. Rinaldi et al. (2015) studied the earthquake-resistant construction of traditional buildings of the Besemah tribe in Pangaralam City, North Sumatera. This study found three principles in the construction of earthquake-resistant wooden houses namely [5]:

- Building materials are as light as possible;
- The building plan is symmetrical and straightforward; and
- The construction system is adequate in reducing earthquake risk.

Community-based reconstruction can be in the form of material or financial assistance distributed through community groups that are active in decision-making and development management [6]. The house reconstruction process after the earthquake disaster is referred to as a community-based program or an empowerment model if the community is involved or collaborates [6].

This research aims to determine the level of community satisfaction with the construction of residential houses by the government at the earthquake-affected locations in Tanjung Sub-district, North Lombok Regency. The study is comparing the advantages of each type of earthquake-resistant house (Risha, Riko, Rika). The results and recommendations in this paper can be used as input for relevant actors, especially the government. This can ensure that the provided housing is in line with the expectations of the community affected by the earthquake.

2. Research method

2.1 Research approach

This research used a mixed-method approach, using qualitative and quantitative techniques, and a survey. Mathematical models were used for calculating the level of community satisfaction with the government-assisted housing units, through the Customer Satisfaction Index (CSI).
2.2 Research variables

The variables used are based on previous literature studies in combination with several theories stated above, it is formulated as follows.

Table 1. Research variables [6].

| Indicator  | Variable                                                                 |
|------------|--------------------------------------------------------------------------|
| Reliability| - Information support and dissemination about adequate and on-time programs<br>- Quick service and program initiation<br>- Readiness and adequacy of materials and equipment<br>- Skilled and professional provision of assistance<br>- Quick needs identification<br>- Process of identifying beneficiaries and types of rapid assistance |
| Responsiveness| - Fast response to community complaints<br>- Fast response to the community<br>- Readiness to serve the community<br>- Establishing intense communication with the community<br>- Establishing good cooperation with the community<br>- Ease in the process of distributing aid |
| Assurance  | - Providing security<br>- Providing a positive image<br>- Giving trust to the community |
| Empathy    | - Ease in obtaining information<br>- Giving individual attention<br>- Considering the needs of the sub-districts<br>- Non-discriminatory service provision |
| Tangible  | - The provided assistance creates happiness<br>- The provided assistance is based on the wishes and expectations of the program recipients<br>- Feasible and suitable assistance provision The initial commitments are fulfilled when providing information<br>- Professional facilitators are used |

2.3 Research sample

The subject of research was the community in Tanjung Sub-district, who received shelter repair assistance. The research sampling technique carried out was simple random sampling. Simple random sampling is a technique, where each element of the population is considered to have the same opportunity to be selected as a sample.

The samples used included 100 people scattered in the community who chose the RISHA, Rika, and RIKO buildings. Table 2 shows the distribution of samples per type of house.

Table 2. Distribution of Samples.

| No | House Type | Sample |
|----|------------|--------|
| 1  | Risha      | 35     |
| 2  | Rika       | 35     |
| 3  | Riko       | 30     |
|    | Total      | 100    |
2.4 Stages of research

The Customer Satisfaction Index (CSI) was calculated using four steps as follows:

1. Determining the Mean Importance Score (MIS) and Mean Satisfaction Score (MSS). This value comes from the perceived average level of importance and performance of each respondent.

\[
MIS = \frac{\sum_{i=1}^{n} Y_i}{n} \\
MSS = \frac{\sum_{i=1}^{n} X_i}{n}
\]

Notes:
- \( n \) = Number of respondents
- \( Y_i \) = Value of the importance of attribute to \( i \)
- \( X_i \) = Performance value of the attribute to \( i \)

2. Creating Weight Factor (WF). This weight represents the percentage of MIS values per attribute against the total MIS of all attributes.

\[
WF = \frac{MIS_{i}}{\sum_{i=1}^{p} MIS_{i}} \times 100\%
\]

Notes:
- \( P \) = Number of attributes of interest (\( k = 24 \))
- \( i \) = Service attribute to \( i \)

3. Creating a Weighting Score (WS). This weight is the multiplication between Weighting Factor (WF) and the average level of satisfaction (Mean Satisfaction Score = MSS)

\[
WS_i = WF_i \times MSS_i
\]

Notes: \( i \) = Servant attribute

4. Determine CSI

The consumer scale, commonly used in index interpretation, is a scale of zero to one hundred.

\[
CSI = \frac{\sum_{i=1}^{n} WSI}{5} \times 100\%
\]

CSI values in this study are divided into five categories ranging from dissatisfied to very satisfied, and the five categories are as follows:

| No | Index Value | Satisfaction |
|----|-------------|--------------|
| 1  | 81 – 100    | Very satisfied |
| 2  | 66 – 80.99  | Satisfied     |
| 3  | 51 – 65.9   | Sufficient    |
| 4  | 35 – 50.99  | Less satisfied |
| 5  | 0 – 34.99   | Dissatisfied  |

3. Result dan Discussion

3.1 Overview of Tanjung Sub-District

Tanjung Sub-district is the center of the capital of North Lombok Regency. It is the center of trade and government in the regency and consists of seven villages, namely: Jenggala, Medana, Sigar Penjalin, Sokong, Tanjung, Tegal Maja, and Teniga. The population of Tanjung Sub-district is 47,918 [7]. Tanjung Sub-district borders the Java Sea in the north, Pemenang Sub-District in the west, Gangga Sub-district, and Narmada Sub-district and Gunung Sari Sub-district (West Lombok Regency) in the south.
3.2 Overview of the construction of earthquake resistant houses in Tanjung Sub-District

Tanjung Sub-District, as one of the locations affected by the earthquake disaster, received assistance from the government in the form of earthquake-resistant houses with the Risha, Rika, and Riko models. In the construction of the three models of earthquake-resistant houses, each model has its own characteristics based on the material used. The Risha model uses reinforced concrete, while the Riko model uses mild steel, and the Rika model uses certified wood.

![Image of earthquake resistant houses](image)

**Figure 1.** Earthquake resistant Risha, Rika, and Riko houses

3.3 Satisfaction level analysis

The satisfaction analysis showed varying results for the research variables. Based on the findings in the field, many community houses were still not 100% finished. For many houses, only the foundation is finished or the houses do not have a roof yet. Consequently, several residents still live in shelters provided by the government or other social institutions. The problem encountered in the field is the fact that many residential buildings have not been built yet. This is due to the lack of construction workers who can build earthquake-resistant houses; delays in the process of disbursing funds to community groups; and because of difficulties of obtaining building materials. This is especially true for certified material that must come from other regions. Based on the results using the formula, Table 4 gives an overview of the value of the satisfaction level or CSI for each model of earthquake-resistant housing.
Table 4. Satisfaction level analysis of earthquake-resistant housing in TanjungSub-District.

| Attribute                                      | RISHA | RIK A | RIKO |
|------------------------------------------------|-------|-------|------|
| RELIABILITY                                   |       |       |      |
| Information support and dissemination about   | 4.92  | 3.67  | 4.41 |
| adequate and on-time programs                 | 4.17  | 5.00  | 4.60 |
| Quick service and program initiation          | 4.92  | 4.21  | 4.49 |
| Readiness and adequacy of materials and       | 4.58  | 3.63  | 4.15 |
| equipment                                     | 14.90 | 4.63  | 4.28 |
| Skilled and professional provision of         | 4.58  | 3.50  | 4.11 |
| assistance                                    | 14.39 | 4.38  | 3.75 |
| Quick needs identification                    | 4.67  | 3.58  | 4.19 |
| Process of identifying beneficiaries and       | 4.67  | 3.79  | 4.19 |
| types of rapid assistance                     |       |       |      |
| RESPONSIVENESS                                |       |       |      |
| Fast response to community complaints         | 4.79  | 3.50  | 4.30 |
| Readiness to serve the community              | 4.71  | 3.50  | 4.22 |
| Establish intense communication with the       | 4.50  | 3.50  | 4.04 |
| community                                     | 14.13 | 4.38  | 3.63 |
| Establishing good cooperation with the         | 4.42  | 3.42  | 3.96 |
| community                                     | 13.53 | 4.25  | 3.88 |
| Ease in the process of distributing aid        | 4.46  | 3.54  | 4.00 |
| ASSURANCE                                      |       |       |      |
| Providing security                            | 4.83  | 2.96  | 4.33 |
| Providing a positive image                    | 4.33  | 3.46  | 3.89 |
| Giving trust to the community                 | 4.46  | 3.50  | 4.00 |
| EMPATHY                                       |       |       |      |
| Ease in obtaining information                 | 4.71  | 3.96  | 4.22 |
| Giving individual attention                   | 4.46  | 3.46  | 4.00 |
| Considering needs of the sub-districts         | 4.33  | 3.00  | 3.89 |
| Non-discriminatory service provision          | 4.38  | 4.00  | 3.92 |
| TANGIBLE                                      |       |       |      |
| The provided assistance creates happiness      | 4.96  | 3.75  | 4.45 |
| The provided assistance is based on wishes    | 4.96  | 3.21  | 4.45 |
| and expectations of the program recipients    |       |       |      |
| Feasible and suitable assistance provision    | 4.96  | 3.54  | 4.45 |
| The initial commitments are fulfilled          | 4.96  | 3.67  | 4.45 |
| when providing information                    |       |       |      |
| Professional facilitators are used             | 4.54  | 3.50  | 4.07 |
| Sum                                           | 111.50| 84.92 | 354.02|

Based on the results of the analysis, the CSI values for each model of the earthquake-resistant houses are as follows:
The CSI values for the Risha and Rika model are in the category of satisfied, while for Riko, the CSI value is in the category of very satisfied. By looking at the valuation indicator, which is the variable of this research, the community satisfaction and dissatisfaction for each residential model is described as follows:

1. Risha Earthquake-Resistant Housing
   The community satisfaction for the Risha model is calculated using the highest and lowest scoring intervals, i.e.:
   - \( \geq 13.53 \) (dissatisfied)
   - \( 13.53 - 15.40 \) (sufficient)
   - \( 15.40 \leq \) (satisfied)

2. Rika Earthquake-Resistant Housing
   The community satisfaction for Rika earthquake-resistant houses is as follows:
   - \( \geq 12.68\) (dissatisfied)
   - \( 12.68 - 15.34\) (sufficient)
   - \( 15.54 \leq \) (satisfied)

3. Riko Earthquake-Resistant Housing
   Like the Risha and Rika models, measuring the level of satisfaction on Riko home models also uses judgment intervals, as follows:
   - \( \geq 16.46 \) (dissatisfied)
   - \( 16.46 - 18.30 \) (sufficient)
   - \( 18.30 \leq \) (satisfied)

Based on the classification above for the three models of earthquake-resistant houses, the community is dissatisfied with the positive image that the activity is supposed to provide. However, the community reported satisfaction for the variables of ‘the provided assistance creates happiness’; ‘the provided assistance is based on wishes and expectations of the program recipients’, and ‘the initial commitments are fulfilled when providing information’.

4. Conclusions
   The CSI values for the Risha and Rika models are 70.80% and 67.16%, respectively. These scores are in the category of satisfaction. The CSI value for the Riko model CSI is 81.86% which is categorized as very satisfied. The community is dissatisfied with the variable of ‘the activity provides a positive image’. However, the community reported satisfaction for the variables of ‘the provided assistance creates happiness’; ‘the provided assistance is based on wishes and expectations of the program recipients’, and ‘the initial commitments are fulfilled when providing information’.

Acknowledgments
The authors would like to thank the Institute for Research and Community Services (LPPM) of the Muhammadiyah University of Mataram for funding this research.

Reference
[1] Destyawan D 2018 BNPB: Terjadi 1.005 kali gempasusulan di Lombok Sejak 5 Agustus 2018 Tribunnews [online] Available at: https://www.tribunnews.com/nasional/2018/08/21/bnpb-terjadi-1005-kali-gempa-susulan-di-lombok-sejak-5-agustus-2018 accessed 10-1-2019
[2] Febrianto F 2018 Ini data lengkap kerusakan gempa lombok versi BNPB Tempo [online] Available at https://bisnis.tempo.co/read/1125319/ini-data-lengkap-kerusakan-gempa-lombok-versi-bnpb accessed 10-1-2019
[3] BPS Kabupaten Lombok Utara 2018 Laporan cepat kejadian gempa Kabupaten Lombok Utara (Tanjung: Badan Pusat Statistik Kabupaten Lombok Utara)
[4] Sabaruddin A and Sukmana N P 2015 *RISHA Rumah Instan Sederhana Sehat* (Bandung: Kementerian Pekerjaan Umum dan Perumahan Rakyat Pusat Penelitian dan Pengembangan Perumahan dan Permukiman)

[5] Rinaldi Z, Purwantiasning A W and Nur'aini R D 2015 Analisa konstruksi tahan gempa rumah tradisional Suku Besemah di Kota Pagaralam Sumatera Selatan *Prosiding Seminar Nasional Sains dan Teknologi* pp. 1-10 (Jakarta: Fakultas Teknik Universitas Muhammadiyah Jakarta)

[6] Istijono B, Ophiyandri T, Chairisna D and Tadzkia A 2016 Communities' satisfaction toward housing rehabilitation and reconstruction program after september 30, 2009, Earthquake in West Sumatra *Journal of Construction Engineering* 2016 art. 2148408 DOI:10.1155/2016/2148408

[7] BPS Kabupaten Lombok Utara 2017 *Tanjung dalam angka 2017* (Tanjung: Badan Pusat Statistik Kabupaten Lombok Utara)