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The construction of temporary and permanent housing after the Semeru eruption as a new strategy for post-disaster reconstruction

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ABSTRACT

Mount Semeru in East Java erupted on December 4, 2021, which resulted in dozens of residents in Lumajang Regency dying and thousands of residents fleeing. The government is programming the rehabilitation of infrastructure and facilities, including reconstructing temporary and permanent housing for refugees. The research location is in the refugee relocation area in Sumbermujur Village, Candipuro District. In post-disaster reconstruction programs, permanent housings are built after temporary housings have been occupied for several months. However, in Lumajang Regency, the government accelerated the construction of permanent housing so that the developer completed the permanent housing earlier than the temporary housing. Two types of residential units were built simultaneously on a plot of site by different developers, so problems arose in combining the different housing types. After conducting literature studies and general observations, the researcher selected five cases for further observation. The criteria and technical specifications for temporary units are stated in Lumajang Regent Regulation Number 1 of 2022. The construction of permanent units uses RISHA technology. The two types of housing are planned to be directly connected in integration. This paper aims to explain the implementation of the construction of temporary and permanent housing and identify problems in combining the two types of housing in one plot. Researchers found four categories of issues, namely: differences in floor height at the connection between two building units, door and window openings that do not function because they meet the wall, two areas of the roof that are not connected properly, and there are gaps in the connection between units.

Introduction

East Java is one of the provinces with a high vulnerability to volcanic disasters. This condition can occur because, in East Java, there are 8 (eight) active type A volcanoes, namely Mount Kelud, Arjuno, Welirang, Bromo, Semeru, Lamongan, Raung, and Ijen (Andryana et al. 2011; Magma Indonesia 2021). Type A volcanoes are volcanoes whose eruptions have been recorded since 1600. Mount Semeru, one of the eight type A volcanoes, experienced an eruption on December 4, 2021 (Hidayat and Ermawati 2022). The impact of the eruption disaster recorded 51 deaths as of December 21, 2021, and 10,395 people were displaced in almost 410 refugee camps (BNPB 2021). The impact of the disaster was damage to facilities and infrastructure, including residents' houses (figure 1).

Figure 1. Damage caused by the eruption of Mount Semeru in Kamarkajang Village

In the post-disaster handling stages, namely the rehabilitation and reconstruction stage, the government is programming the rehabilitation of infrastructure and facilities, including reconstruction, providing temporary shelter (*huntara*) and permanent housing (*huntap*) for people affected by the disaster who lost their residential buildings. Apart from that, the government also provides shelter and shelter for residents of certain villages in disaster-affected areas. These villages have been determined in Lumajang Regent Regulation Number 1 of 2022, namely Kamar Kajang Hamlet, North Kebondeli Hamlet, South Kebondeli Hamlet, Kajar Kuning Hamlet in Sumberwuluh Village; and Curah Kobokan Hamlet, Sumbersari Hamlet, Gumuk Mas Hamlet in Supiturang Village (Lumajang 2022a).

Post-disaster rehabilitation and reconstruction

Post-disaster rehabilitation and reconstruction activities are carried out to repair and restore all aspects of public services and rebuild all the facilities and infrastructure needed by post-disaster communities in a particular area. This activity is the responsibility of the central government and or regional governments affected by the disaster. The scope of post-disaster rehabilitation is environmental improvement, public infrastructure and facilities, house repair assistance, social psychological recovery, health services, reconciliation and conflict resolution, socio-economic and cultural restoration, restoration of security and order, and public service functions (BNPB 2008). Apart from formulating policies, the scope of reconstruction activities also includes permanently building physical facilities and infrastructure that have begun at the rehabilitation stage in post-disaster areas, as determined by the local regional government.

Post-disaster house repair assistance in the rehabilitation phase is provided to people who wish to remain in their damaged houses. This assistance must meet the requirements of the post-disaster rehabilitation and reconstruction guidelines and technical guidelines from the Ministry of PUPR (BNPB 2008). One of the conditions is that the house has moderate structural damage. Post-disaster reconstruction includes rebuilding due to heavy structural damage or collapsed buildings. Apart from severe damage or collapse, the residential relocation program can be classified as being in the reconstruction phase.

The planned construction of 1951 temporary and permanent housing units in Sumbermujur Village, Candipuro District, Lumajang Regency, is a residential relocation activity that occupies ± 90 Ha of Perhutani land. So, this development falls into the reconstruction category. Lumajang's Regent Decree in carrying out reconstruction

activities was strengthened by recommendations from the Geological Agency of the Ministry of Energy and Mineral Resources Number: T501/GL.04.04/BGL/2021 and Decree of the Minister of Environment and Forestry of the Republic of Indonesia Number SK. 1256/ MENLHK/SETJEN/PLA.2/12/2021 concerning Approval of the Use of Forest Areas for Temporary Accommodation Activities for Victims of the Natural Disaster Eruption of Mount Semeru and Their Business Land in the Name of the Lumajang Regency Government in the Permanent Production Forest Area in Lumajang Regency (Lumajang 2022a). The relocation location can be seen in figure 2.

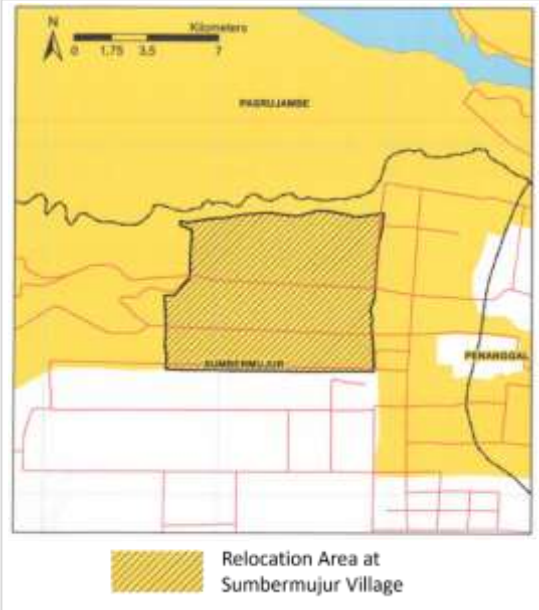

Figure 2. The location map of relocation
Source: (Lumajang 2022a)

When Vice President K.H. Ma'ruf Amin visited the construction site in Sumbermujur Village on January 14, 2022 (figure 3), he firmly stated that the first stage was to build temporary housing, then continue with building permanent housing (Anugrah 2022). In subsequent developments, on instructions from the president, the government, through the Ministry of PUPR, accelerated the construction of special houses (Rumah Khusus/Rusus in the form of 1,951 permanent housing units (Huntap) in Lumajang Regency, East Java Province (PUPR 2022a). The acceleration of housing provision was welcomed by the disaster victims registered as receiving temporary and permanent housing assistance.

Figure 3. The Vice President inspected the temporary housing construction site in Sumbermujur Village
Source: (Anugrah 2022)

Temporary and permanent housing criteria

Temporary housings (Huntara) are residences built for displaced victims of natural disasters. Huntara can be a temporary residence for many families, one family or individual. The government built this kind of house during the transition period from the emergency response stage to the construction stage (Ayu et al. 2020). The temporary housing in Sumbermujur Village, Candipuro District, is a residence built based on Lumajang Regent Regulation No. 1 of 2022 concerning the Implementation of Temporary Housing for Victims of the Natural Disaster of the Mount Semeru Eruption (Lumajang 2022b). The floor plan, appearance, structure, and materials of the Huntara have been determined by the Lumajang Regent's regulations. Apart from that, the site's floor plan layout, which is integrated with the permanent housing development, is also regulated by the rules (figure 4).

Figure 4. The floorplan and layout of Huntara
Source: (Lumajang 2022b)

The minimum criteria set by the government for shelters are as follows: the building provides protection against weather, meets health aspects, is friendly to older people, pays attention to the concept of growing houses, and has a minimum durability of 2 (two) years (Lumajang 2022b). Apart from that, technically, the temporary house specifications must meet the following criteria: unit size 6 m x 4.8 m on an area of 10 m x 14 m; there is one bedroom, bathroom, multipurpose room, and terrace. The structural material is class III of wood or galvalume with a metal or PVC roof, and the wall material consists of 60 cm brick/block masonry and clipboard covering. Apart from that, it is also regulated that the shape and size of the shelter must be in line with the permanent housing plan (Huntap). This strict determination by the regional government considers that the shelters (Huntara) are built by involving donations or Company Social Responsibility (CSR) from various private and non-private institutions. In construction, the donor also involved different developers, so guidance was essential to maintain the quality of the building for the Huntara.

Permanent housings (Huntap) are built for disaster victims according to the criteria set by the government. They are built in Sumbermujur Village, Candipuro District, Lamongan Regency, use Simple Healthy Instant Home (*Rumah Instant Sederhana Sehat*/RISHA) technology. A growing house is a core house that can be expanded (grow) according to increasing space requirements (Cambier et al. 2021). The main house can be made using RISHA technology. RISHA is a simple house that meets the basic criteria for comfort, security, and safety of the building and its occupants, which is built using a prefab system with concrete material for the structural components, then assembled in the field (Sabaruddin and Sukmana 2015). Other components are local foundation (individual footing) components made from river-stone, utility, non-structural, and roof components. The RISHA structural component consists of type 1, 2, and 3 structural panels as connecting panels (figure 5). These components can be cast at the construction site (precast in situ).

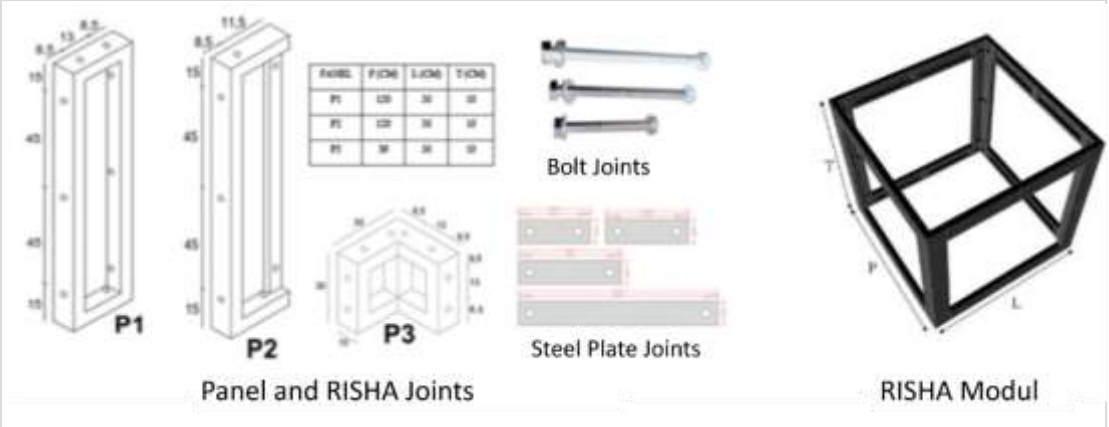

Figure 5. Structural components of RISHA: Panel 1, 2, dan 3
Source: (Carissa et al. 2022)

In the case of temporary housing construction, which was planned to be completed earlier, it turned out to be slower than the construction schedule of permanent housing. Two housing types were built almost simultaneously on one plot by different developers; in implementation, there needed to be more integration in combining the two housing types. This paper aims to explain the implementation of temporary and permanent housing construction and identify problems in combining the two housing types in one site plot.

Methods

This research is qualitative research with a case study approach. The research location is in the refugee relocation area after the eruption of Mount Semeru, namely in Sumbermujur Village, Candipuro District, Lamongan Regency. Researchers conduct a sampling process to determine cases as objects of observation (Neuman 2014). The objects chosen were

temporary and permanent housing (Huntara and Huntap), which had been built on one plot and had problems with the construction implementation. This method can be categorized as purposive sampling (Lucas 2016). Firstly, the researcher conducted a literature study to find criteria for the development of Huntara and Huntap. The requirements are the minimum set by the government, which includes the suitability of the building's function against weather, health aspects, accessibility, building durability, building dimensions, and technical provisions. After conducting literature studies and general observations, the researcher selected 5 (five) cases for further observation. The physical data of the 5 (five) cases was collected through object measurements and photo documentation. Measurements use a manual measuring instrument. The measurement results are then drawn using AutoCAD software. Figure 6 shows the research frameworks.

Figure 6. Research frameworks

Researchers conduct data analysis by identifying prominent construction problems in each case, creating problem categories, and displaying the data as figures and tables (Creswell 2013). The observation units in this research are permanent and temporary housing (Huntara and Huntap), which are still under construction, especially where the two units meet on one plot. The units of analysis are: (1) The gaps between buildings; (2) The meeting of the roof planes between buildings; (3) The meeting of the floor planes between buildings; (4) The meeting position of openings (doors and windows) at the walls of the two units.

Results and discussion

Site planning for relocation area

The construction site of temporary housing (Huntara) for victims of the natural disaster of the Mount Semeru eruption in Candipuro District, Lumajang Regency, was determined through Lumajang Regent's Decree

188.45/27/427.12/2022 (Lumajang 2022a). This decision was made based on recommendations from the Geological Agency of the Ministry of Energy and Mineral Resources (No. T-501/GL.04.04/BGL/2021) and the decision of the Minister of Environment and Forestry (No. SK. 1256/MENLHK/SETJEN/PLA.2/ 12/202). The Minister of Environment and Forestry approved using the Permanent Production Forest area in Lumajang Regency covering an area of ± 90.98 Ha for Huntara activities for victims of the Mount Semeru eruption natural disaster. This location is in the Sumbermujur Village, Candipuro District (figure 7).

Figure 7. Site plan for dividing the temporary housing area
Source: (Lumajang 2022b)

The regional planning team from the Research and Community Service Institute (*Lembaga Penelitian dan Pengabdian Masyarakat*/LPPM) Bandung Institute of Technology, in collaboration with LPPM UIN Maulana Malik Ibrahim Malang, designed the site planning for a predetermined relocation area of 92 Ha. Figure 6 shows the results of the site planning. The planner team divides the relocation area into several zones: the infrastructure zone, including clean water and waste processing; the residential zone; and the public facilities zone. To make adaptation more accessible for the people who will be relocated, the planner team groups the people of one hamlet into one zone. This decision is correct because living next door to residents of the same hamlet at the relocation location can support the residents' resilience in living in their new neighborhood. Apart from that, residents in one hamlet usually have kinship relationships to support their comfort in living in their new neighborhood. Family or relative factors can make it easier for people to socialize, thus influencing residents' success in adapting to a new location (Katudju et al. 2020).

Construction methods for temporary and permanen housing

Temporary housing for refugees was built involving funding from the community through non-governmental organizations and private institutions coordinated by the Lumajang Regency Regional Government through the Department of Housing and Residential Areas (*Dinas Perumahan dan Kawasan Permukiman*/DPKP). The development is carried out in stages by the agreement between the aid providers and the Lumajang Regency Regional

Government (Lumajang 2022b). In implementing development, the local government, through the Department of Housing and Settlement Areas, provides facilitators who play a role in supervising the implementation of housing development. The role of the facilitator, apart from being a supervisor, is also to coordinate the volunteers to carry out documentation and identify problems in the construction of each housing unit. The volunteers consisted of architecture students from several campuses in Surabaya, including Petra Christian University, UPN Veteran East Java, and University 17 August 1945 Surabaya. The volunteers are members of the Semeru Care Volunteers of the East Java Indonesian Architects Association.

Contractors carried out the Huntara construction work to meet the criteria and technical specifications in Lumajang Regent Regulation No. 1 of 2022. Contractors carry out various work concerning these regulations, including land improvement, wall frames, roof frames, wall coverings, floors, doors, windows, sanitation, and finishing work. Material procurement prioritizes local materials, especially bricks for walls. This material was molded by local village people using sand from the eruption of Mount Semeru, one of which is a brick-molding small enterprise in Kamar Kajang Hamlet (figure 8).

Figure 8. Brick-molding small enterprise by the people of Kamar Kajang Hamlet

The Ministry of PUPR carried out the construction of permanent housing using RISHA technology through the Directorate General of Housing, which commissioned BUMN Karya, namely PT Brantas Abipraya and PT Hutama Karya. Prefabricated concrete structural components are cast at the construction site (precast in situ), as seen in figure 9.

Figure 9. In situ precast for Huntap structural elements

The construction of temporary and permanent housing

The construction of temporary housing (Huntara) involves local contractors with design guidelines and specifications by Lumajang Regent Regulation No. 1 of 2022. From the results of observations in the field, the construction of Huntara has generally considered the provisions of these regulations, including the placement of units, area, shape, space layout, materials, structure, and construction. Place the unit on the site according to figure 4. The building is square, with an area according to regulations, namely 6 meters x 4.8 meters, with a gable roof shape. The rooms provided include 1 (one) bedroom (3 meters x 2.4 meters), 1 (one) bathroom (1.5 meters x 1.5 meters), a multipurpose room, and a terrace. The materials used follow regulations; for wall materials, use brick and Calsiboard with a galvalume frame with a total wall height of 3 meters (figure 10).

Figure 10. The construction of Huntara

For roof materials, generally, the frame parts use galvalume, and the roof covering uses spandex metal (figure 9). Apart from the galvalum frame, Lumajang Regent Regulation No. 1 of 2022 allows the material of wall and roof frames to use class III wood. From observations, one donor built Huntara with a wooden frame of Meranti for wall and roof frames (figure 11). Red Meranti wood (Shorea Shorea leprosula Miq.) is classified as class III wood (Wahyudi and Sitanggang 2016). So, using meranti wood does not violate the Regent's Regulations.

Figure 11. The construction of Huntara's wooden frame

Using the RISHA concept, BUMN carries out the construction of permanent housing (Huntap) under the Ministry of Public Works and Public Housing (PUPR) coordination. From observations, the Huntap built in Sumbermujur Village is a square measuring 6 meters x 6 meters with 4 (four) modules. The size of the module is 3 meters x 3 meters. The structural frame on the walls is made of precast concrete components (figure 12), with the filler walls being lightweight concrete 7 cm thick. The roof is gable-shaped with a light steel (galvalume) roof frame and a spandex metal roof covering. The unit's placement on the site follows Lumajang Regent Regulation No. 1 of 2022, namely, in front of the Huntara. The front of the permanent housing unit faces the neighborhood road, and the room provided includes 2 (two) bedrooms 3 meters x 3 meters, a multi-function room, and a bathroom 1.5 meters x 1.5 meters. The walls are finished with plaster, and the floors are covered with ceramics. The construction implementation follows the RISHA guidelines from the Center for Settlement Research and Development (Puslitbangkim) Ministry of PUPR prepared by (Sabaruddin and Sukmana 2015).

Figure 12. The construction of permanent housing (Huntap)

Problems in intergration of the housing in one plot site

Generally, the government carries out the post-disaster reconstruction stages by building temporary housing (Huntara) first, then 6-12 months later, building permanent housing for the disaster victims. However, what happened in Sumbermujur Village was different because the development (reconstruction) stages after the eruption of Mount Semeru changed plans. Based on Presidential Instructions, the government, through the PUPR Ministry, is accelerating the construction of special housing (*Rumah Khusus*/Rusus) in the form of 1,951 permanent residential units (Huntap) in Lumajang Regency, East Java Province (PUPR 2022b). The construction of Huntap by BUMN Karya was completed more quickly than the construction of Huntara by donors. This acceleration has a positive impact because residents can obtain their rights more quickly. However, there are problems with the integration between Huntara and Huntap units on one plot site. General problems in applying RISHA technology can be classified as management and development procedures, architecture and structure, and social and stakeholder issues (Mulyawan et al. 2023).

During the implementation of development, problems arose when the results of the construction of Huntara and Huntap needed to meet the integration in the connection of two building units on one plot site. The Huntara and Huntap are planned to be built directly connected without gaps so that precision is required in the construction implementation. When conducting field observations, researchers found problems with some of the Huntara and Huntap units built on one plot site. These problems include the

following: (1) Difference in floor levels at the two building unit junctions (figure 13A); (2) The door and or window openings in the Huntara meet the massive walls of the Huntara so that the two building elements in the Huntara do not function (figure 13B); (3) Meeting roof planes that are not correctly connected (figure 13C); (4) A wide gap at the meeting of the Huntara and Huntap units (figure 13D).

Figure 13. Problems in integration of the two housings

Table 1 shows the results of observations and measurements in the five cases. Researchers found that the gap between the two units in one plot was the widest in case three, namely 23 cm. The researchers also found that the difference in floor level at the meeting of the two units was the highest in case 1, namely 50 cm. Apart from that, the striking difference is the construction of the wall frame, roof, and the height of the bathroom brick walls in case 5. In case 5, the wall and roof frames use wood. The brick walls are only 72 cm high, and the wall construction continues using Kalsiboard with a wooden frame (see figure 10). In other cases, the height of the bathroom walls is between 147 cm – 200 cm.

Table 1. The observation results on the implementation of huntara work

Observation object	Case 1	Case 2	Case 3	Case 4	Case 5
Gap between the two units	17 cm	20 cm	23 cm	20 cm	20 cm
Difference in floor level between the two units	50 cm	8 cm	38 cm	20 cm	20 cm
Height of the bathroom brick walls	180 cm	147 cm	148 cm	200 cm	72 cm
Wall frame	Galvalume	Galvalume	Galvalume	Galvalume	Wood
Roof frame	Galvalume	Galvalume	Galvalume	Galvalume	Wood
Door/opening access with Huntap	Exist	Not-exist	Not-exist	Not-exist	Not-exist
Back Door	Not-exist	Not-exist	Not-exist	Exist	Exist
Kitchen/Pantry table	Exist	Exist	Not-exist	Not-exist	Not-exist

Figure 14 shows the layout of the combined Huntara and Huntap plans in five cases. Researchers found three things from this data. The first discovery was a gap with varying distances between the Huntara and Huntap units. The second finding was that there were four cases of door and window openings in the Huntara meeting massive walls in the Huntara building, so both building elements in the Huntara needed to be fixed. The third finding is that the spatial layout in Huntap is the same in each case. Still, in Huntara, there are several differences, namely connecting access between the two units, the back door, and the kitchen/pantry table (see also table 1).

Figure 14. Layout of Huntara and Huntap for cases 1 to 5

Proposed pst-disaster reconstruction strategy

The government has relocated refugees affected by the eruption of Mount Semeru and provided housing on Perhutani land. In fulfilling shelters for the Mount Semeru eruption disaster victims in Lumajang, the government implemented a different strategy from handling disaster victims in other areas. In other regions, the government generally built Huntaps after Huntaras, but in Lumajang, the government built the two housing types almost simultaneously. Most Huntaps were constructed first. Problems arising from the development pattern of Huntara and Huntap have been discussed in the previous subchapter in this paper. The government and related parties need to evaluate the rehabilitation and reconstruction program implementation following the Mount Semeru eruption disaster in Lumajang Regency. Based on the experience of post-disaster management in Aceh, Yogyakarta, and Lombok, residential or residential reconstruction strategies are more effective if the government involves contractors and the community (Setyonugroho and Maki 2024).

For this reason, if the case of the post-disaster reconstruction stages in Sumbermujur Village, Candipuro District, Lumajang Regency is deemed successful in accelerating the recovery of people's lives after the disaster, then this new model can be used as a post-disaster reconstruction strategy that the government can apply it in other places. But to support post-occupancy sustainability, the government needs to make the following changes: (1) In the first stage of development, the government prepares the land and starts constructing Huntap by BUMN Karya with precast in situ using the RISHA concept; (2) In the second stage, after the Huntap construction is complete, the community is allowed to be involved in the 'growth and development' of their residence. Huntara, as part of the aid package, could be an extension of Huntara as a core house.

Conclusions

The post-disaster reconstruction model in Sumbermujur Village, Candipuro District, Lumajang Regency, differs from post-disaster reconstruction in other areas in Indonesia. Following the research objectives, some conclusions of the construction process of Huntara and Huntap development after the eruption of Mount Semeru in Sumbermujur Village, Lumajang Regency, are as follows: (1) The construction of Huntara and Huntap uses a different approach than development in other post-disaster areas. Both were built within the same time frame, with different developers and did not involve the affected communities as potential building users. This non-involvement can potentially cause adaptation problems for disaster victims when occupying housing, that is their right; (2) Four problems of non-synchrony when two types of residential units meet on one site plot, namely that there are gaps between buildings, the meeting of the roof planes between buildings, the meeting of the floor planes, and the position of openings (doors and windows) at the meeting of the walls of the two residential units; (3) Fulfilling the minimum criteria for the growing house concept in the construction of Huntara is not appropriate. The concept of a growing house is more appropriately applied to the Huntap with RISHA technology because it is a permanent house and can become a core of growing houses. The permanent houses that grow (expand) with the temporary houses can be by needs if the development process 'involves' potential building users.

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References

Andryana, K., Maryanto, S., Susilo, A., & Triastuti, H. (2011). Mekanisme Fokus Gempa Vulkanik Tipe A Gunung Semeru, Jawa Timur–Indonesia. *Natural B*, *1*(2), 139–145. https://natural-b.ub.ac.id/index.php/natural-b/article/view/122/119

Anugrah, N. (2022). *Wakil Presiden RI Tinjau Lokasi Pembangunan Hunian Sementara Di Lumajang*. Kementerian Lingkungan Hidup Dan Kehutanan. https://ppid.menlhk.go.id/berita/siaran-pers/6377/wakil-presiden-ri-tinjau-lokasi-pembangunan-hunian-sementara-di-lumajang

Ayu, D. P., Prayitno, B., & Haryadi, A. (2020). Fabrikasi Hunian Sementara untuk Pasca Bencana (Temporary Shelter Fabrication for Post-disaster). *Tesa Arsitektur*, *18*(1), 32–43. www.mercy.org.my

BNPB. (2008). Pedoman Rehabilitasi dan Rekonstruksi Pasca Bencana. In *Peraturan Kepala Badan Nasional Penanggulangan Bencana Nomor 11 TAhun 2008*.

BNPB. (2021). *Korban Meninggal Paska Erupsi Semeru Bertambah Menjadi 51 Jiwa*. Badan Nasional Penanggulangan Bencana. https://bnpb.go.id/berita/korban-meninggal-paska-erupsi-semeru-bertambah-menjadi-51-jiwa

Cambier, C., Galle, W., & De Temmerman, N. (2021). Expandable houses: An explorative life cycle cost analysis. *Sustainability (Switzerland)*, *13*(12), 1–28. https://doi.org/10.3390/su13126974

Carissa, C., Larasati, D., Triyadi, S., & Slamat, V. (2022). Evaluasi Modul RISHA pada Rumah Susun Kampung Deret Petogogan. In *Journal of Sustainable Construction* (Vol. 1, Issue 2, pp. 19–32). https://doi.org/10.26593/josc.v2i1.5708

Creswell, J. W. (2013). *Qualitative inquiry & research design: choosing among five approaches*. Sage Publications.

Hidayat, Z., & Ermawati, E. (2022). Urgensi Capacity Building Terhadap Resiko di Kawasan Gunung Semeru Lumajang. *Jurnal Abdi Masyarakat Indonesia*, *2*(4), 1265–1270. https://doi.org/10.54082/jamsi.415

Katudju, B., Lamadirisi, M., Umaternate, R., & Kerebungu, F. (2020). Adaptasi dan Toleransi

Pengungsi Mamuya di Tobelo Halmahera Utara. *JIPSINDO, VOLUME 7*(1).

Lucas, R. (2016). *Research Methods for Architecture*. Laurence King Publishing.

Lumajang, B. (2022a). *Keputusan Bupati Lumajang Nomor: 188.45/27/427.12/2022Lokasi Pembanguan Hunian Sementara untuk Korban Bencana*.

Lumajang, B. (2022b). *Peraturan Bupati Lumajang Nomor 1 Tahun 2022 Tentang Penyelenggaraan Hunian Sementara untuk Korban Bencana Alam Erupsi Gunung Semeru.*

Magma Indonesia. (2021). *Tipe Gunung Api di Indonesia (A, B, dan C)*. Pusat Vulkanologi Dan Mitigasi Bencana Geologi. https://magma.esdm.go.id/v1/edukasi/tipe-gunung-api-di-indonesia-a-b-dan-c

Mulyawan, Z. H., Wimala, M., & Carissa, C. (2023). Pembelajaran Berbasis Masalah: Penerapan Teknologi Rumah Instan Sederhana Sehat (RISHA) di Indonesia. *RekaRacana: Jurnal Teknil Sipil*, *9*(2), 13. https://doi.org/10.26760/rekaracana.v9i2.13

Neuman, W. L. (2014). Social Research Methods: Qualitative and Quantitative Approaches. In *Teaching Sociology* (Seventh Ed). Pearson Education Limited. https://doi.org/10.2307/3211488

PUPR, K. (2022a). *Ditargetkan Rampung Akhir April 2022, Kementerian PUPR Selesaikan Pembangunan Huntap Korban Erupsi Semeru Secara Bertahap*. Kementrian PUPR. https://pu.go.id/berita/ditargetkan-rampung-akhir-april-2022-kementerian-pupr-selesaikan-pembangunan-huntap-korban-erupsi-semeru-secara-bertahap

PUPR, K. (2022b). *Kementerian PUPR Selesaikan 1.951 Huntap Bagi Korban Erupsi Gunung Semeru, Wapres Ma'ruf Amin : Rawat dengan Baik*. Kementrian PUPR. https://pu.go.id/berita/kementerian-pupr-selesaikan-1951-huntap-bagi-korban-erupsi-gunung-semeru-wapres-maruf-amin-rawat-dengan-baik

Sabaruddin, A., & Sukmana, N. P. (2015). *RISHA Rumah Instan Sederhana Sehat*. Puslitbangkim, Kementrian Pekerjaan Umum dan Perumahan Rakyat.

Setyonugroho, G. A., & Maki, N. (2024). Policy implementation model review of the post-disaster housing reconstruction in Indonesia case study: Aceh, Yogyakarta, and Lombok. *International Journal of Disaster Risk Reduction*, *100*. https://doi.org/10.1016/J.IJDRR.2023.104181

Wahyudi, I., & Sitanggang, J. J. (2016). Kualitas Kayu Meranti Merah (Shorea leprosula Miq.) Hasil Budi Daya. *Jurnal Ilmu Pertanian Indonesia*, *21*(2), 140–145. https://doi.org/10.18343/jipi.21.2.140

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