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Ready for the Next Earthquake? Housing Reconstruction in Lombok, Indonesia

VIEWPOINT

Iftekhar Ahmed[1] **and Agus Hery Purnomo**[2]
[1]University of Newcastle, Australia, email: ifte.ahmed@newcastle.edu.au
[2]Disaster Management Agency of North Lombok Regency, Indonesia. Email: aguspurnomogeo@gmail.com

Housing is usually the most important asset for people. Rapid onset disasters such as earthquakes kill many people and cause significant devastation to housing; close to 550,000 people were killed by earthquakes in this century (Statista(a), 2023). The greatest damage in disasters is often experienced by the housing sector (Marti, 2005) and the impact of disasters on housing is extensive in Global South countries such as Indonesia because of the widespread prevalence of inadequately constructed buildings.

There is thus the need for resilient housing to protect people from disaster risks and impacts, and reconstruction provides an opportunity to address that need. Building housing back to a better and safer standard that is less vulnerable to local hazards can contribute towards community resilience. This concept of 'building back better' is embodied in one of the four priority areas (Priority 4) of the global Sendai Framework for Disaster Risk Reduction, to which most governments of the world are signatory. This is relevant to housing in the Global South that is so significantly affected by disasters.

The widespread disasters around the world in recent times have led to extensive housing reconstruction initiatives by governments, non-governmental organizations (NGOs) and other agencies. However, obstacles to effective reconstruction are many and it is often a protracted process. Mismatch in perceptions and expectations exists between institutional housing providers and disaster-affected people, and access to and availability of adequate funding and other resources for housing reconstruction is a key issue. These issues have been found around the world in both Global South and Global North countries, discussed in books by the lead author (Ahmed & Charlesworth, 2015; Marsh et al., 2018). Importantly, the promotion and sustenance of safe building practices for resilient housing seems to face significant barriers, and new risks continue to be created, compounding people's vulnerability to future disasters.

The above issues relating to post-disaster housing reconstruction are illustrated here through a case study in Lombok, Indonesia. Indonesia is a highly disaster-prone country, where the greatest risks are posed by earthquakes and associated tsunamis (Statista(b), 2023). The island of Lombok was shaken by a series of three earthquakes in 2018, all above magnitude 6, resulting in massive devastation. More than 200,000 houses were impacted, with 35% destroyed or heavily damaged (Pribadi et al., 2020). The northern and western parts of the island experienced maximum damage - 80% of the houses in North Lombok Regency were decimated (Lines et al., 2022). The government began a reconstruction program consisting of funding and technical support to build ‘earthquake-resistant’ houses. Housing reconstruction was largely a governmental undertaking with limited involvement of NGOs and other such stakeholders. NGOs mostly provided emergency shelter, relief, building toolkits, and in some cases developed local construction capacity (IFRC, 2020; Lines et al., 2022), but beyond supporting the government generally did not engage in housing reconstruction. This indicates a shift from the previous practice of NGOs building the bulk of reconstruction housing in Indonesia, such as in Aceh after the Indian Ocean Tsunami, with the Indonesian government developing the institutional agenda to lead post-disaster housing reconstruction programs.

North Lombok was targeted for reconstruction of more than 44,000 houses; by early 2020 85% had been built (Tsulis Iq’bal et al., 2022). Nonetheless, there are widespread reports of delays in the reconstruction program, which was planned to be completed a year earlier, due to a range of factors including bureaucracy, slow fund disbursals, complicated grant process, difficulties in landownership verification, and labour and materials shortages (Tsulis Iq’bal et al., 2022; Lines et al., 2022; Pribadi et al., 2020; Sunarti et al., 2021; Widyayanti et al., 2020). There was no transitional housing policy for Lombok (Lines et al., 2022; Pribadi et al., 2020) - for people already affected by the earthquake disaster, living in temporary shelter over an extended period prolonged their suffering. In the interim, many people initiated self-recovery, usually achievable for those who had money and other resources (Lines et al., 2022), while others built vulnerable, makeshift, or incomplete houses.

Reconstruction was implemented through a community-driven process where 15-20 households formed a ‘POKMAS’ to manage their procurement and construction with technical support from government facilitators. It was expected that people within the POKMAS who had construction skills could earn an income by working for the community, however, there were limited examples of this (Pribadi et al., 2020), possibly because of an overall shortage of construction workers. Households were provided rebuilding grants according to the level of damage – low, medium, and high – of 10 million rupiah, 25 million rupiah and 50 million rupiah respectively (Pribadi et al., 2020). An average house of a similar size costs between 75-100 million rupiah, therefore, the maximum grant amount was not enough to rebuild a destroyed house. Hence people prioritised the most critical repairs, planning to gradually complete the house in increments as and when funds became available, placing them at risk if a disaster strikes in the interim. The program did not prioritise support to the most vulnerable households, it was implemented on a “first come first served” basis (Lines et al., 2022, p.8). Thus, the reconstruction program had varying outcomes according to income constraints and other vulnerabilities, resulting in the poorest in the affected communities facing hurdles in building adequate housing.

Three main 36 square metre (m^2) prototype house designs were provided, RISHA (concrete frame and panels), RIKO (confined masonry) and RIKA (timber), but later up to 18 designs were offered, leading to confusion among the communities (Pribadi et al., 2020). Because of the trauma experienced, communities rejected RISHA because of fear of collapse in earthquakes and preferred RIKO or RIKA; RISHA also required sophisticated technology, hence faced production problems (Pribadi et al., 2020). In an earthquake in 2019, several under-construction RISHA houses were damaged (Lines et al., 2022), damaging the community's confidence and catalysing the rejection of the model. However, to prevent illegal logging the government restricted timber supply, and eventually the RIKO model was widely accepted (Sunarti et al., 2021), using mostly concrete framing and earthquake-resistant construction designs provided by the government (see Fig. 1). A survey indicated that the highest satisfaction was with RIKO among the three types (Widayanti et al., 2020), perhaps because it related closely to local building practices. However, the use of corrugated iron (CI) sheet roofing causes the house interior to become very hot, reported by residents, compared to the previous clay tile roofing, which was discouraged because of its weakness in earthquakes.

Fig. 1: A RIKO house *(photo: lead author, 2023).*

The $36m^2$ house is a standard government prototype for reconstruction housing applied across the country. Studies indicate that extensive extensions and transformations of the prototype are carried out by homeowners over time to accommodate the needs of growing and extended families, sometimes growing 3-4 times larger (recorded for example in Aceh by Ahmed & O'Brien, 2011). There was more flexibility in Lombok – people who wanted a larger house could build one in agreement with the POKMAS. But is not clear to what extent earthquake-resistant construction is followed in these houses.

Inadequate construction quality has been widely reported with divergence between the construction specifications and what was built, and most of the rebuilt houses were not actually earthquake resistant (Tsulis Iq'bal et al, 2022; Lines et al., 2022; Pribadi et al., 2020; Widayanti et al., 2020). Materials such as cement, steel and timber are not readily available, leading to use of low-quality materials and cutting corners (Pribadi et al., 2020). A key reason behind poor construction is the lack of adequate inspections, quality control and monitoring by professionals. There was limited availability of trained and technically competent facilitators appointed by the government (Tsulis Iq'bal, 2022; Lines et al., 2022; Pribadi et al., 2020), indicating the lack of institutional capacity despite the government's readiness to implement reconstruction programs.

Additionally, to cover for the initial delay, implementation was accelerated to meet the timeline, which also suffered from lack of construction quality control.

Fig. 2: A RIKO house with a low brick wall and fibre board wall infills above *(photo: lead author, 2023).*

Although the reconstruction program officially ended in 2021 and almost all destroyed and damaged housing had been rebuilt (Lines et al., 2022), many houses were not really completed, evident from field observations in 2023. The widespread RIKO model consisted of a low 90-centimetre outer brick wall with upper infills of fibre-cement, bamboo, timber, etc (see Fig. 2). These somewhat incomplete houses are vulnerable to earthquakes and other hazards. Furthermore, the extensive low-quality construction makes the houses more vulnerable. Field observations also found that in new houses being built by homeowners with their own funds, earthquake-resistant construction guidelines are not being followed. For example, instead of continuous lintels as instructed, discontinuous lintels were found to be built, reducing the safety of the structure (see Fig. 3). Traditionally houses were built of timber, but transition to 'modern' materials such as brick and concrete has resulted in low construction quality, evident from the massive devastation in Lombok. There was no provision for inspection and monitoring after project completion, thus, dissemination and promotion of earthquake-resistant construction did not happen, despite the potential demonstration value of the reconstruction house designs. Therefore, there is a need to develop institutional capacity for providing stronger technical support, including support beyond the project timeframe to ensure dissemination of disaster risk reduction principles and safer construction.

Fig. 3: A homeowner building a house with discontinuous lintels *(photo: lead author, 2023).*

Thus, despite well-intentioned efforts, the opportunity for 'building back better' seems to have been addressed only partially in Lombok. Risk has been re-created and many people continue to live at risk in this earthquake-prone island. They remain exposed to subsequent hazard events that can result in a vicious cycle of reconstruction efforts, which can eventually result into more and more vulnerable situations. There are other hazards in Lombok such as floods and landslides, and a comprehensive multi-hazard risk reduction and recovery plan is necessary. The Lombok reconstruction experience does offer useful lessons that should be utilised for future reconstruction and recovery planning. A focused approach to housing reconstruction is required, where recovery should be a pathway for disaster risk reduction and community resilience.

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