International Conference of Innovation and Community Engagement - ICoICE
31 October – 1 November 2024
Universitas 17 Agustus 1945 Surabaya

Collaboration of Architects in Providing Social Facilities After The 2018-2019 Earthquake Disaster in Lombok
Case Study : Community Learning Centre, Rembitan – Central Lombok, NTB (2019)

Teddy Aria Permana Noerkamiden
Master of Architecture Program , Faculty of Engineering
Universitas 17 Agustus 1945 Surabaya, Email: 5422400002@surel-untag-sby.ac.id
R.A. Retno Hastijanti
Master of Architecture Program , Faculty of Engineering
Universitas 17 Agustus 1945 Surabaya, Email: retnohasti@untag-sby.ac.id
Darmansjah Tjahja Prakasa
Master of Architecture Program , Faculty of Engineering
Universitas 17 Agustus 1945 Surabaya, Email: darmansjahtp@untag-sby.ac.id

Abstract

After the 2018 earthquake disaster in Central Lombok Regency, West Nusa Tenggara, various recovery efforts have been carried out involving support from local, national, and international levels in the 2018-2019 period. The impact of losses, both in the form of materials and casualties, is enormous, with total infrastructure damage estimated at Rp 9.1 billion[1]. In the context of accelerating rehabilitation and reconstruction, architects play a role as key agents who act as balancers, catalysts, and harmonisers in the process of rebuilding affected communities. This research is based on the activities of the Indonesian Institute of Architects (IAI) East Java Province [2] and Titian Foundation [3], focusing on providing assistance to affected communities in Rembitan Village, Pujut Sub-district, Central Lombok, through the planning and construction of a Community Learning Centre (CLC) [4] in the 2019-2020 period. This assistance includes professional assistance to ensure the building is built in accordance with its recovery objectives. Using contextual-based qualitative research methods and comparative analysis, this study aims to re-evaluate the process of community recovery through physical infrastructure development. In particular, a new built environment that is based on the daily activities of the local community is expected to provide significant changes in rehabilitation and reconstruction efforts. By integrating all of the above elements, the CLC can become a place that encourages the creation of a resilient community. The CLC not only functions as a place of learning, but also as a centre for community coordination and support in dealing with disasters. Through adaptive design, good collaboration, and the utilisation of local resources, CLCs can help communities to be better prepared for unexpected challenges, reduce vulnerability, and increase resilience and adaptability. With resilient CLCs in place, communities can learn to not only survive, but also thrive in the face of upcoming changes and challenges.

Keywords: community learning center, contextual design, resilience architecture, rehabilitation & reconstruction

Introduction

In 2018, a massive earthquake shook Lombok, damaging infrastructure, homes and public facilities. Many residents lost their homes and access to essential services such as schools and health centres. This created huge challenges for the recovery of the Central Lombok community. In the midst of limited resources, the *Community Learning Centre* (CLC) comes as a solution to meet the need for learning spaces and community centres that support social and economic recovery. The CLC is designed to help communities access education and skills training needed after a disaster. The establishment of the CLC is the result of a collaboration between Titian Foundation and the Indonesian Institute of Architects (IAI) East Java, involving the local government, architects and donors. Architects act as designers and facilitators who understand local needs and design disaster-responsive buildings.

The design of the CLC prioritises inclusivity and disaster resilience. The building was built with a resilience architecture approach, using flexible structures and affordable local materials. The construction methods are simple yet robust, making it easy for the community to maintain and repair the building in the event of another disaster. In addition to providing physical infrastructure, CLCs also aim to strengthen social resilience by providing spaces for gathering and learning, increasing community solidarity. The CLC in Central Lombok is a shining example of sustainable community-based recovery, demonstrating the important role architecture plays in building inclusive and disaster-resilient neighbourhoods..

Figure 1 : Early Design of CLC (Author's Documents, 2019)

- **Theoretical Foundations**

Resilience Architecture

Brewer, McVeigh and von Meding (2013) use ANT to explain resilience architecture as a complex system that includes interactions between human and non-human elements (such as infrastructure, organisations and policies). ANT introduces a concept of resilience that sees buildings not just as physical structures, but as part of the social and physical networks that enable the system to survive and recover after a disaster. It helps identify key elements in the reconstruction process and the important role of collaboration between actors in architectural resilience.

Vernacular Theory in Sustainable Architecture

Guillaud et al (2016) state that the Versus Project highlights the importance of *vernacular architecture*, or architectural approaches that respond to local and cultural characteristics, to achieve sustainability and resilience. By using local materials and traditional techniques that have proven adaptive to the local climate and environment, buildings can become more resilient to disasters. This approach reflects the idea that resilient architecture should be adaptive and flexible, combining local knowledge with modern innovations to be effective in specific contexts, such as disaster-prone areas.

Collaborative Design

"The Integrated Design Process" (IDP) fosters a collaborative approach where diverse stakeholders, including architects, resilience experts, government agencies, and local communities, are actively involved from the earliest stages of design. This approach enhances the ability of buildings to adapt to environmental and social conditions by ensuring that local needs, resources, and specific expertise are referenced in every step of the design. By engaging communities, IDPs result in designs that are not only disaster-resistant, but also socially inclusive and sustainable' (Brewer et al., 2013; Versus Project, 2020).

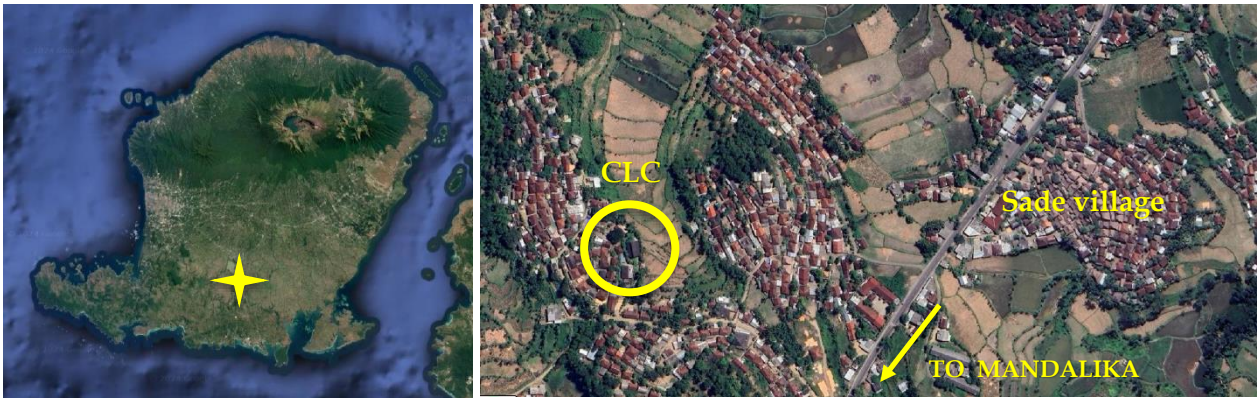

Figure 2 : Map of Lombok & CLC Location (Google Map, 2024)

Methodology

This research uses a qualitative approach with methods including :

Case Study :

Comparing several Community Learning Centres (CLCs) in Indonesia, such as **CLC Pemenang** (Lombok) and **CLC Bayat** (Central Java), to analyse similarities and differences in design, function, and impact on the local community.

Participatory Observation :

Collect data through direct involvement in activities at the CLC, whether in social, educational, or operational activities, to gain an in-depth understanding of how the CLC works and its relevance to the community.

Interviews :

Extract qualitative data by having a direct dialogue with :

1. **CLC Users** : to find out their experiences, needs, and the impact of The CLC.
2. **Architectural Designers** : to understand the design concepts, challenges, and architectural solutions applied.
3. **CLC Owner / Initiator** : to find out the vision, purpose, and motivation for establishing the CLC.

Contextual Analysis Technique :

Evaluate the CLC design based on the local characteristics of the community, including :

1. **Culture** : traditions, values and ways of life that influence spatial requirements.
2. **Social** : community dynamics, members interactions, and social function of the CLC.
3. **Economy** : the level of welfare and economic potential of the community as a consideration for design efficiency and sustainability.

Results and Discussion

1. Analysis and Discussion.

Analysis	Discussion
CLC Design Concept	The CLC design adapts the local context in terms of both environment and culture to create spaces that are relevant and supportive of community sustainability. A focus on inclusivity, affordability, and appropriateness to community needs is at the core of the concept. (de Souza, A. M. L., da Costa, I. P., & de Souza, L. C. (2021). Contextual Design : Defining and Supporting Local Responses to Climate Change. *Sustainable Cities and Society*)
Aspects of Disaster Space, Space Rehabilitation, Place Rehabilitation	The CLC is designed as a safe and multifunctional post-disaster space, providing a facility that can be used as a learning space as well as a gathering place for the community in recovery. The facility supports the rehabilitation of space and place by providing a comfortable and adaptive environment. (McEntire, D. R. (2021). Disaster Recovery and Place Re-making: Toward a New Agenda. *International Journal of Disaster Risk Reduction)*
Community Engagement and Resource Efficiency	In their development, CLCs actively involve the community to create a sense of ownership, and optimise local resources to be accessible and maintainable by all communities. (Palmer, K. R., Wilkins, R. T., & Baird,

	G. (2020). Community Participation in Disaster Recovery: The Role of Inclusive Approaches. *International Journal of Disaster Risk Reduction)*
Vulnerability & Resources	The concept focuses on understanding local resource limitations and mitigating vulnerabilities. Its design and implementation take into account local needs as well as suitable building technologies to ensure the building's resilience to environmental risks. (Folke, C. (2019). Understanding Vulnerability and Resilience: A Social-Ecological Perspective. *Ecological Economics)*
Resilience Mechanism	CLC design includes guidelines that are responsive to local geographical and cultural conditions, with a flexible approach that allows buildings to adapt and support long-term community resilience. (Smith, L. D. (2021). Architectural Resilience: The Role of Design in Disaster Preparedness. *Sustainable Cities and Society)*

Table 1 : Variables of Analysis (source : Author's Primary Data, 2024)

Figure 3 : CLC during Construction (Author's Documentations, 2019)

2. Research Findings

CLCs have a positive impact by improving access to education, supporting economic recovery and strengthening social cohesion in the community. The facility is not only a place of learning, but also a centre for community activities that invites residents to actively participate in local development. This is in line with research showing that community engagement in education and training can strengthen post-disaster social and economic resilience (Palmer et al., 2020). Despite the many benefits, CLCs face challenges such as limited resources, both financial and material. In addition, there are challenges in achieving consensus among the various parties involved in planning and development, which can hinder project progress. Lack of community involvement or differences in priorities can also be a barrier

to effective implementation (McEntire, 2021). The sustainability of the CLC depends on community support and good management. To ensure these facilities remain functional and relevant, it is important to integrate sustainability principles in their design and operation. Using local materials and construction methods that can be maintained by the community can increase the durability and long-term sustainability of the CLC. It is also important to encourage a sense of belonging among residents (Folke, 2019).

Conclusions

The Importance of CLCs in Post-Disaster Recovery : CLCs play a crucial role in the post-earthquake community recovery process, providing access to education and skills training needed to support the social and economic life of affected communities. CLCs also serve as community spaces that strengthen solidarity and cohesion among residents.

Social and Economic Impacts : The existence of CLCs enhances the ability of communities to adapt to and recover from disasters. By integrating education and training elements, CLCs help to create employment opportunities and improve skills, which are essential for local economic recovery.

Challenges Faced : Despite their many benefits, CLCs face challenges in terms of resources, support from stakeholders, and understanding diverse local needs. These challenges need to be addressed to ensure the sustainability and effectiveness of the facilities.

Recommendations

Figure 4 : CLC after Opening (Author's Documentation, 2020-2021)

***- Increased Community Involvement* :** It is important to actively involve the community in the planning and management of the CLC. A participatory approach can help ensure that the facility meets the specific needs of the community and increase a sense of ownership among residents.

- Continuous Programme Development **:** CLCs should develop programmes that are sustainable and adaptive, including skills training relevant to local market needs. This will help communities better prepare for future economic and social challenges.
- Cooperation with Stakeholders : Developing stronger partnerships with government, non-governmental organisations, and the private sector can strengthen support for CLCs. This support is important in terms of funding, resources, and access to wider training programmes.
- Monitoring and Evaluation : It is important to conduct regular monitoring and evaluation to assess the effectiveness of the CLC. Data and feedback from users can be used to identify areas for improvement and ensure that the CLC remains relevant to community needs.

Acknowledgments

I would like to express my deepest gratitude for the guidance of the master of architecture lecturers and friends who always encourage me, and do not forget the exotic island of Lombok which always inspires me.

References

[1] B. Amadei, "A Systems Approach to Building Community Capacity and Resilience," Challenges, vol. 11, no. 2, p. 28, 2020, doi: 10.3390/challe11020028.

[2] V. Bourgeois and L. Colletti, "Resilient Architecture: Strategies for Adaptation and Sustainability," Journal of Sustainable Architecture, vol. 45, no. 3, pp. 123–145, Mar. 2022, doi: 10.1016/j.susarch.2022.03.004.

[3] G. Brewer, A. McVeigh, and J. von Meding, "An Evaluation of the Usefulness of Actor Network Theory in Understanding the Complexities of Vulnerability and Resilience in Post-Disaster Reconstruction," Archnet-IJAR, vol. 7, no. 3, pp. 80–92, Nov. 2013.

[4] S. A. T. Cahyono, E. Kuntjorowati, I. Hermawati, Ikawati, C. Rusmiyati, and A. Purnama, "Disaster risk management based on local wisdom in handling natural disaster victims," IOP Conference Series: Earth and Environmental Science, vol. 1109, p. 012023, 2022, doi: 10.1088/1755-1315/1109/1/012023.

[5] E. Charlesworth and J. Fien, "Design and Disaster Resilience: Toward a Role for Design in Disaster Mitigation and Recovery," Architecture, vol. 2, no. 2, pp. 292–306, Apr. 2022, doi: 10.3390/architecture2020017.

[6] S. Elkady, J. Hernantes, and L. Labaka, "Towards a resilient community: A decision support framework for prioritizing stakeholders' interaction areas," Reliability Engineering and System Safety, vol. 237, p. 109358, 2023.

[7] C. Folke, "Resilience and Sustainable Development: Building Adaptive Capacity in a Complex World," Sustainable Development, vol. 27, no. 3, pp. 358–371, 2019, doi: 10.1002/sd.1864.

[8] S. Hadi, "Learning from the Legacy of Post-Disaster Recovery in Indonesia for the Acceleration of Post-Disaster Recovery in Lombok," The Indonesian Journal of Development Planning, vol. 3, no. 1, pp. 14–24, Apr. 2019.

[9] S. M. Maiteh and E. S. Zoltán, "Descriptive comparative analysis of post-disaster settlements," International Journal of Disaster Risk Reduction, vol. 95, p. 103879, 2023.

[10] D. McEntire, "Community Resilience: The Role of Collaborative Design in Post-Disaster Recovery," Journal of Disaster Research, vol. 16, no. 1, pp. 34–46, 2021, doi: 10.20965/jdr.2021.p0034.

[11] D. Palmer and L. Dempsey, "Engaging Communities in Design: A Framework for Participatory Architecture," Design Studies, vol. 68, pp. 105–127, Mar. 2020, doi: 10.1016/j.destud.2020.03.002.

[12] S. Parnell and R. Whelan, "Urban Resilience: A New Approach to Designing Cities for the Future," Urban Studies, vol. 58, no. 5, pp. 983–1000, 2021, doi: 10.1177/0042098020973431.

[13] K. Peters and J. Koppenjan, "Building Resilient Communities: Lessons from Post-Disaster Recovery Efforts," Journal of Urban Planning and Development, vol. 146, no. 2, pp. 1–12, 2020, doi: 10.1061/(ASCE)UP.1943-5444.0000560.

[14] A. Starzyk, J. Marchwiński, E. Maciejewska, P. Bujak, K. Rybak-Niedziółka, M. Grochulska-Salak, and Z. Skutnik, "Resilience in Urban and Architectural Design—The Issue of Sustainable Development for Areas Associated with an Embankment," Sustainability, vol. 15, no. 9, p. 9064, 2023, doi: 10.3390/su15119064.

[15] E. Yuliyanti and W. Wiyatiningsih, "Adaptation Patterns of Refugees to Create Space on the Eruption of Mount Merapi Disaster Shelter in Magelang Regency, Central Java," Jurnal Permukiman, vol. 17, no. 2, pp. 77–84, Nov. 2022.