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MORALITY BEFORE KNOWLEDGE

Emergency response, rehabilitation, and reconstruction management

Leonita Agustina Setyawati[1,*]
[1] *Department of Environmental Science, Graduate School of Sustainable Development, Universitas Indonesia, Central Jakarta, Special Capital Region of Jakarta 10430, Indonesia.*
*Correspondence: setyawatileonita@gmail.com

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ABSTRACT

Background: Post-disaster rehabilitation and reconstruction are essential components of disaster management aimed at restoring community functions while enhancing long-term resilience. As one of the world's most disaster-prone countries, Indonesia faces significant challenges in implementing sustainable recovery programs due to institutional, financial, environmental, and social constraints. This study examines rehabilitation and reconstruction management from a sustainability perspective by integrating environmental, social, and economic dimensions into post-disaster recovery. **Methods**: This study employs a qualitative literature review approach by analyzing scientific publications, government regulations, international reports, and policy documents related to disaster rehabilitation and reconstruction. The analysis focuses on disaster management frameworks, rehabilitation and reconstruction strategies in Indonesia, sustainability principles, existing challenges and opportunities, and the post-earthquake rehabilitation case in Lombok as an illustrative example. **Findings:** The review demonstrates that sustainable rehabilitation and reconstruction require integrated planning, stakeholder collaboration, and long-term commitment. Major challenges include land availability, funding limitations, institutional coordination, regulatory barriers, and psychosocial recovery. The Lombok earthquake case illustrates that integrating environmentally friendly construction, community participation, local cultural values, renewable energy, and sustainable economic development contributes to improved disaster resilience and community recovery. The study also highlights the strategic role of civil society organizations, international cooperation, and the penta-helix approach in strengthening post-disaster recovery governance. **Conclusion**: Sustainable rehabilitation and reconstruction should become a central component of disaster management policies in Indonesia. Integrating sustainability principles with effective governance, adaptive planning, and multi-stakeholder collaboration can strengthen community resilience while ensuring that post-disaster recovery supports long-term sustainable development. **Novelty/Originality of this article:** This study provides a comprehensive synthesis of disaster rehabilitation and reconstruction management by integrating sustainability principles, Indonesian regulatory frameworks, stakeholder collaboration mechanisms, and practical lessons from the Lombok earthquake recovery into a unified framework for sustainable post-disaster recovery.

KEYWORDS: disaster rehabilitation; disaster reconstruction; disaster management; post-disaster recovery; sustainable development.

1. Introduction

Disaster rehabilitation is an integrated part of disaster management. A disaster is an event that can seriously undermine a country's potential for sustainable development over the long term. Disasters can also cause a country's government to significantly change its socio-economic priorities and programs. Disasters can also cause psychological pressure

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that leads to many subsequent consequences. In the process, areas or countries with a high disaster risk will receive greater scrutiny and attention, where necessary actions must be taken before another disaster occurs. Disasters result in the loss of human lives and resources. Disaster rehabilitation requires a long time and substantial resources (Pinkowski, 2008).

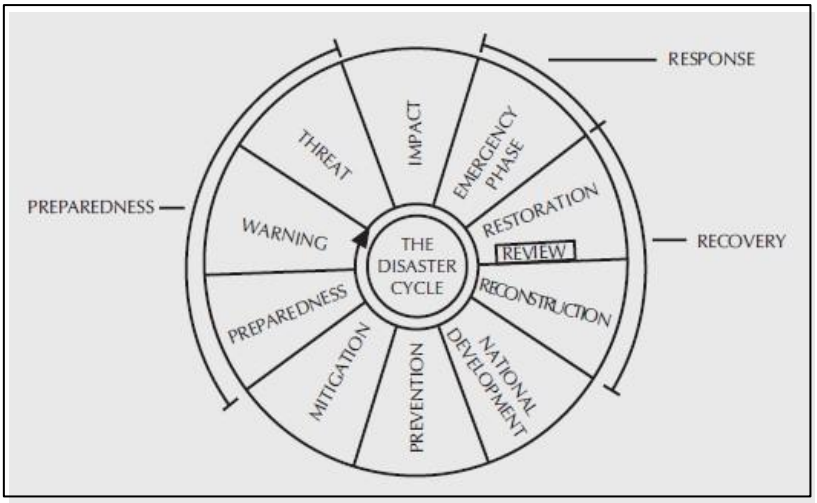


Fig. 1 Disaster management cycle
(Carter, 2008)

Figure 1 illustrates the disaster management cycle, which consists of a series of interconnected phases. This cycle includes four main stages: preparedness, emergency response, recovery, and prevention, which are interrelated in efforts to manage disaster risk holistically. The preparedness stage involves mitigation and warning efforts to reduce threats, followed by the emergency response phase, which covers handling the impacts of disasters during the emergency phase. Next, the recovery phase consists of restoration and reconstruction aimed at restoring post-disaster conditions and supporting national development. The next phase in the disaster management cycle is prevention, which includes mitigation efforts and the development of strategies to reduce disaster risk in the future. This cycle also involves a review process to ensure continuous improvement at every stage (Carter, 2008). Furthermore, Pinkowski (2008) defines recovery as a process by which communities and countries are assisted in returning to normal functioning or conditions after a disaster. This process can take a long time, possibly 5–10 years or more, and usually includes aspects such as restoration and reconstruction.

The Government of Indonesia defines rehabilitation as the repair and restoration of all aspects of public services or community life to an adequate level in post-disaster areas, with the main goal of normalizing or restoring the normal functioning of all aspects of governance and community life in post-disaster areas. Meanwhile, reconstruction is defined as the formulation of policies and concrete, well-planned, consistent, and sustainable efforts and steps to permanently rebuild all infrastructure, facilities, and institutional systems—both at the government and community levels—with the main goal of growing economic and socio-cultural activities, upholding law and order, and reviving the role and participation of civil society in all aspects of community life in post-disaster areas (Head of BNPB Regulation No. 11 of 2008 concerning Guidelines for Post-Disaster Rehabilitation and Reconstruction, 2008). In short, rehabilitation is temporary repair, while reconstruction is permanent development. The implementation of rehabilitation includes physical repair activities and the restoration of non-physical functions. Rehabilitation activities are carried out in disaster-affected areas as well as other areas that may be designated as target areas for rehabilitation activities. Rehabilitation activities are carried out by National Disaster Management Agency/*Badan Nasional Penanggulangan Bencana* (BNPB) if the disaster status is at the national level, or on the initiative of BNPB and/or Regional Disaster

Management Agency/*Badan Penanggulangan Bencana Daerah* (BPBD) for regional disaster status. Rehabilitation activities may also involve numerous stakeholders and the community.

Based on Head of BNPB Regulation No. 11/2008 concerning Guidelines for Post-Disaster Rehabilitation and Reconstruction, the implementation of rehabilitation and reconstruction covers 10 components, including: (i) restoration of the disaster-affected environment, (ii) repair of public infrastructure and facilities, (iii) provision of assistance for repairing community housing, (iv) social-psychological recovery, (v) health services, (vi) reconciliation and conflict resolution, (vii) socio-economic and cultural recovery, (viii) restoration of security and order, (ix) restoration of government functions, and (x) restoration of public service functions.

Rehabilitation and reconstruction have different characteristics and objectives; therefore, the strategies at each implementation stage also have different characteristics. The following table summarizes the rehabilitation and reconstruction implementation strategies based on BNPB Head Regulation No. 11/2008.

Table. 1 Rehabilitation and reconstruction implementation strategy

Rehabilitation	Reconstruction
Involving and empowering the community in the implementation of rehabilitation.	Involving community participation,
Taking into account the characteristics of the disaster, the area, and the local community culture.	Respecting local wisdom by considering local social and cultural conditions as well as government policy.
Based on actual field conditions, including the level of damage and obstacles.	Encouraging capacity building at various levels to produce reconstruction that is more resilient to disasters.
Promoting rehabilitation as a community movement by organizing victims and active actors into self-help groups.	Prioritizing long-term solutions over temporary ones.
Distributing aid in a timely manner, in the right form, and in the right amount to promote comprehensive rehabilitation.	Focusing on sustainable local efforts.
	Using integrated planning with short-, medium-, and long-term priorities.
	Prioritizing local economic recovery by involving many local economic actors.
	Combining advanced technology with appropriate local resources.
	Using a simple implementation plan.
	Providing open access to information on all reconstruction activities for the sake of accountability and transparency.

(BNPB Head Regulation No. 11/2008, processed by the researcher, 2024)

Table 1 explains the main differences in rehabilitation and reconstruction implementation strategies within the post-disaster recovery process, in accordance with BNPB Head Regulation No. 11 of 2008. The rehabilitation stage emphasizes community empowerment, strengthening local characteristics, and addressing actual field conditions by ensuring that aid is provided in a timely manner, in the right form, and to the right target. Rehabilitation aims to restore the basic functioning of the lives of the affected community. Meanwhile, the reconstruction stage involves broader community participation, the preservation of local wisdom, capacity building, and a focus on sustainable long-term efforts, including the strengthening of the local economy. Appropriate technology and access to information are also emphasized at this stage to ensure simple and effective implementation in rebuilding. These two stages complement each other as part of a comprehensive post-disaster recovery strategy.

There are 5 main phases in the implementation of Rehabilitation and Reconstruction, which include: a) post-disaster needs assessment; b) preparation of the rehabilitation and reconstruction plan; c) allocation of resources and funds; d) implementation of rehabilitation and reconstruction; and e) monitoring, evaluation, and reporting. Some of these phases have been regulated in several regulations, such as BNPB Regulation No. 6 of 2017 concerning the Implementation of Rehabilitation and Reconstruction, BNPB Regulation No. 5 of 2017 concerning the Rehabilitation and Reconstruction Plan, and Head of BNPB Regulation No. 15 of 2011 concerning Post-Disaster Needs Assessment, as followed up by Head of BNPB Regulation No. 5 of 2012.

BNPB currently has a standard disaster damage assessment framework called *Pengkajian Kebutuhan Pascabencana* (JITUPASNA), or Post-Disaster Needs Assessment (PDNA), which has been carried out for all major disasters in Indonesia. This activity is managed by the Deputy for Rehabilitation and Reconstruction at BNPB. JITUPASNA has a long history, beginning in 2005 when the World Bank introduced DALA (Damage and Loss Assessment) for the Aceh Tsunami disaster (December 2004) and the Yogyakarta Earthquake (May 2006) through BAPPENAS. Since 2009, following the West Sumatra (Padang) Earthquake, BNPB has combined DALA with Human Recovery Needs Assessment (HRNA), introduced by UNDP, to form the current JITUPASNA. While DALA focuses more on asset losses (value/quantity), HRNA focuses more on human needs for recovery (used to inform policy and priorities). JITUPASNA itself is regulated under Head of BNPB Regulation No. 15 of 2011 concerning Guidelines for Post-Disaster Needs Assessment. In JITUPASNA, DALA is conducted by assessing 5 (five) sectors, namely: a) Housing; b) Infrastructure; c) Economy; d) Social, and e) Cross-Sector. For damage assessment, all asset losses across these five sectors are estimated and calculated. Losses largely account for cleanup costs, additional fuel costs, lost income, decreased production/harvest, and so on. For HRNA, the assessment covers 3 (three) aspects, namely: 1) Access disruption, 2) Function disruption, and 3) Increased risk (Japan International Cooperation Agency (JICA) et al., 2019).

In rehabilitation management, there are three types of disaster rehabilitation: physical, social, and psychological (Pinkowski, 2008). Physical rehabilitation is a very important aspect of rehabilitation. It includes the reconstruction of physical infrastructure, such as housing, buildings, railway lines, roads, communication networks, water supply, electricity, and others. Social rehabilitation is also an important part of disaster rehabilitation, in which vulnerable groups—such as the elderly, orphans, widows, and children—require special social support to survive the impacts of a disaster. Rehabilitation plans must include a component that takes into account the fact that victims must undergo a process of readjustment to a new social environment. Another important dimension of disaster rehabilitation is psychological rehabilitation (Pinkowski, 2008).

2. Methods

This study employed a qualitative literature review approach to examine the management of disaster rehabilitation and reconstruction from a sustainability perspective. Data were collected from secondary sources, including peer-reviewed journal articles, books, government regulations, reports from national and international organizations, and official policy documents related to disaster management. Key references included the Indonesian National Disaster Management Agency (BNPB) regulations, the United Nations Office for Disaster Risk Reduction (UNDRR), the Japan International Cooperation Agency (JICA), the World Bank, and previous studies on post-disaster recovery. The collected literature was selected based on its relevance, credibility, and contribution to understanding rehabilitation and reconstruction practices in Indonesia and internationally.

The collected data were analyzed using qualitative descriptive and thematic analysis techniques. The analysis focused on identifying the principles, implementation strategies, challenges, opportunities, and sustainability aspects of post-disaster rehabilitation and reconstruction. In addition, the post-earthquake rehabilitation and reconstruction program

in Lombok, Indonesia, was examined as a case study to illustrate the practical application of sustainable recovery principles. The findings from the literature and the case study were synthesized to develop comprehensive recommendations for strengthening sustainable disaster rehabilitation and reconstruction management through integrated governance, stakeholder collaboration, and long-term resilience planning.

3. Results and Discussion

3.1 Sustainability concepts in rehabilitation and reconstruction

Sustainable development is defined as development activity that meets present needs without compromising the ability to meet future needs. Sustainable development has 3 pillars, namely social, environmental, and economic, and the harmonization of interactions among these pillars must be taken into account (UNISDR, 2009).

The concept of sustainability is a form of long-term development that arises from the awareness that planet Earth has limited resources. As it has evolved, sustainable development has come to be defined as an effort to meet human needs while remaining within the carrying capacity of the ecosystem.

The 2019 Global Assessment Report (GAR) on Disaster Risk Reduction emphasizes sustainable development founded on the principle of disaster risk reduction. Approaches to managing risk—both current and future—require an understanding of the systemic and complex nature of risk. Because of its complex nature, risk management cannot be carried out in isolation. Fundamental redesign is needed, both in financing and in international development cooperation (UNDRR, 2019). The document sets out seven global targets accompanied by guidance for reducing disaster impacts, alongside addressing the root causes of disaster risk and protecting development gains for present and future generations.

3.2 Challenges and opportunities

Challenges in the post-disaster rehabilitation and reconstruction phase are complex issues that require careful planning and collaboration among stakeholders. One of the main challenges is the inherently uncertain nature of reconstruction. Damage caused by disasters often involves multiple sectors—such as housing, infrastructure, economy, and social affairs—that require an integrated approach. In addition, the time required to begin long-term recovery often takes years. Once the emergency response period ends, support from government and non-government institutions tends to decline, leaving many affected communities to fend for themselves in restoring their conditions, both physically and psychosocially (Leitmann, 2007).

Land availability is one of the most significant challenges in the rehabilitation and reconstruction phase, as seen in the post-disaster case in Palu. More than a year after the earthquake and tsunami, the relocation of permanent housing remained a major obstacle. Difficulty in finding safe and suitable land is often caused by a lack of coordination among institutions, regulatory barriers, and land ownership conflicts. This situation highlights the importance of early planning that incorporates risk-based spatial planning, so that affected areas can quickly find solutions for rebuilding (Prawenti et al., 2023). In addition, research by Prawenti et al. (2023) identified that suboptimal planning and management are often the cause of delays in the reconstruction process. A lack of clarity regarding roles and responsibilities among institutions, as well as inflexible regulations, often worsen the situation. Regulations that are designed too strictly or are not suited to local conditions hinder the implementation of reconstruction programs, making recovery goals difficult to achieve. This calls for more adaptive regulation and stronger cross-sector collaboration to ensure the success of reconstruction programs.

On the other hand, health and safety at reconstruction sites are often overlooked challenges. Reconstruction carried out in environments that are not yet fully stable, such as

landslide-prone areas or areas close to hazard zones, poses risks to both workers and surrounding communities. The mental health of survivors also often does not receive adequate attention, despite the heavy pressure they face from the loss of assets and life-supporting environments. The provision of health services covering both physical and psychosocial aspects at reconstruction sites must be an integral part of planning.

Funding issues are also a significant challenge in the rehabilitation and reconstruction phase. Government fund allocations are often insufficient to cover all recovery needs, while assistance from donors or international institutions tends to be short-term in nature. This budgetary uncertainty can affect the quality and sustainability of rebuilding efforts. Therefore, a more inclusive and sustainable funding strategy is needed, including encouraging private sector involvement in supporting the recovery process. By addressing these challenges in an integrated manner, the rehabilitation and reconstruction phase can become more effective in restoring the lives of post-disaster communities (Prawenti et al., 2023).

As a country with diverse disaster risk potential and a unique geographic and demographic context, the Government of Indonesia receives various forms of support for capacity building in disaster management. Among these is USAID-HFI STEADY (Strengthening Disaster Management Capacity and Accompaniment of CSOs in Emergency Response, Coordination, and Advocacy), run by USAID and the Humanitarian Forum Indonesia (HFI), which aims to strengthen the capacity of civil society organizations (CSOs) in disaster response (U.S. Embassy Jakarta, 2023). This program also strengthens interfaith collaboration for the construction of disaster-resistant places of worship. Meanwhile, the Indonesia Disaster Resilience Initiatives Project (IDRIP), funded by the World Bank with a loan of US$160 million, helps Indonesia improve disaster resilience through a comprehensive approach (World Bank Indonesia, 2019). The Japan International Cooperation Agency (JICA) also frequently provides technical and financial assistance for training and the development of disaster-resistant infrastructure. The Australian Department of Foreign Affairs and Trade (DFAT) supports preparedness training and local capacity building, while the European Union (EU) is involved in technology development and disaster management training. The United Nations Office for Project Services (UNOPS) also supports disaster-resistant infrastructure projects to strengthen national capacity. This support reflects global collaboration in helping Indonesia become more resilient to disaster threats.

Indonesia has a significant opportunity to improve disaster coordination by leveraging the existence of active and well-established civil society organizations (CSOs) engaged in discussions and advocacy on disaster-related issues. CSOs in Indonesia, such as the Indonesian Red Cross (PMI), the Humanitarian Forum Indonesia (HFI), and various other local institutions, already have extensive networks at the community, national, and international levels. Their presence provides a strong foundation to support the government in aligning policies, improving cross-sector communication, and ensuring inclusivity in decision-making. The active role of CSOs in policy advocacy and disaster response programs enables more effective synergy among government, communities, and the private sector. By empowering CSOs as strategic partners, Indonesia can accelerate local capacity building, improve the dissemination of disaster risk information, and facilitate the development of more sustainable, community-based solutions. In addition, the expertise of CSOs in managing resources and building public trust can be key to creating a disaster coordination system that is more adaptive and responsive to needs on the ground.

The role of civil society organizations (CSOs) can also be strengthened through government regulatory frameworks related to disaster coordination, including (Decree No. 308 of 2024 concerning the Disaster Management Cluster, 2024). This cluster system divides responsibilities across various sectors such as logistics, health, displacement, and child protection, involving the government, international organizations, and CSOs. These clusters are designed to facilitate more organized cross-sector coordination during the emergency response period, ensuring that the needs of affected communities are met

quickly and effectively. CSOs play a strategic role in supporting these clusters through resource mobilization and direct access to communities.

With the support of this regulation, CSOs are not merely complementary actors but strategic partners that contribute to the effectiveness of disaster response. This role enables CSOs to collaborate closely with the National Disaster Management Agency (BNPB) and local governments in supporting the implementation of disaster-related policies. This cluster-based collaboration clarifies the roles and responsibilities of each party, reduces duplication of effort, and improves the overall efficiency of the disaster management system. The integration of CSOs into this regulatory framework creates stronger synergy, ensuring a disaster response that is more inclusive, coordinated, and adaptive to needs on the ground.

3.3 Case study

On 29 July 2018 at 05:47:39 WIB and on 5 August 2018 at 18:46:35 WIB, earthquakes occurred with fairly large shocks, with magnitudes of 6.4 and 7.0 on the Richter scale, respectively. In the series of earthquakes that occurred, with the epicenter located on Lombok Island, 564 people died, 1,584 people were injured, and 445,343 people were displaced. According to BNPB data, the majority of fatalities and injuries occurred in North Lombok and West Lombok Regencies. The number of fatalities in North Lombok reached 467, with 829 injuries, while in West Lombok Regency, 44 people died and 399 were injured (PUPR, 2019).

Post-disaster rehabilitation and reconstruction in Lombok were carried out by applying sustainability principles that integrate environmental, social, and economic aspects. In this context, several sustainable practices have been implemented to ensure that the process not only repairs physical conditions but also supports ecological sustainability and improvements in community welfare.

From an environmental perspective, the use of environmentally friendly materials such as bamboo and local timber is one of the sustainable practices implemented in Lombok. In addition, renewable energy such as solar power has also been used to support environmental recovery. These initiatives aim to reduce the carbon footprint and ensure that natural resources are preserved (North Lombok Regency Government, 2021). From a social perspective, various activities initiated by BNPB have served as a catalyst in accelerating the recovery of social conditions within the community. This program was designed to encourage the activation of social capital within community groups, thereby creating solidarity that supports long-term recovery. A significant role was also played by the tuan guru, religious leaders who hold great influence in Lombok. Through various religious activities, the tuan guru contributed to disseminating disaster mitigation knowledge, raising community awareness of earthquake hazards, and providing basic information on the steps to take when a disaster occurs. Moreover, through their influence, the tuan guru were able to calm the community and strengthen the psychosocial resilience of the community during and after the disaster (Mardialina & Munir, 2021). On the economic side, sustainable tourism and local business development are an important part of the rehabilitation strategy in Lombok. Tourist destinations such as the Rinjani Geopark not only attract tourists but also provide employment for the local community. In addition, environmentally friendly accommodations that apply energy-efficient technology help reduce operational costs and promote sustainability.

The strategies used in rehabilitation and reconstruction in Lombok have shown fairly positive results. The use of environmentally friendly technology, community empowerment, and local economic development have improved community quality of life and reduced environmental impact. However, challenges remain, such as limited resources and coordination among related parties, which require further attention.

The sustainable approach brings many benefits, including increased disaster resilience, reduced carbon emissions, and improved local economic welfare. These initiatives will help Lombok Island increase its use of clean energy while reducing the impact of carbon

emissions. With good integration among environmental, social, and economic aspects, the rehabilitation and reconstruction process in Lombok can proceed effectively and sustainably. Collaboration among government, communities, and the private sector is essential to ensure the success of this program and to achieve better long-term goals.

3.4 Strategy and recommendations

The integration of sustainability principles into disaster rehabilitation and reconstruction programs needs to be continuously enhanced to ensure the long-term impact of such programs. Several strategies that can be implemented include the following; a) Implementing a risk- and environment-based approach. To ensure sustainability, rehabilitation and reconstruction programs must adopt a risk-based approach that takes environmental aspects into account. This strategy includes risk-based spatial planning, the use of environmentally friendly building materials, and the adoption of energy-efficient technologies. The program also needs to incorporate climate change mitigation into every stage of planning so that the infrastructure built is able to withstand potential future risks (BPBD Prov Jawa Timur, 2021); b) Strengthening collaboration among stakeholders. The success of a sustainable rehabilitation and reconstruction program requires synergy among the government, communities, and the private sector. The government must act as the main facilitator in creating regulations that support sustainability, such as incentives for the use of environmentally friendly materials and the construction of resilient infrastructure. Communities need to be actively involved through local empowerment and education on the importance of sustainability in reconstruction. Meanwhile, the private sector can play a role in providing innovative technology, alternative funding, and skills training for affected communities (SIAP SIAGA, 2021); c) Strengthening local capacity and education. Empowering local communities is key to ensuring sustainability during the recovery phase. The government and related institutions must provide training and education for affected communities to improve their skills, both in sustainable construction work and environmental management (BPBD Prov Jawa Timur, 2021); d) Promoting inclusive and sustainable funding. Sustainable funding requires cross-sector collaboration. The government can adopt blended funding schemes, such as public-private partnerships (PPPs), and encourage long-term investment from the private sector. In addition, the use of innovative financing mechanisms, such as green bonds, can ensure that available funds are used for projects that support sustainability. International donor institutions also need to be directed to support initiatives that directly contribute to sustainable development (Jibiki et al., 2020); e) Building a transparent monitoring and evaluation system. To ensure sustainability, a transparent and accountable monitoring and evaluation system is needed. The government and related institutions must establish clear sustainability indicators to measure the effectiveness of rehabilitation and reconstruction programs. This system must also involve the community as independent monitors to ensure that sustainability principles are truly implemented in the field. Through this mechanism, all stakeholders can work together to achieve sustainable long-term goals (BPBD Prov Jawa Timur, 2021).

4. Conclusions

A sustainable Rehabilitation and Reconstruction Program needs to become a priority in formulating disaster management strategies in Indonesia. To achieve this goal, collaboration among various parties is essential, including the government, communities, the private sector, academics, and the media, through the penta-helix approach. By working together, we can strengthen community and national resilience against increasing disaster risks. This approach also integrates sustainability principles at every stage of emergency response, from mitigation to rehabilitation, with a focus on sustainable practices that balance social, economic, and environmental factors.

This process will not happen in a short time, as it requires systematic intervention and the involvement of various sectors. Long-term commitment and strong support from all

parties are needed to ensure that sustainability principles are fully implemented in rehabilitation and reconstruction programs. Only in this way can we build better capacity and create a more resilient system to face future disaster challenges.

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Author Contribution

The author was solely responsible for the conceptualization, literature review, data collection from secondary sources, analysis, interpretation of findings, and preparation of the manuscript. The author also reviewed and approved the final version of the manuscript.

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Ethical Review Board Statement

This study employed a qualitative literature review using secondary data from published academic literature, government regulations, institutional reports, and policy documents. Therefore, ethical review board approval was not required.

Informed Consent Statement

Not available. This study did not involve interviews, surveys, experiments, or direct interaction with human participants.

Data Availability Statement

The information analyzed in this study was obtained from published literature, government regulations, institutional reports, and other publicly available secondary sources cited in the manuscript. Additional information may be available from the author upon reasonable request.

Conflicts of Interest

The author declares no conflict of interest.

Declaration of Generative AI Use

The author declares that no generative artificial intelligence (AI) tools were used to generate substantive content, conduct data analysis, or replace the author's intellectual contribution to this study. If AI-assisted tools were used for language refinement, their use was limited to improving grammar, spelling, and language clarity.

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Biography of Author

Leonita Agustina Setyawati, Department of Environmental Science, Graduate School of Sustainable Development, Universitas Indonesia, Central Jakarta, Special Capital Region of Jakarta 10430, Indonesia.

- Email: setyawatileonita@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A