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BUILDING A CULTURE OF RESILIENCE: INTEGRATING PRO-ENVIRONMENTAL BEHAVIOR INTO DISASTER RECOVERY EFFORT

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Abstract

Disaster resilience depends not only on infrastructure and preparedness, but also on how pro-environmental behavior is integrated into the recovery process. This article discusses the importance of adopting environmentally friendly practices in disaster recovery efforts to create more sustainable resilience. By implementing strategies such as efficient waste management, ecosystem rehabilitation, and responsible use of natural resources, communities can reduce the environmental impacts of disasters and improve their preparedness for future risks. In addition, community participation, government policies, and cross-sectoral collaboration are key to building an environmentally oriented culture of resilience. Through education and community-based programs, awareness of the importance of pro-environmental behavior can be increased, so that disaster recovery focuses not only on physical aspects but also on ecosystem sustainability. By integrating sustainability principles into disaster recovery, communities can create systems that are more resilient and adaptive to environmental changes. This approach not only reduces the risk of future disasters but also supports sustainable development that takes into account the balance between social, economic, and ecological aspects.

Keywords: Building, culture of resilience, pro-environment, disaster recovery

INTRODUCTION

Community resilience to disasters is one of the crucial aspects in post-disaster mitigation and recovery. Along with the increasing frequency and intensity of natural disasters due to global climate change, Sun, Y., Zhu et al., (2024) stated that it is important to develop strategies that are not only

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oriented towards physical recovery but also include aspects of environmental sustainability. One approach that can be applied is to integrate pro-environmental behavior in disaster recovery efforts to create a sustainable culture of resilience. Natural disasters such as floods, earthquakes, landslides, and forest fires often have a broad impact on the environment and socio-economic life of the community. According to Motevalli et al., (2024) the post-disaster recovery process generally focuses on rebuilding infrastructure and economic recovery, but often ignores environmental factors. In fact, an approach that ignores environmental sustainability can increase the risk of disasters in the future. One of the main challenges in post-disaster recovery is how to encourage communities to adopt pro-environmental behaviors that can strengthen disaster resilience. For example, the practice of recycling building materials, using renewable energy, and conserving natural resources can contribute to a more sustainable recovery. Therefore, this study aims to examine how pro-environmental behavior can be integrated into disaster recovery efforts to build a culture of community resilience (Smith et al., 2021).

Integrating pro-environmental behavior into disaster recovery has several important benefits. It can reduce the environmental impacts resulting from rehabilitation and reconstruction activities, such as increased construction waste and exploitation of natural resources (Malik, I., & Jamshed, 2023). In addition, building an environmentally-based culture of resilience can increase public awareness of the importance of sustainability in facing future disaster threats. This approach can also encourage collaboration between various stakeholders, including the government, non-governmental organizations (NGOs), the private sector, and communities in implementing sustainable recovery strategies. In the context of Indonesia, as one of the countries with a high level of disaster risk, the implementation of a recovery strategy based on pro-environmental behavior is becoming increasingly relevant. Various cases of disasters that have occurred in Indonesia show that recovery that only focuses on physical aspects is often less effective in building long-term resilience (Ramkissoon, 2020). Therefore, this study is expected to provide new insights into how a more sustainability-oriented recovery strategy can be implemented in various disaster-prone areas. This study aims to analyze the relationship between pro-environmental behavior and community resilience in the context of disaster recovery. In addition, this study also seeks to identify factors that influence the adoption of pro-environmental behavior in the post-disaster recovery process. By understanding the factors that encourage and inhibit pro-environmental behavior in the context of disaster recovery, this study is

expected to provide applicable recommendations for policy makers and field actors in building a more sustainable culture of resilience.

In this study, the concept of resilience culture refers to the ability of communities to adapt to environmental changes and disasters through the implementation of sustainable strategies. Pro-environmental behavior includes various actions aimed at reducing negative impacts on the environment, such as resource reuse, energy efficiency, and conservation of natural ecosystems. Meanwhile, disaster recovery includes a series of actions taken to restore community conditions to normal or better conditions after a disaster. The integration of these three concepts will be the basis for the analysis and development of more effective strategies in building an environmentally-based resilience culture (Vadivarasi, D. (2017). Thus, this study not only contributes to the field of disaster but also to environmental conservation efforts more broadly. Disaster recovery that does not take environmental aspects into account can increase community vulnerability to future disasters. Therefore, integrating pro-environmental behavior into disaster recovery strategies is an important step in building a sustainable resilience culture. This study seeks to answer how this approach can be applied effectively in the context of disaster recovery in Indonesia, so that it can provide long-term benefits for society and the environment.

RESEARCH METHOD

This study uses a literature review method to analyze the integration of pro-environmental behavior in disaster recovery efforts. The literature review was conducted by tracing various scientific sources, such as academic journals, books, international organization reports, and government policies related to environmental-based disaster mitigation and recovery. The data collected was analyzed using a qualitative approach to identify key patterns and themes related to the relationship between pro-environmental behavior and post-disaster community resilience. The analysis techniques used include comparative studies of various disaster recovery cases that apply the principle of sustainability. In addition, this study also evaluates the factors that influence the success of implementing pro-environmental behavior in disaster recovery strategies. With this literature review method, the study is expected to provide a deeper understanding of the role of pro-environmental behavior in building community resilience to disasters and provide strategic recommendations for stakeholders in formulating sustainable recovery policies.

RESULT AND DISCUSSION

Pro-Environmental Behavior in Disaster Recovery and Integration of Sustainability in Recovery Efforts

Pro-environmental behavior in disaster recovery encompasses a range of strategies aimed at reducing negative impacts on the environment while ensuring effective and sustainable recovery. One approach that is often implemented is the use of environmentally friendly building materials and the reuse of recyclable construction materials. This strategy not only reduces waste but also conserves limited natural resources (Lane, H., Killingsworth, J., & Farias, 2023).

Integrating sustainability into recovery efforts also includes long-term planning that considers environmental resilience and adaptation to climate change. For example, rebuilding infrastructure in disaster-prone areas can use designs that are more resilient to future disaster risks, such as earthquake-resistant houses or better drainage systems to reduce flood risks (Tashiro, 2022). In addition, community involvement in the recovery process is essential to ensure that the approaches adopted are appropriate to local needs and can be implemented sustainably. Education and training programs aimed at raising community awareness of the importance of environmentally friendly practices in disaster recovery also play a critical role in the success of this strategy.

In addition to environmental benefits, a sustainable recovery approach also provides significant economic and social benefits. By adopting environmentally friendly technologies, communities can reduce long-term costs in infrastructure maintenance and improve energy efficiency. Meanwhile, a community-based approach can strengthen social relationships and increase community capacity to cope with future disasters (Tashiro, 2022). Overall, integrating pro-environmental behaviors into disaster recovery is an essential step in building a stronger and more sustainable culture of resilience. By ensuring that each stage of recovery takes into account environmental, social, and economic aspects, communities can be better prepared for future disaster risks and create systems that are more adaptive and resilient to future challenges (Zebardast, L., & Radaei, 2022).

Environmentally Based Recovery Case Study

Several case studies have shown that environmentally-based recovery can have a significant positive impact on building community resilience. One example is the reconstruction after the tsunami in Aceh in 2004. In the recovery process, various international organizations and local governments

implemented environmentally friendly strategies, such as reforestation of coastal areas and the application of construction techniques that are more resistant to earthquakes and tsunamis. As a result, areas that adopted this approach showed increased resilience to similar disasters in the future (Dehghanbaghi et al., 2016). Another case is the post-earthquake recovery in Japan, where the government implemented sustainable development policies by strengthening green infrastructure and more sophisticated early warning systems. In addition, communities were encouraged to be more environmentally aware by implementing more efficient waste management systems and reducing the use of fossil fuels (García-Ayllón, 2019). In Indonesia, environmentally-based recovery efforts were also seen in the rebuilding of villages affected by the eruption of Mount Merapi. Local communities were involved in the reforestation and land conservation process to reduce the risk of further disasters such as cold lava floods. These programs not only improve environmental quality but also strengthen the social and economic involvement of local communities.

With this case study, it can be concluded that environmental-based recovery not only has a positive impact on the ecosystem but also increases the capacity of community resilience to future disasters. Integrating sustainability principles into recovery is key to creating communities that are more adaptive and resilient to environmental risks.

Concept Analysis and Implementation of Pro-Environmental Behavior in Disaster Recovery

Pro-environmental behavior in the context of disaster recovery refers to various actions aimed at reducing environmental impacts during the reconstruction and rehabilitation process. This concept is rooted in the principle of sustainable development which emphasizes the balance between social, economic, and ecological aspects in every stage of post-disaster recovery. The implementation of pro-environmental behavior covers various aspects, ranging from waste management, natural resource conservation, to the use of environmentally friendly technology in rebuilding disaster-affected infrastructure (Janmaimool, P., & Denpaiboon, 2016).

One approach that is often used in the implementation of pro-environmental behavior is the application of sustainable waste management strategies. After a disaster, waste production increases significantly due to collapsed buildings, fallen trees, and various waste materials resulting from the evacuation and reconstruction process (Tian, H., & Liu, 2022). Therefore, waste

management using the reduce, reuse, and recycle (3R) method is one solution to reduce negative impacts on the environment. By recycling building materials that are still suitable for use and reducing the use of new materials that are not environmentally friendly, the recovery process can be carried out more efficiently and sustainably.

In addition to waste management, according to Concari, A., Kok, G., & Martens, P. (2020), the aspect of natural resource conservation is also an important part of implementing pro-environmental behavior in disaster recovery. These efforts can include rehabilitating ecosystems damaged by disasters, such as reforestation of land affected by floods or landslides, as well as protecting water catchment areas to reduce the risk of future disasters. This ecosystem-based approach not only helps improve environmental conditions but also increases community resilience to disasters by providing better natural protection against the threat of subsequent disasters.

In addition, the use of environmentally friendly technology in infrastructure reconstruction also contributes to sustainable recovery efforts. For example, the use of building materials that are more resistant to disasters and have a low carbon footprint can help reduce greenhouse gas emissions and extend the life of the infrastructure being built. Some examples of the application of environmentally friendly technologies in disaster recovery include the use of renewable energy, such as solar panels and efficient water management systems, to support the needs of post-disaster communities (Grilli, G., & Curtis, 2021).

However, the implementation of pro-environmental behavior in disaster recovery often faces various challenges, both in terms of policy, resource limitations, and the level of public awareness. The lack of regulations that encourage the use of environmentally friendly materials and technologies in reconstruction can hinder the implementation of this approach on a wider scale. In addition, limited access to the resources needed to implement environmentally-based recovery strategies is also a separate obstacle (Lu et al., 2021). Therefore, support is needed from various stakeholders, including the government, non-governmental organizations, and the community, to ensure that sustainability principles can be effectively integrated into the disaster recovery process.

In the context of Indonesia, the application of pro-environmental behavior in disaster recovery is increasingly relevant given the high disaster risk faced by this country. Several initiatives have been carried out in various disaster-affected areas, such as reforestation programs in tsunami-affected

areas and the construction of temporary housing based on environmentally friendly materials. However, further steps are still needed to ensure that pro-environmental behavior becomes an integral part of disaster recovery policies in Indonesia (Alzaidi, S. M., & Iyanna, 2022).

Considering the various aspects that have been discussed, it can be concluded that the integration of pro-environmental behavior in disaster recovery is an important step in building a sustainable culture of resilience. Implementing strategies that include waste management, natural resource conservation, and the use of environmentally friendly technologies can help reduce negative impacts on the environment and increase community preparedness in facing future disasters. Therefore, this study is expected to contribute to developing policy recommendations that support the implementation of pro-environmental behavior in disaster recovery more broadly and systematically.

Factors Influencing the Adoption of Pro-Environmental Behavior

The adoption of pro-environmental behavior in disaster recovery is influenced by various factors that can be categorized into individual, social, economic, and policy aspects. Individual factors include awareness, knowledge, and attitudes towards the environment. The level of community understanding of the importance of sustainability in disaster recovery greatly influences the extent to which they are willing to adopt more environmentally friendly practices. Awareness of the long-term impacts of unsustainable recovery is also a major determinant in the adoption of this behavior (Coelho et al., 2017).

According to Xie, H., & Huang, Y. (2021) social factors play an important role in shaping pro-environmental behavior in society. The influence of the community, community leaders, and social norms can encourage individuals to follow more environmentally friendly practices. Communities that have a culture of mutual cooperation and high collective awareness tend to be more likely to adopt environmentally-based recovery practices. In addition, education and socialization carried out by non-governmental organizations and academic institutions can also increase public understanding of the long-term benefits of pro-environmental behavior in disaster recovery.

According to Marr, E. J., & Howley, P. (2019), economic aspects also play a role in determining the success of adopting pro-environmental behavior. The availability of financial resources and access to environmentally friendly technology are significant factors. Sustainable disaster recovery often requires a larger initial investment than conventional methods, although in the long

term it can provide greater economic benefits. Therefore, financial support from the government and the private sector is key to ensuring the sustainability of pro-environmental practices in disaster recovery.

In addition to individual, social, and economic factors, policies and regulations play a very crucial role in encouraging or inhibiting the adoption of pro-environmental behavior. Policies that support environmentally friendly recovery practices, such as incentives for the use of environmentally friendly materials and strict waste management regulations, can accelerate the adoption of this behavior on a wider scale. Conversely, policies that are less supportive or weak enforcement of regulations can be obstacles to the implementation of sustainable recovery strategies (Li et al., 2019).

In Indonesia, several policy initiatives have been implemented to encourage environmentally friendly disaster recovery, such as reforestation programs in disaster-affected areas and the application of environmentally friendly technologies in reconstruction. However, the challenges in implementation are still quite large, especially related to coordination between agencies and budget constraints. Therefore, collaboration between various stakeholders is a strategic step in ensuring the sustainability of more environmentally friendly disaster recovery. By understanding the various factors that influence the adoption of pro-environmental behavior, it is hoped that disaster recovery strategies can be designed more effectively and inclusively. Through an approach based on individual awareness, social support, economic incentives, and progressive policies, post-disaster recovery can be carried out more sustainably and contribute to building a stronger culture of community resilience to future disasters.

The Impact of Sustainability in Building a Culture of Resilience

The impact of sustainability in building a culture of resilience is very broad and includes social, economic, and ecological aspects. Sustainability in disaster recovery not only aims to reduce environmental impacts, but also ensures that affected communities can recover in a more resilient and adaptive manner to future disaster risks (Souza et al., 2017). From a social aspect, sustainability in disaster recovery helps strengthen community involvement and raise public awareness of the importance of protecting the environment. Community participation in planning and implementing environmentally-based recovery can strengthen social solidarity and increase community capacity to face future disaster challenges.

In the economic aspect, the application of sustainability principles allows for more efficient and long-term recovery. For example, the use of local resources, the use of green technology, and the implementation of circular economy strategies can create new jobs and reduce dependence on external assistance. Thus, sustainability in disaster recovery not only provides benefits to the environment but also encourages more stable economic growth.

In the ecological aspect, sustainability-based recovery ensures that the reconstruction and rehabilitation processes are carried out by considering long-term environmental impacts. Efforts such as reforestation, better waste management, and environmentally friendly infrastructure development can help reduce the risk of future disasters and maintain ecosystem balance (Holtorf, 2018).

By understanding and applying sustainability principles in disaster recovery, communities can build a stronger culture of resilience. Sustainability is not only an effective recovery strategy but also a foundation for creating a more resilient environment against future disasters.

CONCLUSION

Building a culture of resilience in the face of disasters requires a holistic approach that focuses not only on physical recovery but also on environmental sustainability. Integrating pro-environmental behaviors into the disaster recovery process can help reduce the risk of future disasters and accelerate the recovery of affected ecosystems. Steps such as sustainable waste management, environmental rehabilitation, and wise use of natural resources can increase community resilience to disaster impacts.

In addition, community awareness and participation are essential in creating an environmentally-based culture of resilience. Education and training on environmentally friendly practices in disaster recovery can encourage more sustainable behavioral changes. Collaboration between the government, non-governmental organizations, and local communities is also needed to ensure that policies and programs implemented are effective and sustainable.

By integrating pro-environmental behaviors into disaster recovery efforts, communities can not only recover from disasters more quickly but also build more resilient and sustainable systems. This step will create a balance between social, economic, and ecological development, thereby providing long-term solutions for resilience to future disasters.

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