

Flood Disaster Mitigation Management by The Regional Disaster Management Agency (BPBD), Mojokerto District, Indonesia

Ellza Nathania Christy^{1*}, Muhammad Agus Muljanto²

^{1,2}Universitas Pembangunan Nasional "Veteran" Jawa Timur, Indonesia

Email: ellzanathania11@gmail.com ; magusmuljanto@upnjatim.ac.id

Abstract. Floods remain one of the most frequent natural disasters in Indonesia, causing significant impacts on communities, infrastructure, and local economic activities. Areas located near riverbanks and low-lying regions are particularly vulnerable, making effective disaster mitigation an essential component of risk reduction and community resilience. This study aims to understand and analyze flood disaster mitigation management implemented by the Regional Disaster Management Agency (BPBD) in Kedunggempol Village, Mojokerto District, Mojokerto Regency. The research employs a qualitative method with a case study approach. Data were collected through interviews, observations, documentation, and literature review. The findings reveal that the implementation of non-structural mitigation measures, including training, public education, and early warning systems, remains limited, while community participation has not been fully optimized. BPBD has also not completely established local disaster management institutions or provided mitigation incentives for residents. Regarding structural mitigation, Kedunggempol Village only possesses levees that are often damaged and remain in unstable condition, along with several non-engineered buildings that have been elevated independently by the community. The study concludes that although both structural and non-structural mitigation efforts have been implemented, their effectiveness remains suboptimal. Therefore, stronger policy support, improved inter-agency coordination, and broader community involvement are necessary to enhance disaster preparedness and reduce flood risks in the area.

Keywords: BPBD; Disaster Management; Disaster Mitigation; Flood.

*Received:*19-11-2025 *Revised:*20-11-2025 *Accepted:*11-12-2025

INTRODUCTION

In Law of the Republic of Indonesia Number 24 of 2007 on Disaster Management, Article 1, Paragraph (1), it is formulated that a disaster is an event or series of events that threaten and disrupt people's lives and livelihoods caused, either by natural factors and/or non-natural factors or human factors resulting in human casualties, environmental damage, property losses, and psychological impacts. In the Law of the Republic of Indonesia Number 24 of 2007 concerning Disaster Management, Article 1, Paragraph (2), it is formulated that natural disasters are disasters caused by events or a series of events droughts, hurricanes, and landslides. Based on data from the World Risk Report 2023 states that out of 193 countries, Indonesia is ranked 2nd with 43.50 disaster risk points (Bündnis Entwicklung Hilft, 2023). This situation is supported by Indonesia's geographical situation which is flanked by the Asian Continent and the Australian Continent as well as the Indian Ocean and the Pacific Ocean. This situation affects many aspects including economic, political, social, climate, disasters, and others. Referring to the high level of

disaster risk, the Government of Indonesia established the National Disaster Management Agency (BNPB which is a ministerial-level Nondepartmental government agency that has duties, functions and authorities around disaster activities in Indonesia. BNPB is tasked with providing guidelines, setting standards, conveying information on disaster activities, reporting accountability for the implementation and use of the budget to the president related to disaster. So that the process of overcoming and information disclosure can be felt by Indonesian citizens. BNPB as a disaster organization at the central level divides its authority to the regional level. The organization is the Regional Disaster Management Agency (BPBD) which is divided into provincial and city / district levels.

The latest data accessed from <https://gis.bnpb.go.id/> shows that in the period January 1, 2024 - September 4, 2024, floods became the most frequent natural disaster in Indonesia. There were 1,309 disaster events in Indonesia and 752 of these were floods. According to data from <https://gis.bnpb.go.id/> in the period January 1, 2024 - September 2024, East Java Province was ranked second with the highest frequency of natural disasters and fifth with the highest frequency of flooding. District Mojokerto is one of the regions in East Java that has a high historical value because the area is home to the relics of the Majapahit Kingdom. The specialty of this historic value needs to be maintained and in connection with this security, Mojokerto Regency still often experiences flood disasters that can threaten the existence of this historic value. Mojokerto Regency is one of the areas in East Java that frequently experiences floods. Based on data from the Central Bureau of Statistics (2023) in 2021 there were 29 cases of flooding in Mojokerto district. Furthermore, based on the latest data from the Central Bureau of Statistics (2023) in 2023 the number of residents affected and displaced by floods in Mojokerto district was 1,660 people. Referring to the phenomenon of flood disasters, Mojokerto Regency has a BPBD Mojokerto Regency which is tasked with assisting the Regent in carrying out regional government affairs and assistance tasks in the fields of peace, public order, and community protection (disaster sub affairs).

Referring to flood disasters in Mojokerto district, Mojosari sub-district is ranked eleventh out of 19 sub-districts with high flood frequency. Mojosari sub-district received a high flood vulnerability score of 16.65 (Mojokerto District Disaster Management Agency, 2022). Mojosari sub-district has several flood-prone villages including Awang awang, Jotangan, Pekukuhan, Kebondalem, Kedunggempol, Leminggir, Ngimbangan, Menanggal, Modopuro, Randubango, Seduri. Kedunggempol Village is one of several villages in Mojosari Sub-district, Mojokerto Regency, that frequently experiences flooding.

Kedunggempol Village, Mojosari Subdistrict, Mojokerto District, was flooded on March 6, 2024 due to the 25-meter-long Sadar River embankment collapse, exacerbated by high rainfall. Floods as high as 60-100 cm submerged more than 500 houses, 97 hectares of rice fields, and affected 3,000 people, causing disrupted community activities, closed schools, and the threat of crop failure. The Regent of Mojokerto, Ikfina Fahmawati, has visited the flood site and provided trauma healing for affected children, while BPBD continues to work on repairing the unfinished embankment. A similar incident occurred on February 10, 2023 due to the break of the Sumberkembar River embankment, which submerged 200 houses and 30 hectares of rice fields in Kedunggempol and Jotangan Villages.

According to information obtained from BPBD officers in the field of prevention and preparedness, Kedunggempol Village has not yet been established as a Disaster Resilient Village (Destana) so that training, education, warning systems, and others have not been fully implemented, considering that Kedunggempol Village should require the establishment of a Destana to bridge all mitigation activities. This is part of disaster mitigation listed in the Mojokerto Regent Regulation Number 102 of 2021 Part Six of the Prevention and Preparedness Section Article 15 point C, namely the implementation of facilitation and socialization in disaster management prevention and preparedness and point F, namely the implementation of education, training, simulations, and disaster management preparedness rehearsals and nonstructural mitigation gaps by disaster management theory at the mitigation stage by W. Nick Carter.

In addition, the problem that often occurs is the breaking of embankments. Kedunggempol Village already has a dike but the embankment is often broken and damaged, causing floods, besides that Kedunggempol Village also needs sufficient water absorption areas. The frequent levee breaks indicate that there is inappropriate development from several agencies coordinated by BPBD as the implementation of BPBD mitigation to coordinate those listed in point E of implementing cooperation with related agencies or institutions in the fields of prevention, mitigation, preparedness, community empowerment, and disaster risk reduction at the pre-disaster stage and is a gap from structural mitigation in disaster management theory at the mitigation stage by W. Nick Carter. So that flood disaster management by BPBD in Kedunggempol Village, Mojosari Subdistrict, Mojokerto Regency needs to be researched regarding its urgency because of the routine flooding in Kedunggempol Village.

According to data obtained from the 2021 and 2023 Government Agency Performance Reports, there is one main problem that remains unresolved, namely the lack of strong regional resilience to disasters, fire hazards and climate change. The main problem is mapped into

several problems, one of the problems that became the first point in the Mojokerto Regency BPBD LKJIP is that disaster risk reduction, fire hazards and climate change in the region have not been optimized. According to the LJKJIP 2021 and 2023, BPBD Mojokerto Regency formulates that the root cause of the problem is that disaster risk reduction plans, fire hazards, climate change and mitigation have not been integrated into regional development planning.

In a study conducted by Denisya & Hertati (2024) with the title "The Role of the Regional Disaster Management Agency in Flood Disaster Mitigation Efforts in Banyulegi Village, Dawarblandong District, Mojokerto Regency" found that BPBD Mojokerto Regency has carried out its role in flood disaster mitigation efforts in Banyulegi Village, but there are still several aspects that are not fully efficient and require improvement, namely the Banyulegi Village Government has not received and has documents related to disaster mitigation training. The differences between this research and previous research are the research focus, research locus, empirical condition phenomena, and different theories. Based on the background description of the concept, empirical phenomena, and urgency that was found related to the flood disaster in the village Kedunggempol, then this research is intended to find out and describe how flood disaster mitigation management by BPBD Mojokerto Regency in Kedunggempol Village.

METHODS

The type of research used in this research is qualitative with case studies. According to Creswell (2009), qualitative research is an approach to explore and understand the meaning given by individuals or groups to social or human phenomena. The determination of informants was carried out using a purposive technique for Mojokerto Regency BPBD officials and Kedunggempol Village officials, while for the community using the snowball technique. The informants in this study totaled 9 people, namely 4 BPBD officials, 3 Village Officials, and 2 people from the Kedunggempol Village community. Data collection techniques in this study used interviews, observation, documentation, and literature study. The data analysis technique used is the data analysis technique according to Miles et al. (2014), namely data collection, data condensation, data presentation, and conclusion drawing/verification. The research location was at the Regional Disaster Management Agency of Mojokerto Regency and Kedunggempol Village. The types of data used in this research are primary data and secondary data.

RESULT AND DISCUSSION

According to the Law of the Republic of Indonesia Number 24 Year (2007), disaster mitigation is a series of efforts to reduce disaster risk, both through physical development and awareness and improvement of the ability to face disaster threats. The concept of mitigation according to Carter (2008) is the application of certain measures usually in the form of specific

programs in order to moderate or reduce the impact of disasters. The term mitigation more generally implies that while some disaster impacts can be prevented, others will remain but can be modified or reduced provided that appropriate measures are taken.

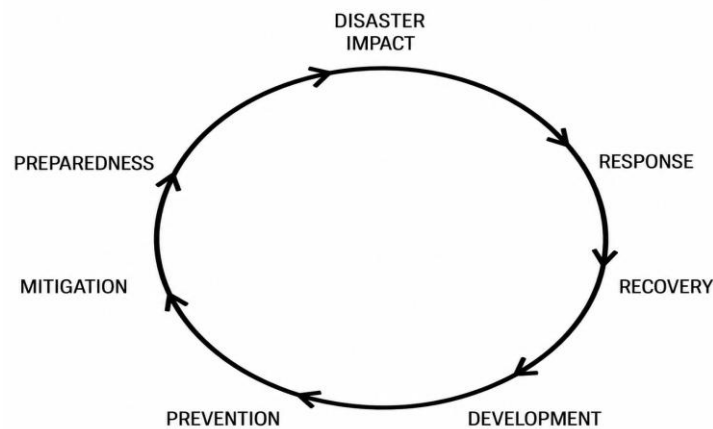


Figure 1: Disaster Management Cycle

Source: Disaster Management: A Disaster Manager's Handbook (Carter, 2008)

According to Carter (2008), there are six main element cycles that must be passed in disaster management. The six element stages are divided into prevention, mitigation, preparedness, response, recovery, and development. According to Carter (2008), there are two main components in the implementation of mitigation, namely the nonstructural mitigation component which has 7 sub-components including the legal framework, incentives, training and education, public awareness, institutional building, warning systems, and agricultural mitigation and the structural mitigation component which has 2 sub-components namely engineered buildings and non-engineered buildings.

Non-Structural Mitigation

Legal Framework

In the mitigation stage of disaster management theory proposed by W. Nick Carter, the legal framework is one of the fundamental pillars that is vital in supporting the sustainability of disaster mitigation efforts in a systematic, comprehensive and sustainable manner. This framework not only functions as a normative guideline, but also as a strategic instrument that is very influential in directing preventive steps before a disaster occurs. Based on interviews conducted with the Mojokerto Regency BPBD, it is known that the implementation of flood disaster mitigation in Kedunggempol Village has referred to a number of very relevant and significant legal regulations. Some of these include Law No. 24/2007 on Disaster Management,

Government Regulation No. 21/2008, and Mojokerto District Regional Regulation No. 6/2011, which is combined with the Contingency Plan as a strategic operational document. All of these legal instruments have become the official basis for the implementation of mitigation activities, especially at the pre-disaster stage, which includes socialization programs, public education, and the installation of evacuation signs at strategic points in Kedunggempol Village.

Furthermore, the mitigation activities carried out by the Mojokerto District BPBD through the Communication, Information, and Education (IEC) program are a clear example of this implementation of the established legal framework. The installation of evacuation signs around settlements and schools, as captured in field documentation, is clear evidence that structural and non-structural mitigation measures have been implemented in a real and consistent manner. However, despite the various mitigation activities, field findings show that the socialization efforts have not fully targeted the community groups directly and thoroughly in Kedunggempol Village. This reflects the need for in-depth evaluation and continuous improvement in the implementation of the legal framework so that its effectiveness is truly felt by all levels of society that are very vulnerable to being affected. Thus, within the framework of W. Nick Carter's theory, the legal framework used by the Mojokerto District BPBD has fulfilled the elements of non-structural mitigation normatively. However, at the implementative level, it is still necessary to increase active, intensive and inclusive community participation, so that the mitigation activities carried out are not only formalistic, but really able to internalize the values of preparedness and disaster risk reduction at the grassroots level.

Incentives

In the disaster management theory proposed by W. Nick Carter, incentives are one of the important components in non-structural mitigation that serves to encourage various parties, including commercial institutions, community organizations, and development actors, to voluntarily integrate mitigation measures in the development process, especially in disaster-prone areas. Based on the results of research conducted in Kedunggempol Village, Mojosari Subdistrict, Mojokerto District, it was found that there are no policies or programs that actually provide incentives to communities or local development actors as part of flood mitigation efforts. From the results of interviews with the Head of Prevention and Preparedness of BPBD Mojokerto District, it is known that forms of support from the private sector tend to be reactive and limited to the emergency response phase through Corporate Social Responsibility (CSR) schemes, such as the provision of public kitchens by food and beverage processing companies. Such support is more directed at post-disaster logistical needs and is not explicitly aimed at supporting mitigation

programs at the pre- disaster stage. In fact, the Village Head and the Kedunggempol Village Consultative Body explicitly stated that no incentives were provided to the community, either in the form of material assistance, preparedness training, or stimulation of community-based activities.

The absence of this incentive program demonstrates the existence of gaps in implementation of non-structural mitigation, which should ideally be one of the key approaches in Carter's mitigation theory. In this context, incentives should function as a tool to internalize a culture of preparedness at the community level and encourage the creation of development mechanisms that are adaptive to disaster risks. The absence of incentives also indicates that disaster risk reduction policies implemented in Mojokerto district are still centralized and have not evenly reached vulnerable communities such as those in Kedunggempol village. This inequality can lead to weak local capacity to deal with disasters and increased dependence on emergency assistance, instead of strengthening long-term preventive efforts. Thus, within the framework of W. Nick Carter's mitigation theory, the incentive component, which should be the main driver in building partnerships between the government, private sector and communities, has not been optimally implemented in Mojokerto, especially in Kedunggempol Village. In fact, if properly utilized, incentives can be a strategic tool to establish a participatory mitigation culture, encourage active community involvement in program planning and implementation, and increase the effectiveness of disaster risk reduction policies.

Training and Education

In the mitigation stage of disaster management theory proposed by W. Nick Carter, training and education are key components in non-structural mitigation aimed at increasing the capacity of human resources in facing disaster risks. However, based on the results of research conducted in Kedunggempol Village, Mojosari Subdistrict, it is known that disaster mitigation training and education activities have not run optimally. From an interview with the Head of Prevention and Preparedness of BPBD Mojokerto District, it is known that Kedunggempol Village has not been included in the Disaster Resilient Village (Destana) program due to budget constraints and regional priority schemes. The implementation plan for the new Destana program will be carried out in 2026. Meanwhile, disaster simulations have indeed been conducted, but the implementation is general and centralized at the Mojosari Subdistrict Hall, not directly in Kedunggempol Village. This creates a gap in access to mitigation education and training that should be accessible to all residents living in disaster-prone areas.

Furthermore, based on information from village officials and community representatives, it is known that most people in Kedunggempol Village have never received direct training or socialization from BPBD. Information about disasters is only obtained by some village officials who are members of volunteer organizations such as Tagana, who then informally convey information to the community. The absence of formal training targeting the general public is a significant weakness in the implementation of non-structural mitigation. This condition shows that training and education as instruments of capacity building have not been fully incorporated into an inclusive and sustainable mitigation strategy in Kedunggempol Village. In fact, in W. Nick Carter's theoretical framework, strengthening community capacity through education and training is the main foundation in building a resilient, adaptive and responsive mitigation system to disaster risk. Thus, the implementation of disaster mitigation training and education in Kedunggempol Village still faces challenges in terms of distribution, sustainability and outreach.

Public Awareness

In the mitigation stage of disaster management theory proposed by W. Nick Carter, public awareness is one of the important elements in the non-structural mitigation approach. Carter emphasizes that the success of mitigation programs is strongly influenced by the level of understanding and involvement of the community towards potential disaster risks in the area where they live. The results of the research in Kedunggempol Village show that community awareness of flood risk has been formed naturally, considering that flooding is a recurring annual disaster. In several hamlets, such as Balongcangak, the community independently takes anticipatory actions, such as clearing rubbish from the bridge, strengthening the embankment, and doing community service ahead of the rainy season. This reflects collective awareness, although it is still reactive and not yet supported by a structured and systematic mitigation system. Some residents even refused to evacuate during floods because they were worried about leaving their homes and possessions behind, indicating that an understanding of safety aspects is not yet fully embedded. Meanwhile, village officials show a better understanding due to regular coordination with BPBD, especially in determining gathering points and installing evacuation signs. However, active community involvement in the formal mitigation process is still minimal.

Furthermore, there are different perceptions between the BPBD and the village government regarding community involvement in mitigation activities related to community involvement in mitigation activities. The BPBD stated that it has cooperated with the community in the construction of mitigation points. However, the village government and community mentioned that the implementation of activities such as the installation of evacuation signs and placards was

carried out by the provincial BPBD and has not directly involved the community. In addition, the information dissemination system is still limited to the use of loudspeakers in places of worship or monthly neighborhood forums. There is no emergency communication system or formal training to improve overall preparedness. Existing public awareness arises more in response to previous experiences, rather than as a result of participatory education and engagement processes designed by disaster management agencies. Thus, within the framework of W. Nick Carter's theory, public awareness as part of non-structural mitigation in Kedunggempol Village is still not optimal. Although there are local initiatives that reflect awareness of flood hazards, community participation has not been fully facilitated by an inclusive and educative formal system.

Building Institutions

In the framework of the mitigation stage of disaster management theory proposed by According to Dr. W. Nick Carter, institutional development is one of the fundamental aspects of non-structural mitigation strategies. Strong institutions serve as the backbone in policy formulation, program implementation, and coordination of various parties in dealing with disasters. Effective and powerful institutions have the capacity to conduct public education, build public awareness, conduct training, and organize early warning and evacuation systems. In addition, Carter also emphasized the importance of inter-agency synergy and the involvement of all elements of society, including the private sector, NGOs, academics and citizens, to form a collaborative and sustainable mitigation system. The results showed that until now the village has not been included in the Disaster Resilient Village (Destana) program, which is the main instrument for establishing disaster preparedness institutions at the village level.

The Head of Prevention and Preparedness of BPBD Mojokerto district explained that the Destana program is only established twice a year and Kedunggempol village has not been included in the priority list. The absence of formal institutions such as Destana means that there is no permanent institutional structure specifically tasked with flood mitigation at the local level. Disaster management activities in Kedunggempol currently rely on the participation of informal elements such as youth organizations that do not have adequate institutional capacity or resources. On the other hand, at the district scale, a Disaster Risk Reduction Forum has been established.(FPRB) that involves various cross-sector parties such as technical agencies, academics, journalists and volunteers. FPRB plays a role in the entire disaster management cycle, from pre-disaster to post-disaster. However, the implementation of FPRB is still general and has not directly touched institutional strengthening in Kedunggempol Village specifically. There is no evidence of FPRB's involvement in assisting the establishment of institutional units in

the village, and no development of community-based local institutional structures. These conditions indicate that institutional development is still centralized and has not reached all areas with high levels of vulnerability, including Kedunggempol Village. By referring to W. Nick Carter's theory, the conditions in Kedunggempol Village reflect an institutional gap in non-structural disaster mitigation strategies. The absence of formal community-based institutions limits the effectiveness of mitigation programs in terms of information dissemination, education and training. Communities do not have an official structure that can be used as a reference for coordination in emergency situations, and do not have full access to training and programs that support local capacity building.

Warning System

In the mitigation stage of disaster management theory proposed by W. Nick Carter, the early warning system (EWS) is one of the strategic elements in non-structural mitigation that aims to significantly reduce the risk and impact of disasters. Carter emphasizes that early warning systems must be able to provide fast, accurate and understandable information to the community before a disaster occurs, enabling timely evacuation and rescue measures. Research results in Kedunggempol Village show that the early warning system has not been implemented optimally. The village has not been facilitated by the Mojokerto District Disaster Management Agency (BPBD) with modern EWS technology. According to information from the Head and Members of the Prevention and Preparedness Division, Kedunggempol Village has not been prioritized for EWS installation because the 2025 allocation is still focused on other areas such as Tempuran. Furthermore, the BPBD stated that the characteristics of the flooding in Kedunggempol, which was caused more by levee breaches, made landslide sensors more relevant than regular flood sensors. However, until now, such landslide sensors have also not been available, so modern early warning systems are still completely absent in the area.

As a substitute for the modern technology system, the people of Kedunggempol Village still rely on traditional warning systems, such as the use of bells, mosque loudspeakers, and verbal communication by word of mouth. Monitoring of river and levee conditions is done by villagers and village officials manually based on experience and visual observation, rather than through sensor systems or automatic detection devices. Although limited, this system is considered to function quite well in the local context, as it has established a rapid response based on gotong royong when signs of danger are identified. Information from the community shows that village officials and residents who are members of volunteers such as Tagana play an important role in disseminating information during emergency situations. From the perspective of W. Nick Carter's

theory, this condition shows that the early warning system in Kedunggempol Village is still at the basic communal-traditional stage and has not been integrated into a sophisticated technology-based disaster management system. Thus, it can be concluded that the early warning system in Kedunggempol Village is not yet appropriate with the principles of disaster mitigation as formulated by W. Nick Carter. Efforts that have been made are still traditional, not yet able to reach all aspects of preparedness as a whole.

Agricultural Mitigation

According to W. Nick Carter in disaster mitigation management theory, non- structural mitigation not only includes education, training and early warning systems, but also includes adaptive strategies in the agricultural sector. Agricultural mitigation is measures geared towards protecting agricultural resources from disaster impacts through sustainable and adaptive approaches. Carter emphasized that this approach is critical to increasing the resilience of agrarian-based communities, as the agricultural sector is highly vulnerable to damage from natural disasters, including floods. Based on the research results in Kedunggempol Village, agricultural mitigation strategies have not been part of systematic policies or programs in flood disaster management. Kedunggempol Village, which is dominated by rice fields and has a geographical morphology in the form of a basin, does not have an optimal water absorption capacity.

According to the Head of Prevention and Preparedness of the Mojokerto District BPBD, tree planting is not considered effective in preventing flooding because water does not seep into rice fields, and flooding tends to occur due to levee breaches. Therefore, the focus of mitigation is directed at structural aspects, such as physically strengthening the embankment with concrete construction. Meanwhile, the Kedunggempol Village Head stated that the available government assistance is only in the form of rice seeds as a form of post-disaster handling, not long-term mitigation efforts. From the community side, the interview results show that there are no collective efforts or programs from the government related to reforestation as part of mitigation. The existing trees mostly grow naturally or are planted individually by residents. Even in some cases, large trees tend to be cut down because they are considered a safety hazard during extreme weather, which shows a mismatch between risk perception and mitigation practices. This indicates that the concept of agricultural mitigation has not been systematically integrated into local disaster policies. The reforestation practices once carried out by the Koramil were also unsustainable and are no longer being implemented.

Within Carter's theoretical framework, this condition indicates a void in the implementation of an important component of non-structural mitigation, namely the strengthening of agricultural systems based on risk adaptation. The absence of an agricultural mitigation program causes the agricultural sector in Kedunggempol Village to remain vulnerable to significant damage and economic losses due to flooding. Thus, it can be concluded that agricultural mitigation in Kedunggempol Village has not been implemented optimally in accordance with the non- structural mitigation principles proposed by W. Nick Carter.

Structural Mitigation

Engineering Buildings

In W. Nick Carter's theoretical framework of disaster mitigation, engineered structures are a key component of structural mitigation strategies that aim to reduce or avoid the direct impacts of disasters on people and infrastructure. Carter emphasizes that structural mitigation should be based on a scientific and technical approach that involves careful planning, risk-based design, and construction implementation in accordance with standards for resilience to specific threats, such as floods, earthquakes and landslides. Based on the findings in Kedunggempol Village, the most dominant form of engineering building in the context of flood disaster mitigation is water retaining walls. These structures have a strategic role in protecting residential areas and agricultural areas from the overflow of the Sadar River, which is the main cause of flooding in the area.

Based on information from the Head of Prevention and Preparedness Division of BPBD Mojokerto District, repairs to the embankment have been carried out and the temporary condition is considered safe. However, the repairs are not yet permanent because they are still using emergency materials in the form of large earth-filled gangsing, which are prone to seepage and abrasion during high water discharge. The Village Head also added that seepage still occurs when the river overflows and the nature of the repair is temporary, as a comprehensive repair has not yet been carried out structurally using permanent construction materials. In Carter's theory, engineered structures such as embankments should not only be built as a response to events, but as part of a long-term mitigation plan. They should be able to withstand water pressure under extreme conditions and be equipped with supporting systems, such as pump houses, drains and technology- based monitoring systems. However, to date, pump houses that function to drain standing water out of residential areas are still not available in Kedunggempol Village and are only limited to the planning stage. This shows that the construction of engineering buildings in the

village is still reactive and does not fully reflect the principle of proactive and comprehensive mitigation.

In addition, observations in the field showed that some of the embankment structures were still in a damaged condition, such as cracks and holes, which could potentially become weak points during floods. The location of the embankment close to settlements has even become a place for community activities such as fishing, which adds to the safety risks and degradation of the structure if not closely monitored. Thus, it can be concluded that the construction of engineered buildings in Kedunggempol Village is not fully in line with the disaster mitigation principles proposed by W. Nick Carter.

Non-engineered Buildings

In the disaster mitigation management theory proposed by W. Nick Carter, non-engineered buildings are one of the structural mitigation objects that should receive serious attention, especially in areas that have a high level of vulnerability to disasters. Carter emphasized that although non-engineered buildings are built without technical planning from certified professionals, their existence needs to be managed appropriately because most people in developing countries live in this type of building. Research results in Kedunggempol Village show that the community has self-mitigated against flood risk through modifications to the structure of their houses. These modifications include elevating the front of the house and building permanent or semi-permanent barriers inside the house to prevent water from entering. Although done without technical guidance from the BPBD or government agencies, these efforts reflect the level of awareness and initiative of the community in adapting to flood-prone environmental conditions. This is in line with Carter's principle of the importance of community empowerment in building disaster resilience, especially when institutional support is limited. The strategy is a very relevant form of locally-based structural mitigation, although it is still self-help and not yet technically standardized. In addition to that, from a spatial perspective, risk mitigation also appears from the location of settlements communities that are not located on the riverbanks. This is in accordance with Carter's recommendation not to build settlements in high-risk areas such as river banks, flood plains, or landslide-prone slopes. Information from BPBD and the village head confirmed that houses are located in relatively safe locations away from direct river flow, which lowers the level of exposure to flash flood threats. However, the difference in building height between houses is still a distinguishing factor in the level of damage during floods. Lower-positioned houses naturally receive more impact than houses built on higher ground. Although this community initiative should be appreciated, in the framework of disaster mitigation according

to Dr. W. Nick Carter, protection of non-engineered buildings still requires strong institutional support. The government and BPBDs should participate in providing simple training to communities on disaster-resistant building techniques, provision of appropriate materials, and technical guidelines that are easy to implement locally.

CONCLUSSION

The implementation of flood disaster mitigation by the Regional Disaster Management Agency (BPBD) of Mojokerto Regency has not been implemented optimally. Structural mitigation has been carried out through the construction and repair of embankments, but they are not permanent and have not been supported by additional infrastructure such as pump houses. On the other hand, non- structural mitigation includes several aspects that have not touched all communities equally. In general, the legal framework has been well implemented as a guideline for mitigation implementation. However, the provision of incentives, training and education, institutional development, and early warning systems are still not running optimally. Mitigation activities are mostly implemented reactively and sporadically, with high community involvement but not adequately supported by local governments in terms of facilitation and technical assistance. This leads to a gap between field needs and applicable policies. One of the main factors causing this is the limited budget owned by the local government, so that BPBD has not been able to realize important programs such as the formation of Disaster Resilient Villages (Destana) in Kedunggempol Village. The Destana program, which should serve as an institutional foundation for community-based mitigation, is still pending implementation. As a suggestion, BPBD Mojokerto district needs to immediately realize the Destana program to strengthen institutional capacity at the village level. In addition, the construction of permanent infrastructure such as solid embankments and pump houses should be prioritized. Disaster training, the formation of alert cadres, and education in schools also need to be expanded so that public awareness becomes a culture. The development of technology-based early warning systems and incentivizing communities and the private sector can increase active involvement in mitigation. Finally, the agricultural approaches such as water-retaining crops and adaptive irrigation systems need to be implemented collaboratively to make flood risk reduction strategies more sustainable.

REFERENCE

- Afriani, R. (2020). Kajian Mitigasi Terhadap Penyebab Bencana Banjir di Desa Sidodadi Kota Langsa. *Jurnal Georafflesia*. <https://journals.unihaz.ac.id/index.php/georafflesia>
- Amri, M. R., Yulianti, G., Yunus, R., Wiguna, S., Adi, A. W., Ichwana, A. N., Randongkir, R. E., & Septian, R. T. (2016). *RBI Risiko Bencana Indonesia* (R. Jati & M. R. Amri (eds.)). Badan

Nasional Penanggulangan Bencana.

Arisal, Z. (2023, February 11). Banjir di Dua Desa Mojokerto Rendam 200 Rumah dan Sawah. Majamojokerto.Net. <https://majamojokerto.net/2023/02/11/banjir-di-dua-desa-mojokerto-rendam-200-rumah-dan-sawah/>

Badan Nasional Penanggulangan Bencana. (n.d.). Definisi Bencana. www.bnpb.go.id. Retrieved December 19, 2024, from <https://www.bnpb.go.id/definisi-bencana>

Badan Nasional Penanggulangan Bencana. (2024). Data Bencana Indonesia. Geoportal Data Bencana Indonesia. <https://gis.bnpb.go.id/>

Badan Penanggulangan Bencana Daerah Kabupaten Mojokerto. (2022). Peta Rawan Bencana.

Badan Pusat Statistik. (2023a, July 26). Jumlah Desa/Kelurahan yang Mengalami Bencana Alam Banjir Menurut Kabupaten/Kota di Provinsi Jawa Timur, 2019-2021. BPS. <https://jatim.bps.go.id/id/statistics-table/1/mzaznimx/jumlah-desa-kelurahan-yang-mengalami-bencana-alam-banjir-menurut-kabupaten-kota-di-provinsi-jawa-timur--2019-2021.html>

Badan Pusat Statistik. (2023b, July 26). Jumlah Korban yang Diakibatkan Bencana Alam Banjir Menurut Kabupaten/Kota di Provinsi Jawa Timur, 2022. BPS. <https://jatim.bps.go.id/id/statistics-table/1/mza2mcmx/jumlah-korban-yang-diakibatkan-bencana-alam-banjir-menurut-kabupaten-kota-di-provinsi-jawa-timur--2022.html>

Baihaki, M., Khikmawanto, & Arief, M. (2023). Manajemen Bencana Oleh Badan Penanggulangan Bencana Daerah (BPBD) Dalam Menanggulangi Banjir di Kelurahan Pedurenan Kecamatan Karang Tengah Kota Tangerang. *Bureaucracy Journal: Indonesia Journal of Law and Social-Political Governance*, 3(3), 2861–2878. <https://doi.org/10.53363/bureau.v3i3.370>

Bidang Pengelolaan Data dan Sistem Informasi (PDSI) BNPB. (2024). Statistik Bencana, Korban dan Kerusakan Menurut Jenis. dibi.bnpb.go.id. https://dibi.bnpb.go.id/statistik_menurut_bencana

BPBD Kabupaten Mojokerto. (2024). Laporan Kinerja Instansi Pemerintah Tahun Anggaran 2023.

Budianto, E. E. (2024a, March 6). Tanggul Sungai Sadar Mojokerto Jebol, 500 Rumah dan 97 Ha Sawah Terendam. Detik Jatim. <https://www.detik.com/jatim/berita/d-7228421/tanggul-sungai-sadar-mojokerto-jebol-500-rumah-dan-97-ha-sawah-terendam>

Budianto, E. E. (2024b, March 8). Perbaikan Tanggul Belum Tuntas, Banjir Masih Rendam 3 Desa di Mojokerto. detik.com. <https://www.detik.com/jatim/berita/d-7232079/penutupan-tanggul-jebol-belum-tuntas-banjir-masih-rendam-3-desa-di-mojokerto>

- Bündnis Entwicklung Hilft. (2023). World Risk Report 2023 Focus: Diversity.
- Carter, W. N. (2008). Disaster Management : A Disaster Manager's Handbook (Vol. 2). Asian Development Bank.
- Creswell, J. W. (2009). Research Design Qualitative, Quantitative, and Mixed Methods Approaches (3rd ed.). SAGE.
- Creswell, J. W., & Creswell, J. D. (2018). Research Design Qualitative, Quantitative, and Mixes Methods Approaches (Marks Amy (ed.); 5th ed.). SAGE.
- Denisy, F., & Hertati, D. (2024). The Role of the Regional Disaster Management Agency in Flood Disaster Mitigation Efforts in Banyulegi Village, Dawarblandong District, Mojokerto Regency. *Jurnal Aristo (Social, Politic, Humaniora)*, 12(1), 75–101.
- Diskominfo Informatika. (2024, March 10). Pasca Banjir di Desa Kedunggempol dan Desa Ngrame, Bupati Ikfina Beri Trauma Healing Kepada Anak-anak. [mojokertokab.go.id. https://mojokertokab.go.id/detail-berita/pasca-banjir-di-desa-kedunggempol-dan-desa-ngrame-bupati-ikfina-beri-trauma-healing-kepada-anak-anak-1710073672](https://mojokertokab.go.id/detail-berita/pasca-banjir-di-desa-kedunggempol-dan-desa-ngrame-bupati-ikfina-beri-trauma-healing-kepada-anak-anak-1710073672)
- Hengkelare, S. H., Rogi, O. H., Program Studi, M. S., Wilayah dan Kota, P., Sam Ratulangi, U., Pengajar Prodi, S. S., & Arsitektur, J. (2021). Mitigasi Risiko Bencana Banjir di Manado. *Jurnal Spasial*, 8(2).
- Kepala Pusat Pendidikan dan Pelatihan Sumber Daya Air dan Konstruksi. (2017). Modul Manajemen Penanggulangan Bencana (Vol. 2). Kementerian Pekerjaan Umum dan Perumahan Rakyat.
- Miles, M. B., Huberman, A. M., & Saldana, J. (2014). Qualitative Data Analysis (H. Salmon & K. Koscielak (eds.); 3rd ed.). SAGE Publications, Inc.
- Nakoe, R. M., & Lalu, N. A. S. (2022). Manajemen Bencana. UD Duta Sablon. www.penerbitdutasablon.com
- Nisa, F. (2014). Manajemen Mitigasi Bencana Banjir, Puting Beliung, dan Tanah Longsor di Kabupaten Jombang. *Jurnal Kebijakan & Manajemen Publik*, 2(2).
- Nurillah, S., Maulana, D., & Hasanah, B. (2022). Manajemen Mitigasi Penanggulangan Bencana Banjir Oleh Badan Penanggulangan Bencana Daerah (BPBD) Kota Cilegon di Kecamatan Ciwandan. *JDKP Jurnal Desentralisasi Dan Kebijakan Publik*, 3(1), 334–350. <https://doi.org/10.30656/jdkp.v3i1.4613>
- Peraturan Bupati Mojokerto Nomor 102 Tahun 2021 Tentang Kedudukan, Susunan Organisasi, Tugas dan Fungsi serta Tata Kerja Badan Penanggulangan Bencana Daerah Kabupaten Mojokerto, (2021).

- Ritchie, H., Rosado, P., & Roser, M. (2022). Natural Disaster. Our World In Data. <https://ourworldindata.org/natural-disasters>
- Saputri, S. S., & Sudarmilah, E. (2019). Game Edukasi Mitigasi Bencana Banjir “Tirta si Pejuang Banjir.” *Journal of Technology and Informatics (JoTI)*, 1(1).
- Sunarya, D., & Sutoyo, E. (2023). Strategi Penanganan Banjir di Kampung Babakan Bandung Desa Leuwisadeng Kecamatan Leuwisadeng. *Jurnal Pengabdian Masyarakat UIKA JAYA: SINKRON*, 1(1), 40–45. <https://doi.org/10.32832/jpmuj.v1i1>
- Susanto, A. B. (2006). *Disaster management di negeri rawan bencana: sebuah pendekatan strategic management*. The Jakarta Consulting Group & Eka Tjipta Foundation.
- Undang-Undang Republik Indonesia Nomor 24 Tahun 2007.
- Urbanus, A., Sela, R. L. E., & Tungka, A. E. (2021). Mitigasi Bencana Banjir Struktural dan Non-Struktural di Kabupaten Bolaang Mongondow Selatan. *Jurnal Spasial*, 8(3).
- Wekke, I. S. (2021). *Mitigasi Bencana* (Abdul (ed.)). Penerbit Adab CV. Adanu Abimata.