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Community-Based Pre-Disaster Abrasion Mitigation Strategy in the Coastal Area of Nibung Village, Paloh District

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ABSTRACT

Coastal abrasion poses significant risks to shoreline stability, infrastructure, and the socio-economic life of coastal communities, yet community-based mitigation efforts often remain fragmented and short-term. This study aims to analyze community-based pre-disaster mitigation strategies for coastal abrasion in Nibung Village, examine the role of the village government, and assess the level of community and youth participation in risk reduction efforts. The research employs a qualitative case study approach, with data collected through field observations, semi-structured interviews, documentation, and limited questionnaires using purposive sampling. Informants include village officials, community leaders, affected residents, and students involved in environmental activities. Data were analyzed using an interactive model supported by triangulation techniques. The findings reveal that the community demonstrates adequate awareness of abrasion risks, informed by lived experiences. Mitigation efforts include temporary embankment construction, mangrove planting, awareness campaigns, and active involvement of community members and students. However, these initiatives remain short-term and are not yet integrated into formal village development planning. Key challenges include limited funding, insufficient technical capacity, and weak institutional coordination. Strengthening collaborative governance and embedding community-based mitigation into long-term planning are essential for achieving sustainable coastal protection.

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1. INTRODUCTION

Coastal areas are highly dynamic regions, serving as transitional zones between land, sea, and atmosphere. The interaction of these three elements makes coastal zones vulnerable to various forms of environmental degradation, including coastal abrasion. Coastal abrasion not only results in shoreline changes but also threatens the sustainability of ecosystems, settlements, and the socio-economic activities of coastal communities. In a

global context, the increasing frequency of abrasion is closely associated with climate change, sea-level rise, and the intensification of extreme wave events [1].

Indonesia, as an archipelagic country, is highly vulnerable to abrasion, particularly in coastal areas facing the open sea. Sambas Regency, West Kalimantan, is one of the coastal regions experiencing significant abrasion. Study [2], which used the Digital Shoreline Analysis System (DSAS) to analyze shoreline change, indicates that the coastal area of Sambas has experienced an increasing rate of abrasion annually. This finding is reinforced by Sutarno et al. [3], who state that wave characteristics along Paloh Beach can reach residential areas, causing seasonal abrasion with erosion rates of 4–6 meters per year.

Nibung Village, located in Paloh Subdistrict, is among the coastal areas most severely affected by abrasion. Between 2019 and 2023, local residents documented shoreline retreat, infrastructure damage, and reduced agricultural land due to strong sea waves. This condition aligns with Rinaldi (2023), who notes that abrasion in Paloh Subdistrict has altered the coastal spatial structure and affected the community's socio-economic conditions. The loss of mangrove vegetation, a natural coastal buffer, has further accelerated abrasion, as explained by Rinjani et al. [4] and Irwansah et al. [1].

Efforts to address abrasion cannot rely solely on structural measures such as seawalls and breakwaters; they must be complemented by non-structural approaches that emphasize community involvement. The concept of Community-Based Disaster Risk Reduction (CBDRR) highlights that local communities are not merely objects but primary actors in disaster mitigation processes [5], [6]. This approach has proven effective in increasing awareness, participation, and social resilience in the face of coastal hazards.

However, previous studies have largely focused on the technical aspects of abrasion or shoreline changes, while research specifically examining community-based pre-disaster mitigation strategies in border coastal areas such as Paloh remains limited. Several studies have also failed to integrate the roles of village government, community participation, and youth involvement into a comprehensive mitigation framework [7], [8].

Based on this research gap, the present study is significant as it comprehensively examines community-based pre-disaster abrasion mitigation strategies in Nibung Village, Paloh Subdistrict. The novelty of this research lies in integrating the roles of the village government, coastal communities, and secondary school students within a unified community-based mitigation model. Therefore, this study not only contributes to the development of abrasion mitigation research but also provides practical implications for strengthening village policies and reducing disaster risk in coastal areas.

The objectives of this study are to: (1) identify community-based pre-disaster abrasion mitigation strategies in Nibung Village, (2) analyze the role of the village government in mitigation implementation, (3) examine the level of participation of the community and youth, and (4) identify the challenges faced in reducing coastal abrasion risk.

2. METHOD

This study employs a qualitative case study design to examine in depth the community-based pre-disaster abrasion mitigation strategies in the coastal area of Nibung

Village, Paloh Subdistrict, Sambas Regency. This approach was selected because it enables a contextual explanation of social phenomena and facilitates an in-depth exploration of meanings, the roles of actors, and mitigation processes occurring at the community level [9], [10].

The research site was selected in Nibung Village, as the area has experienced significant coastal abrasion over the past five years and has implemented various community-based mitigation efforts. The research subjects included the Village Head, village officials, community leaders, coastal residents directly affected by abrasion, and teachers and students of SMA Negeri 1 Paloh who were involved in environmental awareness activities. Informants were selected using a purposive sampling technique, meaning they were intentionally chosen based on their involvement in and knowledge of abrasion mitigation programs [11].

Data collection was conducted through field observations, in-depth semi-structured interviews, documentation, and limited questionnaires to strengthen the qualitative findings. Observations were conducted to examine the physical condition of the coastline, the presence of embankments and mangrove vegetation, and the activities of coastal communities. Interviews were used to explore mitigation strategies, forms of community participation, the role of the village government, and the challenges encountered. Documentation included photographs of abrasion conditions, village program archives, and activity records. Questionnaires were administered on a limited basis to assess community perceptions and levels of awareness regarding coastal abrasion [12].

Data analysis was conducted concurrently with data collection using the interactive model of Miles and Huberman, which involves data reduction, data display, and iterative conclusion drawing [13]. To ensure data validity, this study applied source, technique, and time triangulation, thereby enhancing the credibility of the research findings [12].

3. RESULTS AND DISCUSSION

Community Understanding of the Abrasion Threat

The findings indicate that the majority of residents in Nibung Village understand coastal abrasion as a serious threat to their environment and livelihoods. Direct experiences, including damaged settlements, the loss of agricultural land, and frequent tidal flooding during the west monsoon season, have shaped this understanding. The community is also aware that natural factors do not solely cause abrasion but are accelerated by human activities such as mangrove deforestation. However, this awareness has not been fully accompanied by the consistent implementation of sustainable mitigation measures in daily life. Most residents still rely on temporary sandbags and wood embankments as short-term protective measures. This finding is consistent with Irwansah et al. [1], which states that coastal communities directly affected by abrasion tend to have higher levels of awareness, although their capacity to implement long-term mitigation remains limited [15].

Physical Condition of the Coastal Area of Nibung Village

Field observations reveal that the shoreline of Nibung Village has experienced significant retreat in recent years. Several houses that were previously located at a

considerable distance from the coast are now situated very close to the wave line. The self-constructed emergency embankments appear damaged and are unable to withstand high waves. Mangrove vegetation has also declined, particularly in areas frequently exposed to strong wave action. These conditions indicate that the natural coastal protection system has undergone degradation [16].

This situation reinforces the findings of Burda et al. [2], who report that the coastal area of Sambas Regency has experienced an annual rate of abrasion due to wave pressure and changes in coastal morphology [17].

The Role of the Village Government in Pre-Disaster Mitigation

The Nibung Village Government has undertaken various pre-disaster mitigation efforts, including public awareness campaigns, mangrove planting, the construction of temporary embankments, and the submission of funding proposals to the local government. Awareness programs are conducted through village meetings and community mutual cooperation (gotong royong) activities [18]. However, the implementation of these programs has not been optimal due to budget limitations, insufficient technical personnel, and weak inter-institutional coordination. As a result, most initiatives remain reactive rather than long-term and strategic. This condition aligns with Budiana et al. [5], which states that coastal villages generally face institutional and resource constraints in disaster risk management.

Community and Youth Involvement

The residents of Nibung Village demonstrate relatively strong participation in community service activities and mangrove planting programs. The involvement of students from SMA Negeri 1 Paloh in environmental awareness initiatives also represents a significant strength in community-based mitigation efforts. Students gain an understanding of abrasion threats through geography lessons; however, this knowledge remains largely cognitive and has not fully translated into sustained mitigation-oriented behavior. This finding is consistent with Nugroho et al. [6] and Putri et al. [8], which emphasize that disaster education plays an important role in building awareness but must be supported by practical engagement to influence behavioral change.

Implemented Pre-Disaster Strategies

Pre-disaster mitigation strategies implemented in Nibung Village include mangrove planting, construction of sand embankments, disaster awareness campaigns, and community and school involvement. Although these strategies have positively contributed to increased public awareness, they remain temporary and have not been integrated into long-term village development planning. The lack of a systematic action plan has led to sporadic mitigation efforts [19].

These findings support the argument of Rinjani et al. [4] that community-based abrasion mitigation requires sustainable, well-structured planning to achieve long-term impacts.

Discussion

Community-Based Pre-Disaster Abrasion Mitigation Strategies

The findings indicate that pre-disaster mitigation strategies in Nibung Village are still dominated by a combination of structural and non-structural approaches, although their implementation has not yet been fully integrated into village development planning. Structural strategies are reflected in the construction of temporary embankments and the use of sandbags to withstand wave impact. However, these measures are temporary and reactive in responding to abrasion events. Theoretically, structural mitigation that is not designed based on technical studies and long-term planning tends to be less effective [14].

In contrast, non-structural strategies such as disaster awareness campaigns and mangrove planting represent a more sustainable approach to mitigation. Mangrove planting serves as a natural coastal defense by dissipating wave energy and reducing erosion rates. A study by Irwansah et al. [1] emphasizes that community-based mangrove rehabilitation can enhance both ecological and social resilience in coastal areas. Nevertheless, the effectiveness of this strategy heavily depends on consistent maintenance and institutional support from the village administration [20].

From the perspective of Community-Based Disaster Risk Reduction (CBDRR), the involvement of the Nibung Village community offers significant potential to strengthen local resilience. According to Budiana et al. [5], community-based approaches position residents as primary actors in mitigation processes rather than merely recipients of assistance. The findings of this study show that community participation has been fostered through mutual cooperation (gotong royong) and village discussions; however, it has not yet been institutionalized through formal regulations or systematic mitigation action plans.

The Role of the Village Government in Pre-Disaster Mitigation

The role of the village government in abrasion mitigation in Nibung Village includes initial initiatives such as public awareness activities, proposals for external assistance, and the implementation of mangrove planting programs. However, budget constraints, the lack of technical expertise, and weak cross-sectoral coordination remain the main challenges. This condition reflects common obstacles in disaster risk governance at the local level. As noted by Nugroho et al. [6], village institutional capacity is often insufficient to comprehensively manage disaster risks.

Conceptually, effective disaster mitigation governance requires integration between village development planning and disaster risk reduction strategies. Without such integration, mitigation programs tend to be sporadic and unsustainable. This situation is evident in Nibung Village, where mitigation activities have not yet been fully incorporated into the village's medium-term development planning documents. Therefore, strengthening institutional capacity and participatory planning mechanisms is essential to enhance the effectiveness of pre-disaster mitigation efforts [21].

Community and Youth Participation

Community participation in abrasion mitigation in Nibung Village reflects a collective awareness that has emerged from direct experience with the impacts of coastal

erosion. The involvement of students from SMA Negeri 1 Paloh in environmental initiatives demonstrates that disaster education can reinforce community-based mitigation efforts. However, this study finds that students' understanding remains largely cognitive and has not yet consistently translated into sustained mitigation-oriented actions. [22].

A study by Rizkiani and Suasti [7] argues that disaster education becomes effective when integrated with field practices and community-based projects. Similarly, Putri et al. [8] highlight that contextual disaster learning can significantly enhance students' disaster risk literacy. Thus, integrating school-based programs with village mitigation initiatives presents a strategic opportunity to strengthen community-based coastal abrasion mitigation efforts [23].

Figure 1. Disaster Mitigation Learning at SMA N 1 Paloh

Constraints and Challenges in Mitigation Implementation

The main constraints identified in this study include limited funding, a lack of technical personnel, weak inter-institutional coordination, and the absence of specific village regulations governing abrasion mitigation. These challenges indicate that community-based mitigation requires adequate policy support and financial resources. Without such support, community initiatives tend to remain short-term and reactive in nature [24].

A study by Burda [2] emphasizes that the coastal area of Sambas Regency exhibits complex coastal morphological dynamics, indicating that abrasion mitigation requires spatial data-based planning and scientific assessment. Therefore, collaboration among the village government, local government authorities, academics, and the community is an essential prerequisite for establishing a sustainable mitigation system [25].

4. CONCLUSION

This study highlights that pre-disaster mitigation of coastal abrasion in Nibung Village reflects an emerging but not yet fully institutionalized community-based approach. The findings suggest that while local actors demonstrate awareness and initiative, mitigation practices remain transitional and require stronger integration into formal governance systems. The study affirms that effective abrasion risk reduction depends not

only on physical interventions but also on the alignment between community participation, institutional capacity, and long-term planning frameworks.

The implications of this research underscore the importance of strengthening collaborative governance, in which village authorities, communities, and external stakeholders jointly develop sustainable mitigation strategies. Integrating community-based approaches into village development planning can enhance policy effectiveness and ensure continuity of mitigation efforts.

However, this study is limited to a single case with a qualitative design, focusing primarily on local dynamics without examining broader regional comparisons or quantitative impact measurement.

Future research should explore cross-regional studies, incorporate quantitative risk assessments, and examine community resilience from interdisciplinary perspectives. For the general public, this study contributes by increasing awareness of the importance of collective action and environmental stewardship, and by encouraging communities to participate actively in sustainable coastal protection efforts.

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REFERENCES

[1] Irwansah, Usman, M. Z. H. Muttaqin, and E. Mahariyanti, “Mitigasi Bencana Abrasi Berbasis Keanekaragaman Vegetasi Mangrove di Pesisir Pantai Bagik Batu , Jerowaru,” *J. Ilm. Glob. Educ.*, vol. 5, no. 4, pp. 2062–2068, 2024.

[2] N. Burda, N. Asriati, A. Sugiarto, A. Info, S. Change, and T. Factors, “Analisis Perubahan Garis Pantai Menggunakan Metode Dsas (Digital Shoreline Analysis System) Tahun 2014-2022 Pantai Matang Danau Desa Matang Danau Kecamatan Paloh,” *J. Pendidik. dan Pembelajaran Khatulistiwa*, vol. 11, no. 2014, pp. 2715–2723, 2022.

[3] A. R. Sutarno, A. D. Lestari, and M. M. Danial, “Pemodelan Karakteristik Hidro Oseanografi Di Wilayah Perairan Pantai Tanah Hitam , Kecamatan Paloh , Kabupaten Sambas , Menggunakan Software Mike 21 Modeling Hydro Oceanographic Characteristics In The Coastal Waters Of Tanah Hitam , Paloh District , Samba,” *J. LAOT ILMU Kelaut.*, vol. 6, no. 1, pp. 66–79, 2024, doi: 10.35308/jlik.v6i1.9117.

[4] E. K. Rinjani, Nurhidayah, S. Panbriani, U. A. Amalina, and I. P. Artayasa, “Mitigasi Bencana Abrasi Pantai Melalui Penanaman Mangrove di Desa Seriwe, Jerowaru Lombok Timur,” *J. Pengabdi. Magister Pendidik. IPA*, vol. 5, no. 1, pp. 226–230, 2022.

[5] Budiana, D. A. Sujatnika, A. Nasrudin, and M. S. Nurhakim, “Mitigasi Kebencanaan Dengan Pendekatan Nilai Pendidikan Islam di Kalangan Milenial Daerah Pesisir Pantai Labuan Pandeglang , Indonesia,” *Edukasi Islam.*, vol. 12, no. 1, pp. 1105–1120, 2023.

[6] C. Nugroho, R. Umar, N. Pertiwi, and M. A. S. Mandra, “Perilaku Spasial Anak Usia Sekolah dalam Mitigasi Bencana Banjir,” *J. Ilm. Ilmu Pendidik.*, vol. 6, no. September, pp. 7262–7267, 2023.

[7] A. B. Rizkiani and Y. Suasti, “Pendidikan Kebencanaan Dalam Implementasi Kurikulum Merdeka Tingkat SMA,” *geoedusains J. Pendidik. Geogr.*, vol. 5, no. 1, pp. 66–73, 2024.

[8] M. G. A. Putri *et al*., “Presepsi Siswa SMA dalam Peristiwa Banjir,” *J. Ilm. Wahana Pendidik.*, vol. 9, no. 2, pp. 362–368, 2023.

[9] R. K. Yin, *Case Study Research and Applications: Design and Methods*, vol. 11, no. 1. Surabaya: Sage Publication, Inc, 2023.

[10] M. Rahardjo, “Metode Penelitian Studi Kasus: Konsep, Prosedur, dan Perkembangannya,” vol. 1, Malang, 2025, pp. 1–23.

[11] J. W. Creswell and C. N. Poth, *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications, 2016.
[12] Sugiyono, *metode penelitian pendidikan pendekatan kuantitatif, kualitatif dan R&D*. Bandung: Bandung, Alfabeta, 2017.
[13] M. B. Miles, A. M. Huberman, and J. Saldana, *Qualitative data analysis*. arizona: Sage publications, 2014.
[14] T. Aurel, "Analasis mitigasi bencana abrasi pada wilayah pantai galesong kabupaten takalar," *Ris. Sains dan Teknol. Kelaut.*, vol. 6, no. 2, pp. 237–241, 2023.
[15] IPCC, *Climate Change 2021: The Physical Science Basis*. Cambridge: Cambridge University Press, 2021.
[16] R. J. Nicholls and A. Cazenave, "Sea-level rise and coastal impact," *Science*, vol. 328, no. 5985, pp. 1517–1520, 2010.
[17] UNDRR, *Sendai Framework for Disaster Risk Reduction 2015–2030*. Geneva: United Nations, 2015.
[18] W. N. Adger, "Social and ecological resilience," *Progress in Human Geography*, vol. 24, no. 3, pp. 347–364, 2000.
[19] D. M. Alongi, "Mangrove forests: Resilience and protection," *Estuarine, Coastal and Shelf Science*, vol. 76, no. 1, pp. 1–13, 2008.
[20] Badan Nasional Penanggulangan Bencana (BNPB), *Rencana Nasional Penanggulangan Bencana*. Jakarta: BNPB, 2020.
[21] Kementerian PPN/Bappenas, *Rencana Pembangunan Jangka Menengah Nasional*. Jakarta: Bappenas, 2021.
[22] R. Dahuri, *Pengelolaan Sumber Daya Wilayah Pesisir*. Jakarta: Pradnya Paramita, 2013.
[23] B. Triatmodjo, *Perencanaan Bangunan Pantai*. Yogyakarta: Beta Offset, 2012.
[24] A. D. Setyawan, "Mangrove ecosystem services," *Biodiversitas*, vol. 20, no. 2, pp. 296–304, 2019.
[25] FAO, *The World's Mangroves 1980–2005*. Rome: FAO Forestry Paper, 2007.