

Understanding Rural Community Resilience to Natural Disasters: Challenges for Coastal Communities in Mandalika

Oscar Radyan Danar

Brawijaya University

Corresponding Author: Oscar Radyan Danar, Oscar@ub.ac.id

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ABSTRACT

This study aims to understand the resilience mechanism of rural communities to natural disasters, with a focus on coastal communities in Mandalika. The location of the study was chosen because the coastal area of Mandalika is increasingly vulnerable to various disaster threats such as tsunamis, flash floods, and coastal erosion, which are exacerbated by the impact of climate change. A qualitative method with a case study approach was used in this study, where data were obtained through in-depth interviews, field observations, and document analysis. The results of the study show that coastal communities in Mandalika have developed adaptation strategies that involve local wisdom, community cooperation, and active participation in disaster mitigation programs organized by the government. However, there are a number of challenges that hinder increased resilience, such as limited economic resources, lack of access to accurate information, and suboptimal coordination between local governments and local communities. This research also reveals the important role of non-governmental organizations and efforts to strengthen local capacity in improving disaster preparedness and response. The findings provide a comprehensive overview of the factors affecting the resilience of coastal communities, as well as their implications for disaster risk management policies.

INTRODUCTION

Indonesia has a very long history of natural disasters, so it is able to form a very strong community resilience. Community resilience is an effort to identify upcoming disasters, so as to minimize the risk of natural disasters (Norris et al., 2008) (Audet, 2015; Schneider, 1992). Research trends on Community Resilience show that communities with active involvement in disaster planning tend to be better prepared for disasters and recover faster (Hilhorst, 2013; Kruse et al., 2017). This approach also creates a sustainable culture of preparedness through institutional, social, economic, infrastructure, and environmental variables (Cutter, 2016; Kruse et al., 2017; Mcaslan, 2010). The interconnectedness of infrastructure, institutional, social, and environmental to disaster management lies in their synergy in creating holistic resilience (Kruse et al., 2017; Mcaslan, 2010). Disaster-resilient infrastructure supports rapid response (Chester et al., 2021), strong institutions ensure regulations and resources are on target (Cutter et al., 2010), social capital encourages community participation and coordination (Cachia & Holgado Ramos, 2020; Serrao-Neumann et al., 2018), as well as a healthy environment that reduces natural risks (Hilhorst, 2013; Kirschenbaum, 2017), making this integrated approach essential for sustainable mitigation and recovery (Aldrich & Meyer, 2015).

This research refutes the argument for the growing trend of community resilience research. The high level of development in Mandalika encourages the birth of social chaos due to ecological changes. In the end, it has a fatal effect on the birth of new natural disasters, which have never happened before. This research shows that community resilience to natural disasters is experiencing new challenges due to infrastructure development. Local communities are forced to be adaptive to development that is carried out top-down, without considering the dynamics faced by the community (Grydehøj & Su, 2023). Land clearing and rapid infrastructure development have actually changed the spatial planning of the area, to be the main problem. The trend of community resilience research presents a resilience system that is formed naturally over a very long period of time. The construction then forms a migration of coastal communities to natural disasters. The rapid development in Mandalika actually presents disaster management policies that result in constructing community resilience. The Mandalika community has a mitigation system that has become the collective thinking of coastal communities, but due to land clearing and development, they have to adapt to natural disasters that they have never faced before. Various community groups are making various efforts to strengthen social resilience through internal and external networks. The goal is to be able to anticipate, respond to, and recover from the impacts of disasters effectively by utilizing local resources, infrastructure, and strong social relationships (Maurischa et al., 2023).

LITERATURE REVIEW

Unsustainable development often leads to critical environmental degradation. High deforestation reduces biodiversity, pollution that damages water and soil ecosystems, and urbanization that increases disaster risk due to

the loss of natural ecosystem functions as protectors, such as mangrove forests and water catchment areas (Adger et al., 2005). The complexity of the problem is contained in the development of the Mandalika Special Economic Zone (SEZ) (Yuli et al., 2025). In the end, local communities make various efforts to circumvent changes in their environment. These efforts include building networks between environmental activists, government leaders, and academics, reconstructing development policies, and strengthening mitigation (Rahman et al., 2018).

METHODOLOGY

This research uses a qualitative approach with theory Agrarian Reform with the method system thinking especially the analysis stage of Soft Systems Methodology (SSM). The researcher uses data collection methods through observation, interviews and documentation (Creswell, 2016; Silalahi, 2012; Sugiyono, 2017) (Silalahi, 2012). Furthermore, the researcher used the Soft System Methodology (SSM) as a data analysis tool. The SSM method was chosen because this study is aimed at creating an agricultural policy model in the governance of national park areas with 7 main activities as follows:

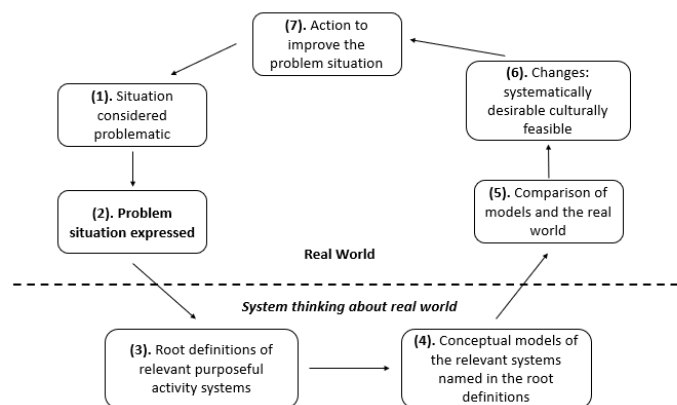


Figure 1. Soft System Methodology

Source: (Checkland, 1990; Mehregan et al., 2012; Rodriguez-Ulloa & Paucar-Caceres, 2005)

SSM's position in social science research is examined through two paradigm currents, namely the hard paradigm and the soft paradigm. SSM as a method in the soft paradigm has the basic idea that the real-world situation we are exploring is an all-around system of individual activity, in which we can choose one or several systems of relevant human activity. From the image above, it can be described that the standard cycle of SSM has 7 stages of activities divided between 2 domains, namely the realm of the real world and the realm of systematic thinking about the real world.

RESULTS AND DISCUSSION

Conditions for Infrastructure Development of the Mandalika Special Economic Zone (SEZ)

Infrastructure is one of the indicators of the acceleration of development carried out in Indonesia. The massive development direction, especially in

industrial estates that transform the area or region into a new destination, can be analyzed through several main aspects. First, from the aspect of physical infrastructure, the basic development of the infrastructure that supports the Mandalika SEZ has been carried out since 2020 within the framework of the "Mandalika Urban Tourism and Infrastructure Project," which is broadly funded by the ASEAN Investment Bank (Grydehøj & Su, 2023).

As for further, in this development, supporting developments were also built that strengthened accessibility through a bypass road connecting Lombok International Airport with the Mandalika circuit area. Broadly speaking, the results of our observations show that there are about 20 roads (15.5 kilometers) connecting to tourist destinations and other strategic places. This basic project, as an international event for MotoGP 2022, is a locomotive for the development conditions in this SEZ to attract foreign investment and tourists. This is also supported by the construction of other facilities such as hotels and resorts that are built on a large scale.

In terms of budget, the allocation of funds issued by the government related to the Mandalika SEZ is in the range of Rp. 1.3 trillion from the total state budget for 2020 to 2023. Not only that, but funding also comes from international schemes such as LPEI and Asian banks, which are also used to support accessibility and connectivity between infrastructure. In particular, the bypass road between Lombok Airport and Mandalika had a budget realization of Rp.706.7 billion. From a policy perspective, this can be seen as part of the government's efforts to increase the competitiveness of the tourism and economic sectors and domestic and foreign investment. As a form of strong support to accelerate the development of Mandalika infrastructure.

However, the investment target in 2025 has decreased significantly, which was initially Rp. 934 billion in 2024 to Rp. 590 billion. We revealed that this decline was caused by a change in the development phase, when the attention of the government and investors began to shift to medium-term projects such as the development of the eastern zone of West Nusa Tenggara. Furthermore, we also study the economic impact of the Mandalika SEZ framework. We see a "seasonal economy" happening at the local level in Mandalika after the MotoGP event. It is undeniable that the presence of this international event, on the other hand, also increases Gross Regional Revenue. This increase in GDP is through an increase in tourist visits and investment, with an economic turnover of Rp. 5 trillion from the MotoGP event in 2023 to 2024.

The same thing also happens in the labor absorption sector and regional tax revenue. In 2024, as many as 7,200 workers will be well absorbed in the construction, hospitality, and MSME sectors. The surge in absorption capacity is around 20% higher than in 2023, presenting new nuances that occurred before and even after the transformation of the Mandalika SEZ. Meanwhile, tax revenues from the tourism sector, especially those related to lodging, accommodation, and transportation, have also increased significantly. This is what we then call the "seasonal economy", which is a condition where the economic impact is felt significantly at a certain momentum but returns to

sluggishness when the event has been completed. This means that at this level the government has not been able to maintain the significance of the increase from all sectors in a sustainable or continuous manner.

Although this infrastructure development was massive during this period, our findings confirm that this infrastructure has not been fully synchronized with local capacity. In this context, it is the development of non-physical elements that have not been fully considered. The government seems to force a region to be pro-private so that the narrative of the development of priority destinations in Mandalika is framed as physical development with fantastic funds without also thinking about the human resources in it, whether they are ready or not to face the shifts that occur. The government does not seem to want to invest much in the development of quality human resources; instead, its main focus tends to be on physical things (Yuli et al., 2025).

On the other hand, the observations that we made on NGOs as development observers analyzed the effects of development on the carrying capacity of land, and it was found that in the aspect of the conditions of the development of the Mandalika SEZ, geotechnical problems appeared. In this context, the soil at the construction site is shifting and deforming, with an average of tens of millimeters per year (observations are made from 2022 to 2025). This also needs to be the government's concern in carrying out stricter supervision, especially in locations that are vulnerable to excessive load and pressure.

This further raises questions for us related to the extent to which the evidence supports the correlation between infrastructure development and the success of special economic zones like Mandalika. Several findings reveal this correlation: effective infrastructure, including transportation, power, and public health facilities, is essential for attracting foreign direct investment (FDI) and promoting economic activities within the zones (Selentyeva et al, 2018). Similarly, according to Meng et al (2017), the lack of adequate infrastructure outside the Zambia-China Economic and Cooperation Zone has been identified as a bottleneck restricting its development. Strong infrastructure within SEZs leads to significant local and regional socioeconomic development. This includes improvements in employment, exports, and overall economic growth. For instance, the development of SEZs in India has shown superior performance in policy implementation and operational efficiency, which is partly attributed to better infrastructure (Salman et al, 2024).

Numerous case studies among countries reveal the importance that supports these correlations. Dorozynski et al (2021) show in Poland, the performance of SEZs is significantly influenced by infrastructural outlays and the quality of zone governance. Similarly, in Vietnam, the comprehensive review of infrastructure within SEZs has shown positive causal effects on foreign direct investment at the district level (Nguyen & Tien, 2021). In contrast to this phenomenon, despite upgraded infrastructure, a study by Durongkaveroj (2022) highlights that SEZs have not attracted the intended level of investment, indicating that infrastructure alone is not sufficient without complementary policies and effective governance. While Dorre (2021) also

reveals that the experience of SEZs in Tajikistan shows that mismatches between infrastructure claims and reality lead to underperformance.

Therefore, we consider that the development conditions in the Mandalika SEZ have achieved impressive results for the transformation of tourist destination areas. However, the post-event management that causes the seasonal economy requires efforts to synergize physical development with local capacity development so that the economic impact can be more sustainable and equitable. So that the government's performance in changing the regional landscape into a tourist destination in the framework of the SEZ will not continue to become "underperforming" if several aspects are considered. The government also needs to take steps to improve the geotechnical monitoring system periodically for further prevention related to the risk of soil deformation.

Challenges of Community Resilience to Disasters Due to Environmental Change

The biggest challenge in building community resilience in Mandalika lies in the structural aspect, where regional governance is greatly influenced by the grand design of development set by PT Pembangunan Pariwisata Indonesia (ITDC). As a state-owned entity, ITDC has significant control over the spatial planning of the area, but often this policy is not in line with the needs of disaster mitigation in buffer villages. The sectoral egos that have emerged between the Destana and Tagana groups have further exacerbated the situation, exposing a crucial coordination gap. This is an obstacle in building cross-sector collaboration needed to strengthen disaster mitigation. If not addressed immediately, buffer villages will continue to face a high risk of vulnerability, especially due to the absence of mechanisms that ensure the integration of spatial interests with local needs.

In addition, the available human resources show significant inequality. Kuta Village, as the center of the region, has a much better human resource capacity than other buffer villages. However, even though Kuta Village is superior in this regard, there has not been a collective effort that can spread that capacity to other areas. Field studies show that buffer villages need pioneer groups that are able to initiate social movements, especially those that focus on collective understanding of disaster mitigation. This inequality not only hampers resilience efforts, but also creates regional preparedness disparities that can adversely affect emergencies (Norris et al., 2008).

In terms of networking, the main strength is seen in the Destana group, which plays a role as the pioneer of Disaster Resilient Villages. However, this strength is not enough if there is no assistance or assistance from external parties. Support such as training, technical assistance, and membership strengthening is an urgent need. Based on the table in the document, these weaknesses in the external network make it difficult for Destana to expand its reach and increase the collective capacity of the community. Without network strengthening, Destana risks losing momentum in building long-term resilience (Aldrich & Meyer, 2015).

The strategy taken by the community until now is still very dependent on government assistance, both in terms of budget, human resources, and program assistance. This dependence leads to weak local initiatives, which is

one of the fundamental weaknesses in building community self-reliance. Internal regeneration in the Destana and Tagana groups has also not been ideal. Based on the data, the lack of structured regeneration programs hinders efforts to increase capacity in a sustainable manner, especially in the face of accelerating environmental change dynamics. To make it easier to understand, we present the conditions and challenges faced as existing conditions in the Mandalika SEZ in the following Table 1: (Maurischa et al., 2023)

Table 1. Summary of Community Resilience Challenges Against Disasters Due to Environmental Change in the Mandalika SEZ

Variable	Condition	Challenge
Structural: Politics, policy and power	• The Mandalika area is managed by SOEs; • The spatial layout of the Mandalika area follows the grand design of the development from PT. Indonesian Tourism Development (ITDC); • There was a sectoral ego between the Destana and Tagana groups.	• Requires coordination and collaboration in every disaster mitigation program; • There are obstacles when there is no synchronization of regional governance interests in the buffer area, especially villages.
Resources	• The largest human resource is owned by Kuta Village, while other buffer villages have not been able to maximize their potential to increase resilience to natural disasters.	• A pioneer group is needed to carry out a social movement (collective understanding) about disaster mitigation.
Network	• The main strength is in the Destana group; • Destana is a pioneer in the strength of disaster-resilient villages.	• There needs to be help/support/mentoring from various parties to strengthen the membership network.
Strategy	• Waiting for government assistance in terms of human resources, budget, and assistance for public space governance programs in the Mandalika buffer.	• There is no ideal enough regeneration within the Destana or Tagana groups. • Governments need to do extra work to build community strength

Based on Table 1, this analysis shows that the challenges faced in building community resilience in Mandalika are multidimensional. The structural aspect requires a more effective cross-sector coordination mechanism, while in the resource aspect, capacity redistribution and collective training are needed to create equality between regions. Community networks must be strengthened through strategic partnerships with various parties, while long-term strategies must be directed towards community self-reliance, reducing dependence on government assistance.

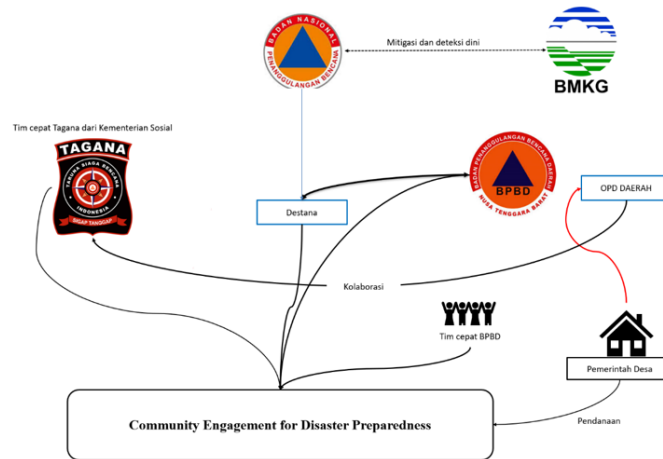


Figure 2. Conceptual Model of Community Resilience Improvement

In Figure 2 above, if we refer to the existing conditions and challenges of community resilience in Mandalika, then we offer efforts to improve community resilience through the following arguments. Destana needs to be strengthened as a strategic hub that can integrate data-driven technology (such as BMKG information related to early detection) with responsive local practices. Technology-based training such as an app-based early warning system can be provided to Destana to improve the accuracy and speed of emergency response. In addition, integrating formal training for young people at the village level as Destana cadres or TAGANA volunteers. Wider community participation can increase resilience (Sufri et al., 2020).

The collaboration model must be optimized through a memorandum of understanding (MoU) between actors to develop a data-based proactive strategy. For example, BMKG can provide seasonal predictions related to disaster risk, which is then processed by BPBD to compile community preparedness guidelines on a regular basis. On the other hand, involving universities and research institutions in this model can provide stronger science-based inputs for disaster risk mitigation. Therefore, we consider that the allocation of village funds can be optimized to build disaster-resilient community infrastructure, such as temporary evacuation houses or better drainage systems. The village government can also involve the private sector to support funding for emergency response activities through corporate social responsibility (CSR) programs. BMKG can develop a two-way communication system with the community through a mobile-based application. Early detection information translated into local languages will be easier for the public to understand and improve the effectiveness of their responses.

CONCLUSIONS AND RECOMMENDATIONS

This study reveals that efforts to build the resilience of coastal communities are not enough to rely only on local capacity or sectoral government intervention. Structural transformation is needed that allows coastal communities to be integrated into an adaptive, data-driven, and cross-sectoral disaster risk management network. Thus, resilience is not only a response to disaster threats, but also sustainable development strategies in the

face of global climate change dynamics. The results of the study show that coastal communities have built adaptation strategies based on local wisdom, community solidarity, and active participation in government mitigation programs. However, this resilience is still partial and vulnerable to structural challenges that include limited economic resources, minimal access to information, and weak coordination between the government and the community. These findings illustrate that, despite significant local capacity, resilience mechanisms are still not optimal to deal with increasingly complex disaster risks.

The study also highlights the lack of integration between various actors in disaster risk management. Local governments tend to be top-down without ensuring the delivery of relevant information to the community level, while the involvement of non-governmental organizations and the private sector is still sporadic and has not been integrated into the broader management system. On the other hand, society relies on traditional mechanisms that are often incompatible with modern disaster risk dynamics. This shows that there is a gap in disaster risk management policies, where existing mitigation programs have not been able to answer the specific challenges of coastal communities (Adger et al., 2005).

In terms of policy, this study provides a number of strategic implications. First, the government needs to adopt an inclusive governance approach that not only empowers the community but also ensures coordination across actors, including the academic, private, and non-governmental sectors. Second, the use of data-based technology, such as an application-based early warning system that is easily accessible to the public, is an urgent need to overcome information limitations. Third, village fund allocation must be directed to long-term programs such as disaster-resilient infrastructure development, community-based training, and disaster-resilient cadre regeneration.

However, we also note the limitations in the scope of the study site focusing on Mandalika, so that the results cannot be representative of other coastal communities with different social, economic, and geographical characteristics. In addition, the qualitative approach used does not allow quantitative measurement of the effectiveness of adaptation strategies. Therefore, future research needs to integrate quantitative approaches and analytical technologies to comprehensively evaluate the impact of adaptation strategies on increased resilience. Further research should also explore more innovative community-based empowerment mechanisms, such as the use of artificial intelligence for risk prediction or blockchain platforms for disaster financing transparency (Grydehøj & Su, 2023).

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