Research Article

Becoming a Resilient Community: How a Disaster-prone Community Survives an Abrasion

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Abstract.
Bedono Village, a village in Demak Regency, Indonesia, is a village severely affected by abrasion. The past 20 years have witnessed the drowning of hamlets due to abrasion, namely the hamlets of Morosari and Senik, and every year the height of the land decreases by 10 cm. As a result, the residents of Bedono Village had to adapt in various ways. The people of Bedono Village have shown resilience and adapted to these new conditions by raising their houses, changing jobs, and founding social organizations. Every resident of Bedono Village has a reserve fund that must be prepared in case of renovation and job changes. This research aims to explain the resilience strategy applied by the residents of Bedono Village in facing abrasion in their area. This research uses a descriptive qualitative method and data are collected using several techniques. Interviews, observation, documentation, and literature study are methods used to obtain information. The initial results show that there is a pattern of societal adaptation amid an environmental disaster. Furthermore, work orientation in the socio-economic community has changed, from the agricultural sector to fishermen and fishponds. Moreover, continuous abrasion results in a decreasing population of the community.

Keywords: abrasion, community, disaster-prone, resilience, strategy

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1. Introduction

Indonesia is a maritime country whose life activities are related to the sea. Indonesia has more than 17 thousand islands, and a coastline of more than 99,000 km, as well as 80% of the industry and 75% of big cities are in coastal areas. The coastal area is an area that lies between the ocean and land boundaries. The coastal area functions as the provider of natural resources, life support services, and comfort services, and as

the recipient of waste derived from development activities conducted on lands such as settlement activities, trade, fisheries, and industry (1).

Therefore, it is not surprising that coastal areas in Indonesia are very vulnerable to environmental damage due to various activities that occur in the coastal areas. Abrasion is a disaster that occurs in coastal areas (2). Abrasion is defined as a process of land erosion caused by waves resulting in substrate drift and reduced land area. Abrasion can cause the retreat of the coastline, damage to fish farms and paddy fields located in coastal areas, and threaten buildings located in coastal areas both buildings that function as supporting tourism and houses of residents (1,3). The main factor of abrasion is wave activity on the coast that occurs continuously and cannot be resisted by coastal material, human activities also influence such as the construction of buildings in the sea area (seaport), industrial buildings, and the expansion of fish farms by carrying out mangrove logging (4,5).

Demak Regency is one of the regions in Indonesia whose areas are most affected by abrasion. One of them is Sayung District, especially Bedono Village, which experiences the most severe abrasion effects. The people of the coastal area in Bedono Village have several prolonged collective problems. Starting from the loss of the coastline, paddy fields area, the loss of access to the inter-hamlet connecting road, and even drowning settlements. Abrasion has caused several hamlets in the Bedono Village to sink, such as Senik and Tambaksari Hamlets. In terms of the environment, over the past 20 years, coastal areas have experienced land loss due to land subsidence. In social terms, there has been a decrease in the intensity of interaction and a decrease in the number of residents each year (6). According to the economic aspect, there has been a change in livelihood orientation, although some jobs such as fishermen and fish farm farmers remained the preferred employment option.

The communities of Bedono Village have various ways of adaptation as a form of defense to achieve comfort in life, known as resilience. Resilience is the ability to adapt and remain firm in difficult situations. The adaptation strategy implemented by Bedono Village communities is a resilience coming from individuals and is influenced by internal factors such as cognitive abilities, gender, and the attachment of individuals to culture, as well as external factors from family and community (7). The process experienced by coastal communities when abrasion occurs will gradually teach the communities about the ability and readiness to deal with abrasion. The ability and readiness that people obtain from experience is a form of resilience (4,7,8). Therefore, this article aims to find out and understand the form of resilience strategies implemented by the people of

Bedono Village amid the abrasion. The results of this research are very important to identify the efforts of local communities to survive amid the abrasion that can occur in other coastal areas in Indonesia.

2. Research Methodology

This research is field research that aims to obtain information and data directly from locations related to the object that is analyzed. The type of research carried out is the research using a descriptive qualitative approach. The reason for using the qualitative approach is to obtain data that can explain the situation that occurred at the research location clearly and in detail, this is intended to understand the phenomena of what is experienced by the research subjects. The focus of this research is to identify the resilience strategy implemented by the people of Bedono Village in the abrasion-prone areas. The research location was in Bedono Village, Sayung District, Demak Regency, Central Java. The data collection was conducted through observation, documentation, interviews, and literature study. This research was conducted in July 2020. Researchers carried out in-depth interviews with 15 informants, consisting of village officials, public figures, community leaders, and group members engaged in the field of empowerment and potential development of Bedono Village and the local community. Data analysis was performed by identifying the results of interviews and observations. Data analysis techniques used consist of data collection, data reduction, data presentation, and decision-making or verification.

3. Research Result and Discussion

3.1. The changes caused by the abrasion

Bedono Village has become one of the areas that were badly affected by abrasion in Sayung District, Demak Regency. The abrasion that occurred in Bedono Village is a prolonged collective problem. In terms of accessibility, the access or road leading to Bedono Village is damaged, bumpy, and sometimes flooded by tidal water. This condition is exacerbated by frequent heavy modes of transportation both cars and trucks that pass through the road (1,5). Based on the results of interviews and in-depth observations that have been carried out, most of the people in Bedono Village respond

to abrasion responsively. To them, abrasion is a part that is certainly always happening as long as they decide to settle in Bedono Village.

Figure 1: The house of a resident in Rejosari Senik Hamlet who still survives in this sunken hamlet (Source: Documentation, July 2020).

The problems faced by the people of Bedono Village due to abrasion have changed the behavior of the people affected. Abrasion has made the people of Senik and Tambaksari Hamlet relocate because their houses were drowned. Other problems that arose were the appearance of slums, the loss of coastline and paddy field area, decreased land productivity in the form of land subsidence, increased fish farm salinity that affected the changes in income, decreased natural resource potential, and the loss of access connecting the hamlets. Abrasion that occurs within an uncertain period becomes a problem that threatens the coast which causes the coastline to retreat into the residential area.

After analyzing the results of the interview, the impact of abrasion occurring in the communities of Bedono Village can be classified into various fields. In terms of the environment, abrasion that has occurred in the last 20 years has made the coastal area experience land loss in the form of land subsidence. Based on an interview conducted with one of the Bedono Village residents, land subsidence has caused inundation at high tides. The productivity of the fish and prawn farms decreased with a high level of salinity. Indeed, this will reduce the potential of natural resources and affect the level of income of people who rely on the results of the fish and prawn farm.

In social terms, there has been a decrease in the intensity of interaction and a decrease in the number of residents each year. This was influenced by the interruption

of the connecting road between hamlets in Bedono Village. Abrasion has resulted in slums that are susceptible to disease and drowned hamlets resulting in the relocation of many residents that made the population dynamics in Bedono Village tend to decrease every year.

While, according to the economic aspect, there has been a change in livelihood orientation from farmers, ranchers, fish and prawn farmers, and fishermen to factory workers, motorcycle taxi drivers, traders, and other occupations although some jobs such as fishermen and fish and prawn farmers were still becoming the preferred employment option. Abrasion has forced the communities to have other skills besides being fishermen and fish and prawn farmers to fulfill daily needs. It is in line with the results of an interview with Mr. Hambali. He stated:

"... So, besides working as fishermen, the people here also work as factory workers. They are free to choose what they want to do because the people here have a principle that they will do anything as long as it is halal and they can earn money for their families. For example, apart from being factory workers waiting for their salaries every month, they also set fish traps to support their daily needs. For example, after working at the factory until 05:00, when it is getting dark, they go out to sea to catch fish until midnight then go back home to sleep and be ready to work in the factory the next morning. The most important thing is that they do not take other people's goods. They also see their abilities. They have their ability. It all depends on how they interpret what they have in themselves to meet their daily needs. So it can be said that it is a multiple livelihood pattern to meet daily needs, not only men but also women ... " (Hambali, 51 years old, the leader of Bedono Bangkit Group, Interview on 16 July 2020).

The statement above shows the pattern of multiple livelihoods in Bedono Village. Many young people in Bedono Village become factory workers and work outside the village area. The pattern of multiple livelihoods has become a familiar term in the communities of Bedono Village. Many people not only work as fishermen but also work as factory workers or traders in the market. Abrasion and tidal water have their influence on the people. For the people of Bedono Village who have decided to remain in areas that have been badly affected by abrasion, they always find out the best strategies to stay firm in dealing with existing problems. Many people tend to follow directions from outside parties to solve abrasion problems such as collaboration with OISCA, Wetlands, several Universities, Local Governments, and the Maritime Office. In addition, they are also very open to foreigners who want to conduct research in Bedono Village. They

help by conducting directional discussions, or village meetings involving every element of the community.

The abrasion that occurred in Bedono Village has caused various phenomena of change in the local communities of Bedono Village. Those changes occurred cover a variety of fields, not only in the form of degradation or the decrease of environmental quality but also the change of people's behavioral patterns both in social and economic fields. The most notable changes are as follows.

First the land-use pattern. Before abrasion occurs, land can be used as a place to live and to build fish farms. However, when tidal water comes in, lands are flooded. Originally, Bedono Village was a village with great potential in the marine and agricultural sectors. The majority of rural communities owned agricultural land and fish farms. Due to abrasion in the 1990s, changes and shifts began to occur mainly in land-use patterns. Land use, before and after the abrasion, experiences changes. Previously, the land functioned as paddy field areas, but the land that had been flooded by seawater due to abrasion was converted into fish farms. Likewise, the area that was previously utilized used for the cultivation of several types of shrimp and fish, now it has been shifted into shellfish farming. This is because the area used for fish and prawn farming was affected by unconducive pond water due to tides caused by abrasion. In addition, the land-use patterns have experienced changes in abandoned lands due to abrasion. This resulted in the decline of the selling price of land in Bedono Village. The lack of interest of people outside the village towards land in Bedono Village has changed people's behavior to shift fish and prawn farms into shellfish farms. Below is the result of the interview conducted with Mr. Hambali, the leader of the Bedono Bangkit group. He stated:

"...shellfish does not need embankment; it only needs bamboo barriers. Shellfish runs like a snail; it does not run like fish. The most important thing in cultivating shellfish is the water flow of the barrier so that they do not go out. There are many kinds of shellfish here, namely clams, mussels, and the most expensive one, oysters. There is also a difference between cultivated shellfish and sea shellfish. Sea shellfish are green in color, while cultivated shellfish are white. The best practice for cultivating shellfish is cultivation that does not include many mangroves because it contains poison...." (Hambali, 51 years old, the leader of Bedono Bangkit Group, Interview on 16 July 2020).

Cultivating shellfish was chosen because shellfish can live in various conditions. Besides, shellfish cultivation is classified as cultivation that is very easy to do because it

does not use embankment or dike, it only requires bamboo barriers and shellfish seeds sowing at various points. This activity has driven the people of Bedono Village to form several local groups.

Second, Community settlement pattern. Previously, settlement patterns of the Bedono Village community followed the contours of the road like settlement patterns in general such as alleys and footpaths connecting one house to another or one alley with another. Although they were not well-ordered, the settlement pattern was already visible even though it was simple. Due to abrasion, now the roads in the settlement have been covered with water and many houses have been flooded by water so that they cannot be occupied and many buildings have been damaged. Concerning this condition, the settlement pattern that used to follow the contour of the road now turns into a pattern with houses that are facing each other along the river channel and with the river in the middle. Today, because of being affected by tidal water, people make their houses higher so that they are not affected by tidal water. Besides, a person who wants to build a house must find a higher place so that it will not be affected by tidal water. A safe house model is a house on stilts model because it can anticipate the arrival of tidal water and also anticipate the abrasion caused by tidal water.

Third, road access and changes in the modes of transportation. Previously, there was a cross-regency road in Bedono Village that could directly connect Genuk to Morodemak Sea Port. However, due to the abrasion, this alternative road was permanently flooded by seawater. The interrupted road leading to Bedono Village was located in Timbul Sloko where there was a road that used to be a regency road but now it has been cut off and cannot be passed any longer. Today, there are two transportation accesses in Bedono Village, namely land access and sea access where it can lead to Morosari by using a boat through the sea. Sea transportation is usually used to transport a lot of goods from Morosari such as government aid because it is faster. The land route is not usually used because it requires to rotate first so that the distance will be farther.

Last, changes in livelihood aspect. There has been a significant change in the type of occupation of the Bedono Village people. Before abrasion occurred, Bedono Village was famous for its natural fertility. According to the results of in-depth interviews with the community, Bedono Village was well-known as the village with *gemah ripah loh jinawi* tagline meaning that it was rich in natural products. Agriculture and marine products were the main commodities in this village. Its agriculture has produced rice and coconut. Apart from being fishermen, every family had their yards, rice fields, and fish farms that supported them to earn income easily. This situation changes after the abrasion occurs

and damages this village. Paddy fields are gone, houses are flooded, salinity is high, frequency of floods which is increasing results in damage to infrastructure and causes environmental degradation. The people of Bedono Village are no longer working as farmers but rather involving themselves in the public sphere and working as ship taxi drivers, traders, factory workers, as well as shellfish and shrimp farmers although being fishermen is still the community tendency. It is not surprising to know that many people there are having more than one type of job. It is done to fulfill their daily needs.

3.2. Resilience strategy of the community in facing abrasion

The people of Bedono Village have various ways of adaptation as a form of defense to achieve comfort in life, known as resilience. Based on the analysis that has been carried out, the forms of resilience strategy carried out are:

First, mangrove planting. The abrasion that occurred in Bedono Village has made the people there more aware and realize the importance of sustainable development in the environmental field. Planting and maintaining mangroves is one form of adaptation for rural communities amid the abrasion disaster that has damaged Bedono Village. In mangrove conservation activities, the communities are assisted by several institutions, both local and international. Some institutions that participated in planting mangroves in Bedono Village were OISCA, the Maritime Mangrove Group, the Department of Environment and Forestry, as well as several mangrove planting programs conducted by students and the police.

“It was remarkable! If we total, 80 hectares means that there were around 100,000 stems. If we count only from OISCA, the number of mangroves planted is around 400.000. That was only from OISCA, not yet from other institutions, with thousands, and hundreds of students. “ - (Kharis, 42 years old, the leader of Mangrove Bahari Group, interview on July 16, 2020)

Mangrove planting carried out before has used more than 400,000 stems in total. The amount was obtained from the number of mangrove stems planted by OISCA. It was not yet calculated from other agency planting programs. There were about 80 hectares of the drowned hamlets in the Bedono Village that have been planted with mangroves. From the beginning of the planting, the community started to realize the benefits of planting mangroves. The benefits of mangroves began to be realized when the waves did not reach residents’ settlements, the wind in the coastal areas was not

so strong, and it finally led to a nursery area for animals that could be utilized by the surrounding communities.

Second, building renovation and relocation. As a result of abrasion, almost every time, the area of Bedono Village is affected by the tidal flood. Tidal floods that occur in Bedono Village will inundate the village area slowly. In the long run, the water that inundates the village area will also cover the road and enter the houses of residents. Building relocation in Bedono Village has been conducted in Tambaksari Hamlet. Tambaksari Hamlet itself is one of the sinking hamlets due to land subsidence and rising seawater due to abrasion. The government has provided a new residential area which is now called Tambaksari Baru Hamlet. Besides relocation, several communities whose areas were flooded by tidal water but not yet completely submerged renovated their houses in the form of house elevation. The elevation of the house that was carried out by the people of Bedono Village will only elevate the floor gradually. Floor elevation is conducted so that household items such as kitchen utensils, mattresses, and other items are not damaged by the water. The people of Bedono Village have also estimated that gradually, the elevated houses will need to be elevated again in line with the high tidal water that submerges community settlements.

Third, the installation of hybrid engineering. A hybrid Engineering building is a type of coastal building that functions to trap sediment carried to the mainland due to the tide during the tidal process and to hold that sediment from returning to the sea during the low tide [10].

“In Chapter 1 Article 1, there has been an additional 2 points discussing hybrid engineering and mangrove tracks. The organizing of this village regulation and its socialization in public is funded by WII” (Hambali, 51 years old, the leader of Bedono Bangkit Group, Interview on 9 July 2020).

Bedono Village is an area prone to tidal flooding due to the tide of seawater. Bedono Village was assisted by a Dutch organization named “Wetlands International Indonesia” in constructing 2 buildings to improve the welfare and the security of the Bedono Village communities, namely Mangrove Forest Track and Hybrid Engineering. Hybrid Engineering was built because it was inspired by the workings of mangrove roots that trap the things that pass through them.

Fourth, changes in job orientation. Before the abrasion occurred, the majority of Bedono Village residents were farmers, fish and prawn farmers, and fishermen. This was supported by the condition of the village which still had paddy fields, farmlands,

and several plantations before being affected by abrasion. At first, paddy fields could not be used because they began to be affected by tidal water. As a result, the paddy field areas were unable to be planted with several types of plants that could support the communities to fulfill their daily needs. Apart from being used for paddy fields, the land in Bedono Village was also used for fish and prawn farming. Fish and prawn farms were used for prawn and milkfish cultivation.

"These were all fish and prawn farms, there also used to be paddy fields behind the house which produced rice, there were lots of fruit trees, coconuts, and mangoes. Now they are all gone" (Husein, 48 years old, Bedono Village resident who works as Fishermen, interview on 16 July 2020)

Changes in land conditions due to abrasion have caused some people to change their jobs. They no longer have a goal to become a farmer because the land in Bedono Village cannot be planted with plants such as rice and other crops anymore. They began to work in the field of the industry by becoming factory workers and selling various foods produced from mangroves. In addition, most fish and prawn farms were converted to shellfish cultivation, because some fish and prawn farms have been polluted by seawater. Another work that recently emerged and was becoming popular in Bedono Village was the motorcycle taxi driver. Bedono Village has the potential as a religious tourism area (9). Some visitors who want to visit the tomb of Mbah Muzakir usually use a motorcycle taxi to reach the destination. In addition, the efforts of the village government to turn Bedono Village into a tourism village are seen from the making of mangrove tracks found in the Bedono and Morosari Villages. Nevertheless, resilience strategies are the option the community must deal with the routine disaster of abrasion. Local knowledge plays a significant role in enhancing resilience to climate change. By leveraging local knowledge, communities can enhance their resilience to climate change, ensuring that adaptation measures are relevant, effective, and sustainable (10).

4. Conclusion

Based on the results of the research, it can be concluded that the phenomenon of abrasion occurring in Bedono Village causes various changes. The abrasion triggers the emergence of various new problems that have impacts on the changes in 1) environmental aspects such as environmental degradation, 2) social aspects which include the decrease in the intensity of interaction and the decrease in population, 3) economic aspects which include the changes in livelihood orientation. From those problems, the

communities of Bedono Village use various resilience strategies such as conducting mangrove reforestation programs, constructing breakwaters through the installation of Hybrid Engineering, implementing multiple livelihood patterns, and improving the facilities and infrastructure in Bedono Village.

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