

## Conference Paper

# Adaptation and Coastal Management in Disaster Areas (Study in the Coast of Depok Beach, Yogyakarta)

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## Abstract

The coast of the southern coast of Yogyakarta is an area that has a tsunami hazard, tidal waves and abrasion. This study aims to find out how adaptation and land use in the coastal areas of Depok Beach, Special Region of Yogyakarta. The research method is carried out qualitatively, data obtained from image interpretation and field observation. The research was conducted through spatial analysis and presented descriptively. The results of the study show that the pattern of community adaptation is demonstrated through use and utilization by considering aspects of the disaster. The results of the study show that land use on the coast of Depok Beach is in the form of business premises, land for reforestation and land for sand dune preservation. Optimizing coastal management and utilization managed independently by the community is able to increase economic value, create jobs so that people's welfare increases. The role of the government in regulating the direction of coastal land use and public awareness is able to keep coastal ecosystems sustainable. Mentoring by the government, capital assistance and various trainings for community businesses and cooperatives on Depok coast are able to increase the capacity of communities to manage and utilize coastal areas in a sustainable manner.

**Keywords:** Adaptation, disaster prone, land use, management of coastal areas.

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## 1. Introduction

The coast of the southern coast of the Special Region of Yogyakarta is an area directly adjacent to the subduction zone between the Indian-Australian plate and the Eurasian Plate with open coastal conditions and directly facing the Indian Ocean, this condition which resulted in the southern coast of Special Region of Yogyakarta having a tsunami hazard. Geological studies show that the southern coast of Java, including Special Region of Yogyakarta, has high seismic conditions that can cause earthquakes and can trigger tsunamis [1]. Several factors that influence the occurrence of tsunamis and the magnitude of tsunami waves by tectonic activity are influenced by several factors: epicenter, earthquake depth, earthquake magnitude (earthquake more than 7 SR), earthquake triggering motion is a vertical motion (dip-slip), topography or level of

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slope the shape of the coast, the strength of the tsunami wave energy formed in the form of solitary waves is not a random wave [2].

The study conducted by Subarjo and Ario (2015) related to tsunami hazard mapping in Kretek Subdistrict by using beach distance variables from the epicenter, land height, slope/topography, distance from the river, land protection, presence of barrier islands, coastal morphology and distance from the coastline produce a tsunami hazard level mapping as shown in the following Figure 1 [3]:

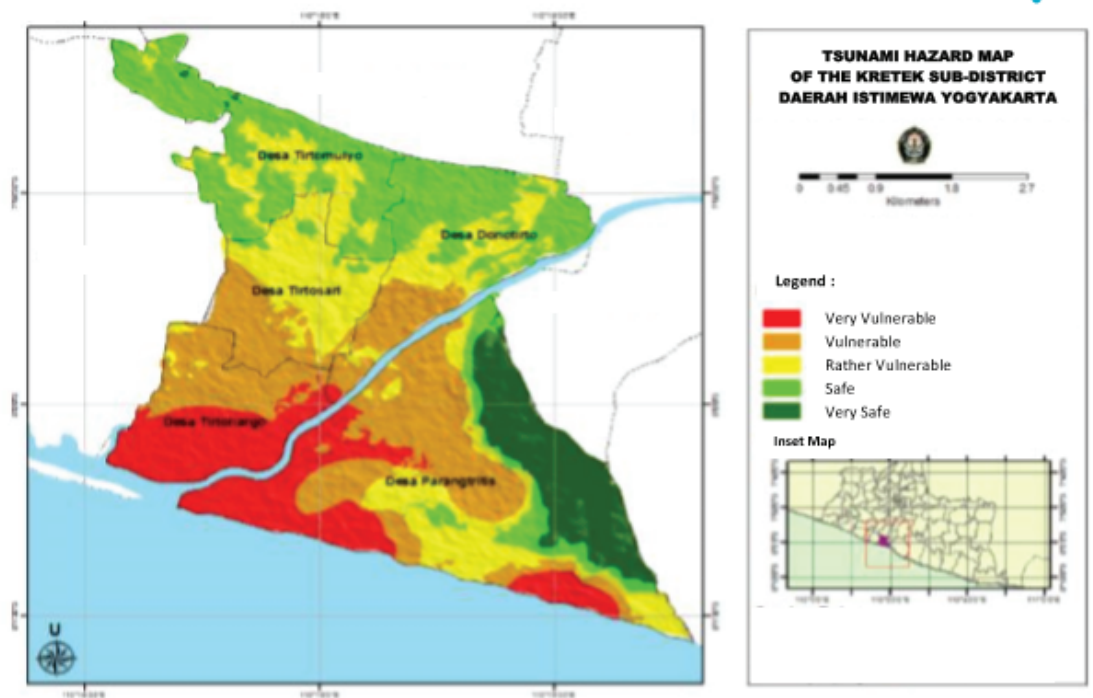


Figure 1: Tsunami Hazard Map of Kretek District [3].

Based on Figure 1, the coastal areas of Depok are mostly located in tsunami prone zones marked with red, while only a small part of the coastal area is in the rather vulnerable zone. Land use and the pattern of adaptation of coastal communities to the threat of disasters (tsunamis, tidal waves, abrasion, landslides, etc.) have strong links [4]. Land use, geomorphological and ecological conditions are an important part of coastal area management [5]. Several tsunami incidents in Aceh, Pangandaran, West Java, tsunamis in the Banten Strait and tsunami in Palu showed that the high number of casualties and damage was mostly caused by land use and adaptation patterns that were less appropriate in coastal areas [6]. In this context, coastal management and adaptation patterns are an important part of efforts to optimally utilize the coast while paying attention to aspects of the disaster [7]. Appropriate coastal management certainly has implications for disaster risk reduction efforts [8]. Problems that occur related to

disaster-prone coastal management include the incompatibility of land use with spatial plans, spatial planning of coastal areas that have not considered the aspects of disaster and the development and development of coastal areas that have not prioritized disaster risk reduction [9]. In addition, some coastal areas are often used as densely populated residential areas [10].

## 2. Methods

Depok Beach as one of the coastal areas with the threat of a tsunami has a unique pattern of coastal adaptation and management. This study was conducted to find out how the pattern of adaptation, especially in the use of land use. This study was conducted through spatial analysis using Google Earth imagery to find out land use in coastal areas along the Depok coast. This study was also conducted through a field survey to find out how the pattern of community adaptation and how land use and utilization is optimized in coastal areas. The results of the study are presented descriptively to present how the patterns of adaptation and optimization of land use.

## 3. Results

### 3.1. The pattern of land use in the coastal area of Depok Beach

The pattern of community adaptation to land use and utilization in the coastal area of Depok Beach based on the interpretation of the google earth image in 2018 can be presented in the picture of the existing land use pattern map as presented in Figure 2 below:

Based on the results of field interpretations and surveys of existing land use on the coast of Depok, most people use and utilize the land for.

#### 3.1.1. Culinary business of seafood restaurants and other businesses in the tourism sector

Coastal areas are one of the strategic areas that can function as protectors and can also be used as sources of livelihood [11]. In coastal areas close to the coast, the use of land is used for the development of tourism objects. The beginning of Depok beach tourism objects was managed and developed by the community independently and funded independently. This tourism object can further develop with the existence of the Mina

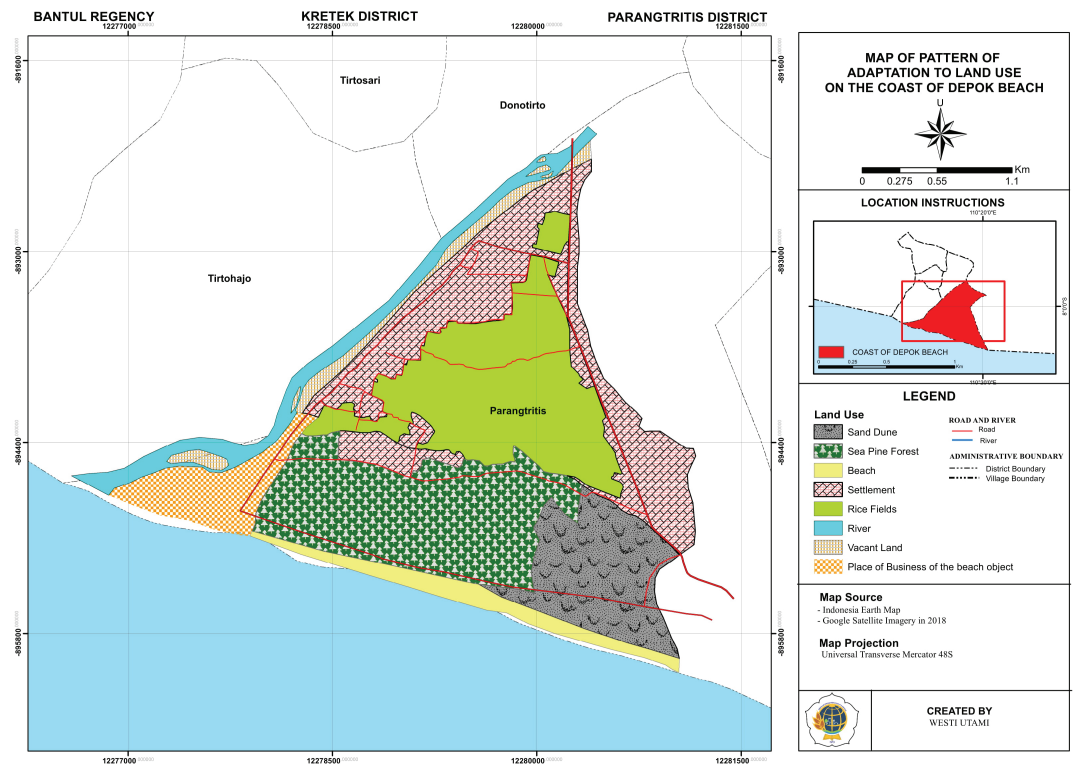


Figure 2: Coastal Land Use in Depok Beach, Bantul, DIY (Source: Data Analysis in 2019).

Bahari cooperative and assistance from the government. The capital assistance that flows through savings and loan cooperatives makes the community able to develop culinary businesses or tourism-related businesses. The success of the development and development of the coastal area of Depok is inseparable from assistance and assistance from several Ministries and Services including the Ministry of Maritime Affairs and Fisheries, the Ministry of Cooperatives and Small and Medium Enterprises and the agencies at the provincial and district levels to contribute to developing the Depok beach tourism area locally based. The results of observations in the field show that the assistance and capital participation is able to ignite the community to create jobs independently through food stalls, ATV rental businesses, souvenir sales businesses, efforts to provide facilities for tourists, etc. The recapitalization is certainly able to improve the skills and capacity of the community. The ability of the community to accept tourists and communicate with many people influences the mindset of the community to be more open and easier to receive input to improve their progress and economy.

Land use in the coastal area of Depok as a food stall business is not as a permanent dwelling if it is reviewed from disaster management, it is safer because the community does not fully live in coastal areas where disasters can occur at any time. So that the level of risk that might occur can be reduced. This condition is different when compared

to coastal areas in Padang, West Sumatra or coastal areas along the coast of Pacitan where the conditions of the settlements on the coast are very close.

The pattern of control and use of land in the coastal area of Depok is more controlled where only local people are allowed to use and use the land. Transfer of management and use of land can be carried out between local communities and not given to large-scale investors or entrepreneurs who live far from the coastal area. The arrangement of those who are allowed to set up food stalls or who do business in the coastal area of Depok makes it easier in the management and provisions of tourism objects. Restrictions on large-scale investors and outside regional investors in accessing businesses in Depok Beach have implications for increasing the welfare of local communities.

### **3.1.2. Natural Barrier in the Form Of Sea Pine Plants**

The adaptation made by the people on the south coast in the form of planting sea pine serves to prevent the adverse effects of abrasion and the threat of a tsunami. Marine pine nurseries are provided by the government, while communities are involved in planting and management. This planting is carried out in a flat and open area and is not in a sand dune protection area. The sea cypress plants that are quite lush along the coast do not only protect the area behind the coast but are optimized by the community as a new tourist area, namely Cemara Sewu beach tourism. This reforestation does not only provide benefits to protect residents' settlements in the event of a disaster, but can be a source of income for the community.

The reforestation policy and planting of sea cypress plants along the coast was initiated by the government and the Bantul Regency Disaster Management Agency. Awareness and prevention efforts against the adverse effects of disasters have been prepared by the government through coastal management. This effort was also carried out through the development of community awareness through training, mentoring and the formation of the Tangguh Village disaster along the coast of Depok Beach to Parangtritis beach.

### **3.1.3. Sand Dune Protection**

Sand dune is one of the land forms of the marin and eolin processes that can function as barriers and protect the area behind it from the threat of tsunamis and disasters that occur in coastal areas. Land use in the sand dune area is limited by the Government

because the sand dune is one of the rare sandbanks. Management and regulation of sand dune is done by keeping sand taken and allowing the sand dune to form naturally.

The pattern of community adaptation to sand dune has long been shown while allowing the sandbank to grow naturally and not cause damage. This is because people realize that with the sand dune the sea breeze will not affect the damage to the crops they are trying to make, and people realize that the sand dune can serve as a barrier to sea water intrusion. Some people use sand dunes near agricultural land to plant grasses or other perennials so that the sand that has been mountained does not enter their farmland.

## 4. Discussion

### 4.1. The Existence of the Sultan Ground against Community Adaptation

Community adaptation is an adaptation strategy that humans use throughout their lives to respond to environmental and social changes [12]. The condition of coastal communities in Depok Beach has unique characteristics when compared to coastal communities in general. The community does not depend entirely on the fisheries / marine products sector but also relies on the agricultural sector. One of the patterns of adaptation shown by the community in managing the coast is indicated by the pattern of land use and use.

The adaptation of the people around Depok Beach is inseparable from the land tenure system. The public is aware that the coastal area along Depok Beach to Parangtritis Beach is largely the land of the Sultan Ground. According to the UUPA, the sultan ground is ulayat land (customary land) and is not guaranteed by the UUPA, but with the existence of Law No. 13 of 2012 concerning the Privileges of the Special Region of Yogyakarta where one of the 7 authorities granted DIY has the authority to regulate land aspects. With Law No. 13 of 2012, the land status of the Sultan and Pakualaman land as Legal Entities are part of the subject matter of ownership rights to the Sultan Geound (as stipulated in UUPA No. 5 of 1960 which explains that Legal Entity is one of the subjects that can have Ownership Rights) [13, 14]. The land status in the form of a sultan ground is one of the controllers so that the community and developers / financiers are not easy to transfer land use functions. The community was given the opportunity by the Sultan to utilize and cultivate land to fulfill their daily needs, but if at any time the Sultan wanted the community to leave the land. The land of the Sultan covers the land

of Keprabon and non-Keprabon land located in all Regencies/Cities in the Yogyakarta area, where the Sultan has the authority to process and utilize as much as possible the Sultan land for the development of culture, social interests, and community welfare.

When compared with the north coast, the coast of the southern coast of Yogyakarta is a coastal area whose development is slower and the condition is not as dense as the northern coast [15]. One of the influencing factors is geomorphological characteristics and land tenure patterns that have implications for patterns of land use and utilization. Most of the coast of Depok is the land of the sultan ground under the authority of the Kraton Yogyakarta. Soil conditions and coastal morphology in the form of sandy soil with fine to coarse texture and partly in the form of sand dunes, limited water sources and hot temperatures make this area limited to being developed as agricultural land. On the south coast the development and construction has only been carried out in the past few years including the construction of the southern crossing line and the construction of new airports.

## 4.2. Increased Income to Vulnerability Reduction

Before the existence of tourism objects, some people living around the coast of Depok only depend on the agricultural sector with limited arable land, but with the existence of tourism, some people are able to use land in the coastal area as a place of business and new resources for improving community welfare. The results of observations made before and after the existence of tourism objects showed that almost a part of the community is in the middle to lower economic conditions and a small portion is in the people who are left behind. But with the existence of tourism objects and the pattern of community adaptation in utilizing coastal land optimally, they are in a very adequate economic condition. This increase in community income also has implications for various aspects, namely the increase in the level of education of the community, the increase in the construction of infrastructure, the increasing level of public health.

In several studies, it was stated that the level of income or the level of welfare of the community affected the level of vulnerability of the community. With increasing welfare, the community is able to reduce vulnerability. Some studies show that people with low income and less prosperous have a higher level of vulnerability in the event of a disaster. While people who have enough income they are able to build houses firmly and some build houses on the second floor so that when there is a disaster the risk is smaller. The people who live around Depok Beach are also able to build infrastructure in the form of roads that are good and wide, making it easier for evacuation routes.

## 5. Conclusion

The pattern of adaptation of coastal communities is an important part of the disaster management and mitigation system, especially along the southern coast of DIY that is prone to tsunami. Community adaptation indicated by land use patterns in Depok Beach in the form of business places, reforestation along the coast and preservation of sandbanks is one form of land use efforts that pay attention to disaster aspects. Land use along the coastal area in the form of non-settlements and preservation of natural coastal barriers in the form of planting pine trees and preserving sand dunes is expected to reduce adverse impacts and protect the community in the event of a tsunami disaster. Efforts that continue to be carried out simultaneously through land use patterns and community capacity building through Tangguh Bencana Village are concrete mitigation efforts that are expected to reduce the level of risk in the event of a disaster.

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