

## Economic valuation of the impact of sand washing in Boncong, Tuban Regency, East Java, Indonesia

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### ABSTRACT

Bancar District is one of the strategic areas in the Tuban Regency Spatial Plan i.e. as the Minapolitan strategic area. Since 2019, in the Bancar District area, precisely in Boncong Village, there has been a silica sand washing area which its waste directly dumped into the river and resulted in many negative impacts. This study aims to calculating the environmental cost due to sand washing activity in Boncong area. The environmental cost in this study was calculated through cost based approach. The results of the study show that the losses incurred due to silica sand washing activity in Boncong reach IDR 508,600,000.00 per year, i.e. IDR 496,000,000.00 per year for maintenance of fisher's ship and additional costs for aquaculture water treatment are IDR 12,600,000.00 per year. Economic approach, and also an ecological approach, has potentially large implications for policy-making of mitigation the impact of sand washing activity.

**Keywords:** economic valuation, environmental cost, cost based approach, sand washing

### INTRODUCTION

Tuban is one of the regencies in East Java Province which is located on the north coast of Java Island. In the 2012 Tuban Regency Spatial Plan, it is stated that Tuban Regency has various potentials which in the planning are divided into several strategic area plans according to regional potential. One of the strategic areas in the Tuban Regency Spatial Plan is the Minapolitan strategic area which consists of the Districts of Palang, Tuban, Jenu, Tambakboyo and Bancar [1].

The total production of the fisheries sub-sector in Tuban Regency is one of the largest contributors to the value of gross regional domestic product of Tuban Regency. Fish production in Tuban Regency also increases every year until 2012. The fishery is one sector that has the potential as a mainstay of economic growth in Tuban Regency. The potential of fishery resources in Tuban Regency is 3.2 tons/km. In addition, the business of processing fishery products in Tuban Regency also contributes to the regional economy.

In the other hand, since 2019 in the Bancar District area, precisely in Boncong Village, there has been a silica sand washing area. The waste from this sand washing is not treated first and is directly dumped into the river. The existence of this sand washing has resulted in many negative impacts such as decreasing the utilization rate of the river due to the silting of the river so that it is difficult to irrigate crops in the fields of local residents and also drink for livestock. It also has an impact on one of the aquaculture places that are right next to the sand washing place, namely the Boncong Marine Aquaculture Installation. The silica sand washing causes a decline in the coastline area i.e. aquaculture media becomes polluted

and ships fisher get dirty easily so that more costs are needed than before the sand washing activity exist.

In general, sand washing activity will have an impact on the destruction of marine biological resources in the area and will also have an impact on the economic life of the people who depend on the location of the waters around the sand washing activity. For this reason, an ecological and economic approach is needed in the decision making process for mitigating the impact of sand washing activity. However, this paper focuses on calculating the environmental cost due to sand washing activity in Boncong area. The results of this study can be used as a reference or initial recommendation in calculating claims for financial compensation for restoration of damaged environments.

### METHODS

#### Study Site

The study area location is in Boncong, Bancar District, Tuban Regency, East Java as shown in Figure-1.

#### Data Collection

In this study, data collection was carried out in June 2022. Data were collected through an interview process. Interviews were conducted using a purposive sampling method in accordance to the objectives of the study. Purposive sampling is an approach that involves researchers who deliberately select samples with consideration of variables or the quality of respondents who are believed to be able to contribute to the study [2]. Based on the definition of purposive sampling, the selection of respondents in this study were respondents who had direct or indirect interactions with silica sand washing activities, were able to communicate well, and

lived in Boncong areas. It is hoped that this will be able to respond to the case study [3].

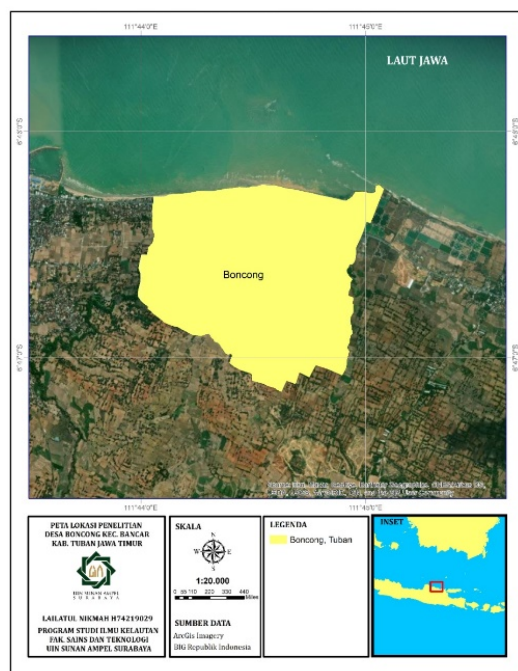


Figure-1. Study area location map

### Data Analysis

The impact assessment on sand washing is carried out using the compensation method, where calculate the environmental costs or value of the losses after the sand washing activity. Estimating the environmental cost in this study was carried out through cost based approach. This approach is taken to determine the economic losses in terms of the impacts that may arise as a result of sand washing activities.

Boncong area in the Bancar Regency has major functions and benefits in the economic field where all the people on the coast of Bancar Regency are very dependent on the fisheries sector, not only as fisher but also as fish traders, smoking and drying fish workers so that the lives of the surrounding community depend on marine productivity in Boncong area. Calculating the value of losses due to an activity, in this case sand washing activity, also aims to describe the relationship between ecology and economy in an integrated manner [4].

## RESULTS AND DISCUSSION

### The Impact of Sand Washing Activity

There are many impacts that are felt by the surrounding community, both the fisher and government agencies in the field of aquaculture around the village of Boncong. This impact resulted in increased expenditure, but in the other hand income remained constant. However, the impact of sand washing activity does not affect the catch of fisher. This is because since long ago, fisher in the Boncong area only fishing in the middle of the sea, while the physical impact in the form of murky water was only about 700 m from the coastline. Silica sand washing activity also affects fishing boats where it causes sand to stick to ships which if not treated and paid attention will cause thickening of the ship's wood and erosion occurs so that it is disturbing for future work.

Information was obtained from several respondents, before the silica washing, ship painting was carried out once a year, after silica washing it could be done every three months for ship cleaning and once a month for painting the ship. The costs incurred in one ship cleaning treatment of IDR 100,000.00. According to the information of respondent, a fisher in Boncong village with a 20 GT ship, prior to the sand washing, he carried out ship maintenance such as repainting and anti-fouling coating once a year with an expenditure of IDR 600,000.00. After sand washing activity exist, the maintenance done every three months. This is because the waste sand attached to the ship's infrastructure is solid and difficult to clean. In addition, the anti-fouling layer on the ship becomes easily peeled off. Previously, anti-fouling lasted three months, after sand washing activity exist the anti-fouling layer only lasted about one month.

Likewise, what was felt by fisher with a 50 GT ship size respondent. It needs to pay the maintenance costs more because the ship is also bigger. For one treatment in the form of cleaning, it has to pay IDR 1,000,000.00 and if a thorough maintenance is carried out with painting and anti-fouling coating it will cost IDR 2,500,000.00 because the differences in types of ship manure attached to fishing boats before and after sand washing. The sand adhering to the ship's infrastructure becomes dense and difficult to clean. This is supported by the statement that the characteristic of silica sand itself is that it has a high compressive strength value so it is widely used as a casting material [5].

Another impact of sand washing activity was felt by the Boncong Marine Aquaculture Installation. Boncong Marine Aquaculture Installation needs to increase the use of chlorine which is used for water treatment before the water is distributed to aquaculture tanks. Once a water treatment uses 30 kg of chlorine (30 kg of chlorine is given to a water tank measuring 800 m × 160 m<sup>2</sup>, which costs IDR 10,000.00/kg) and water treatment takes 4 days. The use of chlorine depends on the level of turbidity and contamination of the water in the Boncong area.

According to information obtained from technicians in the field of cultivation at Boncong Marine Aquaculture Installation, before the sand washing, the use of chlorine in one water treatment only required 15 kg of chlorine at a price of IDR 150,000.00 and after sand washing activity exist the need for chlorine swells two times, which requires 30 kg at a cost of IDR 300,000.00. This also causes swelling in aquaculture costs.

Another impact caused by sand washing is when big waves occur in the area, the turbidity caused by sand washing waste can reach the floating net cages area with a distance of approximately 1 km from the shoreline. This resulted in several negative impacts such as turbidity in the floating net cages area. Turbidity has a positive correlation level with suspended solids, which is where the higher the turbidity value, the higher the suspended solids value. The level of turbidity usually consists of inorganic particles. Increasing turbid the aquaculture water media causes the aquaculture commodities to be less responsive to feed. In addition, another impact caused by the sand washing activity in floating net cages is that they are easily dirty by sand washing waste.

### The Environmental Costs

The results of calculating the impact of silica sand washing using the cost based approach are shown in the Table-1 to 4. This calculation includes costs incurred by Boncong Marine Aquaculture Installation (Table-1) and fisher (Table-3 to 4) before and after being affected by the silica sand washing which caused quite large losses.

Table-1 shows expenditures that are increasing in Boncong Marine Aquaculture Installation, i.e. for the addition of chlorine in the water treatment process, due to the impact of sand washing activity. Table-2 and 3 show the annually expenses were used for large (50 GT) and small (20 GT) ship, before and after sand washing activity, respectively.

Then, the calculation is done by multiplying the difference in ship maintenance costs before and after the sand washing activity with the number of ships operating in Boncong area. There are 15 of 50 GT ships and 35 of 20 GT ships operated in the Boncong area. The total economic losses from ship maintenance costs are shown in Table-4.

**Table-1.** The addition of chlorine in the water treatment process at Boncong Marine Aquaculture Installation

Before sand washing		After sand washing	
15 kg <sup>a</sup>	IDR 1,050,000/month <sup>b</sup>	30 kg <sup>a</sup>	IDR 2.100.000/month <sup>b</sup>
	IDR 12,600,000/year		IDR 25,200,000/year

<sup>a</sup> chlorine costs: IDR 10,000/kg

<sup>b</sup> addition of chlorine about 7 times for 1 month

**Table-2.** Ship maintenance costs before sand washing activity

Ship Maintenance	Expenditure (IDR/3 months)	Expenditure (IDR/year)
<b>50 GT</b>		
Paint and anti-fouling coating	1,500,000	6,000,000
Cleaning treatment	1,000,000	4,000,000
<b>Total</b>		<b>10,000,000</b>
<b>20 GT</b>		
Paint and anti-fouling coating	600,000	2,400,000
Cleaning treatment	100,000	4,000,000
<b>Total</b>		<b>2,800,000</b>

**Table-3.** Ship maintenance costs after sand washing activity

Ship Maintenance	Expenditure (IDR/months)	Expenditure (IDR/year)
<b>50 GT</b>		
Paint and anti-fouling coating	1,500,000	18,000,000
Cleaning treatment	1,000,000	12,000,000
<b>Total</b>		<b>30,000,000</b>
<b>20 GT</b>		
Paint and anti-fouling coating	600,000	7,200,000
Cleaning treatment	100,000	1,200,000
<b>Total</b>		<b>8,400,000</b>

**Table-4.** Total ship maintenance costs

Ship size	Qty	Costs (IDR/year)	Total (IDR/Year)
50 GT	15	20,000,000	300,000,000
20 GT	35	5,600,000	196,000,000
Total Losses			496,000,000

The government through the Regulation of the Minister of Environment of The Republic of Indonesia Number 13 of 2011, explains regarding the provision of guidelines as compensation in resolving disputes both those resolved outside the court and through the courts. The regulation aims to provide guidelines for the parties involved in environmental dispute resolution to reach an agreement in calculating and paying compensation and for carrying out certain actions due to environmental pollution and/or damage.

Further handling is needed due to the impact of sand washing in the Boncong area. Many losses have been experienced by the surrounding community as a result of the impact of silica sand leaching, including increasing expenses, and generally the community prefers to settle it themselves. This shows the need to change the mindset of the community regarding pollution and its impacts. On the other hand, material compensation and coordination with law enforcers are generally lacking. This certainly needs attention from the government.

The impact of silica sand washing activity if allowed to continue will cause damage to the ecosystem and also the economic loss of the community. The level of pollution that is increasingly spreading to the middle of the sea can also potentially affect fisher's income which is not within the scope of this study.

### CONCLUSIONS

The results of the study show that the losses incurred due to silica sand washing activity in Boncong reach IDR 508,600,000.00. The impact on coastal communities, i.e. for maintenance of fisher's ship, is around IDR 496,000,000.00 per year and the additional costs that Boncong Marine Aquaculture Installation has to incur annually for aquaculture water treatment are IDR 12,600,000.00. The losses experienced especially by fishing communities after the silica sand washing activity increased drastically due to unexpected additional costs. Another thing that needs to be considered is compensation criteria, such as the impact of silica sand leaching, for example whether there are health impacts in the form of diseases experienced by the community due to silica sand leaching.

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