

Value of Indirect Benefits of Mangrove Forests as Coastal Abrasion Protectors

^{1,2} Ismail N. Adam, ²Faizal Kasim, ²Citra Panigoro

¹ismailadam99@yahoo.com

²Department of Aquatic Sources Management, Faculty of Fishery and Marine Science,
Universitas Negeri Gorontalo

Abstract

This study aims to determine the value of indirect benefits of mangrove forests as a barrier to coastal abrasion and identify losses after abrasion in Limbatihu Village, Paguyaman Pantai District. The research was conducted in February to July 2016. The research method was observation and interviews with the community as respondents regarding the costs of damage and the construction of wave barriers. Observations were also made on the impact of losses due to loss of residence, land damage and damage to housing. The results showed that the indirect benefit value of wave and current barrier was IDR. 255,414,000 / year. The types of ownership losses due to abrasion are loss of residence (averagely IDR. 28,928,000,-) the loss on damage to land is averagely IDR 3,396,250,- and the loss on damage to dwelling place averagely IDR. 2,939,833,-.

Keywords: mangrove forest; indirect benefits; abrasion.

Introduction

Besides having an economic function, mangrove forests also have important functions that can be utilized indirectly. Indirect use means that the benefits come from environmental services that the resource produces itself (Dian, 2004; Fauzi 2006 in Marhayana, 2012). Indirect benefits from mangrove forests are obtained from an ecosystem indirectly such as abrasion barriers. The indirect benefits of mangrove forests are as a beach abrasion barrier and as a breakwater along the coastline of mangrove forests (Motoku et al, 2014). Other benefits of indirect use of mangrove embassies include, nursery ground, feeding ground, spawning ground, and intrusion sea water.

The phenomenon of environmental degradation of mangrove forests on the South Coast of Boalemo Regency, Gorontalo Province, continues. In the last 20 years, mangrove forests in the district have lost 100 hectares. The cause is the conversion of forests and illegal logging by the community. The widespread depletion of mangrove forests in the South Coast of Boalemo Regency also contributed to abrasion in parts of the region. The example is the occurrence of degradation of mangrove forests in Limbatihu Village, Paguyaman Pantai District, which in the last 20 years has lost land mass. along 50 meters from the sea due to the destruction of mangrove forests. The villagers

generally cut down mangrove trees for household utensils or as a substitute for kerosene fuel and complement fishing boat materials. When the tide is tidal, wave baths inundate residents up to as high as 50 cm or as high as adults' knees. Usually inundate residents' settlements for 3-4 days in a month. This condition occurs in seven villages in Paguyaman Pantai Subdistrict, namely Bangga, Buba'a, Apitalawu, Limbatihu, Lito, Towayu, and Olibu, (Berita Boalemo, Gorontalo.2008).

Abrasion is an event of erosion of the coast due to waves and ocean currents that are destructive. Abrasion is often referred to as coastal erosion due to damage that occurs around the coast. Beach calibration that often occurs in the South Coast area, for example Limbatihu Village. Basically the abrasion results in floods whose water comes from high tides, called sea water, rob. As a result of the erosion problem above, the affected area of the rob has experienced impacts such as loss of residence, damage to land and damage to shelter. Apart from loss of ownership, it is difficult for residents to find a source of clean water supply for daily needs. In addition, residents experience symptoms of diseases such as itching, dengue fever and other types of diseases.

This study aims to determine the value of indirect benefits of mangrove forests as a barrier to

coastal abrasion and identify losses after abrasion in Limbatihu Village, Paguyaman Pantai District.

Research Methodology

Retrieval of data by observing directly in the field or research location about important matters relating to the indirect benefits of mangrove forests as a barrier to waves and ocean currents, and conducting interviews with the community about the losses experienced before the wave barrier (embankment) was built.

Supporting information about the problem under study is obtained through books and research reports as a complement to the data from observations, interviews and literature studies.

An analysis of the indirect benefits of a mangrove forest on a wave barrier is calculated as the total cost of making a breakwater per one meter multiplied by the length of the coastline of the mangrove forest distributed into 10 years of benefit. Calculation of the cost of loss as a factor for coastal abrasion is carried out according to the Ministry of Environment (1999).

Results and Discussion

General description of Limbatihu Village

Previously the Limbatihu Village was still part of the Limba Bubaa Village, and finally in 1946 separated itself into a village called Limbatihu Village and had five hamlets. To reach the village of Limbatihu at that time it could only be taken by sea, while for the land route it could only be traveled by footpaths. Like other areas as well, Limbatihu had also been a colony of the Dutch colonial. Some evidence such as the location of coconut plantations (now owned by HGU) and Hamlet II Bontula which is still known by the name of *koronisasi* derived from the word 'colonial'. Around 1993 also in Limba and Lomuli sub-villages, a pond was opened independently by a community of ± 8 Ha, but did not provide maximum results so that it was left alone. Limbatihu village has also experienced flash floods which claimed 4 lives, but lately even every year sometimes the rainy season in the upstream will cause flooding in its downstream area, in Dusun I Limba. The usually is with mud and trees which causes siltation of the small

rivers which empties into the effluent of the Limba bay.

Indirect benefits of mangrove forests as coastal protectors

The indirect physical benefits of mangrove forests as a beach abrasion barrier are estimated through the Replacement Cost approach to the manufacture of beach concrete for wave and current barrier. The cost of replacing the value of a wave and current barrier (length x width x height) with a ten year endurance (Dahuri, 1995).

This non-direct benefit was analyzed based on the construction of barrier along 700m of 1200m coastline. With the cost of making per meter dike of IDR 3,648,771.43, the total cost of building an embankment along 700m of the beach is IDR.2,554,140,000 for a ten year endurance, thus the cost of replacement or loss is IDR.255,414,000 / year.

Damage due to abrasion

Dike for rob flood

This damage occurs naturally without any role of humans. However, the primary cause of environmental damage in Limbatihu indirectly is the irregular use of mangrove forests by the community.

From interviews obtained from Limbatihu Village residents that natural phenomena that can cause environmental abrasion are the existence of tides or known as tidal floods, to overcome the tidal floods, embankments are needed. Embankment which was built in 2014 by the government is the most important functioned as a wave barrier from rob. However, up to now the construction of the embankment has not been maximized so that the embankment has not provided full benefits.

Loss of ownership

The types of ownership losses that are known in the statements and interviews of some local residents are: Loss of residence; Damage to the land; Damage to residence;

Information was obtained that there were several residents of Limbatihu Village who lost their homes at the cost of their losses as shown in Table 1.

Table 1 Lost of houses

Respondents	House area (m ²)	Loss (IDR)
A	72	18.540.000
B	175	50.350.000
C	60	14.547.000
D	120	32.275.000
Average IDR. 28.928.000,-/ household		115.712.000

(Sources: Processed primary data, 2016)

Based on Table 1 of the four respondents who lost their homes due to erosion of tidal floods, the total cost of losses was IDR 115,712,000. The average value of each respondent losing his place of residence is IDR. 28,928,000 per family.

The survey results show that the land in Limbatihu Village experiences a process of degradation in capacity and quality caused by nature such as abrasion. Abrasion in the area results in floods that are affected by tidal floods. Therefore, land that has been affected by abrasion will be difficult to function again. The cost of losses from damage to land can be seen in Table 2.

Table 2 Loss on land damage

Respondents	Land area (m ²)	Loss (IDR.)
E	15 x 30	3.217.500
F	10 x 50	3.575.000
Average IDR. 3.396.250 / house / year		6.792.500

(Sources: Processed primary data, 2016)

Villagers who have land affected are only two respondents who suffered an average loss of IDR 3,396,250.

Loss due to damage of residence

Respondents who suffered damage to their homes are the ones in the coastal areas (Table 3).

Table 3 Damage to housing

Respondents	Type of house (m ²)	Loss (IDR)
G	semi-permanent	1.655.000
H	permanent	3.662.000
I	permanent	6.100.000
J	permanent	1.545.000
K	semi-permanent	670.000
L	permanent	2.210.000
M	permanent	1.685.000

N	permanent	7.110.000
O	permanent	1.605.000
P	semi-permanent	1.930.000
Q	permanent	8.850.000
R	permanent	3.650.000
S	permanent	1.585.000
T	permanent	5.160.000
U	permanent	1.715.000
V	semi-permanent	590.000
W	permanent	1.090.000
X	semi-permanent	2.105.000
Average IDR. 2.939.833,33-/ household / year		52.917.000

Those who suffered damage to residences numbered 18 respondents. The cost of loss of permanent and semi-permanent building materials involves house walls, roofs, floors, boards and labor. All of the loss costs amounted to IDR 52,917,000 and the average loss cost was IDR. 2,939,833.33 / person / year

In addition to loss of ownership, community members have difficulty finding sources of clean water supply for daily needs. In addition, residents also experience symptoms of diseases such as itching, dengue fever and other types of diseases.

The indirect economic value of mangrove forests on coastal abrasion

The indirect benefits of mangrove forests as an abrasion barrier are equivalent to the costs incurred from the construction of the embankment and all losses of ownership, namely IDR 255,414,000 + IDR 28,928,000 + IDR 3,396,250 + IDR 2,939,833.33 = IDR 290,678,083.33

Conclusion

Value of indirect benefits of mangrove forests as a wave barrier (embankment), namely IDR. 2,554,140,000 with a 10 year endurance, so the estimated cost of replacement or loss per year is IDR. 255,414,000 / year.

The types of ownership losses due to abrasion are losses on the loss of residence of IDR. 28,928,000, the average loss on damage to land IDR 3,396,250 and the average loss on damage to residence 2,939,833.33

The total economic value of the indirect benefits of mangrove forests as a barrier to waves and ocean currents that is derived from the costs incurred in the

construction of a wave barrier (embankment) added 290,678,083.33 / year.
to the types of loss costs equal to IDR

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