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Loss Estimation of Protected Forest Damage and Its Impact on Fishery Sector in Goa Cina Beach, South Area of Malang Regency

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Abstract

Goa Cina is one of magnificent beach destinations in the South Area of Malang Regency which attracts local and foreign tourists. Generally, there are two kinds of tourism management namely ecoturism based and masstourism based. However, Goa Cina implements masstourism based management. Thus it needs an area to build tourism facilities and infrastructures. The ideal functions of protected forest had conversed into buildings such as parking lots, stalls, religious buildings, restrooms, etc. The damage of protected forest caused by its missing functions contributes to some losses. The aims of this research were to: 1) count the loss as the impact of protected forest conversion in Goa Cina which turned into tourism facilities and infrastructures; 2) analyze its impact on fishery production. The data were collected by conducting in-depth interview with the key informant and finding secondary data. The result indicated that the conversion of protected forest into tourism facilities and infrastructures caused ecological and economic loss and it needed massive ecological recovery. The fishery production also decreased due to sedimentation of saltwater. It is suggested that ecotourism should be considered for tourism development instead of masstourisnm.

Keywords: protected forest conversion, ecotourism and masstourism

INTRODUCTION*(

People understanding of nature is needed as the basic of natural resources management. Management success is highly affected by people behaviour. There are four categories of human-nature relationship a) Mastery over nature meaning that human can exploit nature for beneficial purposes but they have to anticipate its loss using economic growth and technology; b) Stewardship of nature meaning that human is allowed to utilize nature but they must be responsible for future generations; c) Partnership with nature emphasizing on human-nature mutual relationship in dynamic process of development; d) Participant in nature meaning that human is a part of nature [1] Human-nature relationship in Goa Cina tourism management is mastery over nature. Based on a research from [2], one of environmental problems found in Sitiarjo Village, Malang Regency, is mastery over nature. It is a conversion of land function or protected forest into production forest. Forest around Goa China coastal area which is supposed to be a conservation forest is converted into a stall buildings and parking lots for tourism facilities. It causes the loss of forest / conservation land function as well as ecological and economic loss which need massive ecosystem recovery. If such losses cannot be restored it will threaten the lives of biota and biodiversity which act as the source of livelihood for people in the present and future. It is explained that tourism is a major booster of socio-economic progress, it gives 5% contribution to Gross Domestic Product. However, tourism contributes to climate change because 5% of CO2 emissions come from the transportation accommodations and other activities [3]. This is in line with [4] which explain that tourism is a source of income in Italy.

Adaptation attempts that increase diversity and provides different options for future action are promoted as the appropriate action. Thereby caring or maintaining the ecosystem resilience and conservation management are more helpful to overcome the uncertainties of environmental changes. Adaptive management which continuously reviews the conservation objectives and measurements that consider both science and local values of ecology on climate change can be a very valuable tool to inform the decisions on conservation of forest diversity [5]. Those different options provide information of losses due to environmental damage that would be done in this study. Therefore this study provides

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insight for potential stakeholders who are able to care and preserve the environment through information of loss due to ecosystem damage. The tourism sector should respond the climate change by reducing greenhouse gases, therefore the role of stakeholders is also very important [3].

People's perceptions and understanding of the land function or conservation forest are varied. The condition in maintaining ecosystem is getting difficult when the authorities related to environmental sustainability are incorporative. This study tries to provide an understanding of other aspects by calculating the value of losses due to environmental damage as a conservation land or forest as well as the decline in status as conservation land into protected land / forest even a production forest. There were three aspects which were counted in this study: ecological loss, economic loss and ecological recovery costs (Ministry of Environment, 2014) [6]. Humans have changed ecosystems more rapidly and widely than ever before, it is mostly done to meet the growing demand for resources and economic development. This demand has been considered as an important factor of ecosystem degradation and biodiversity loss [7]; [18] In order to improve the people's perceptions and understanding of the ecosystem which functions as a conservation through the information of loss due to ecosystem damage. Therefore it is important to conduct this research.

OBJECTIVES OF THE RESEARCH

1. Counting the loss (estimation) as the impact of protected forest conversion in Goa Cina coastal area, Sitiarjo village, South area of Malang Regency
2. Analyzing its impact on fishery production

II. RESEARCH METHOD

This research was located in Sitiarjo village in South Malang Regency, particularly in Goa Cina coastal area. Goa Cina coastal area was interesting to be studied because that area, including its forest, was a conservation protected forest. However it was converted into 61 stores along with parking lots that eliminated its function as a conservation area. The methods used in data collection were in-depth interview with environmental expert as key informant and secondary data from various sources such as journals, books and information obtained from the internet. Calculating the total of loss was done by using a formula adopted from the standards related to the quality of the environment used by previous researchers (literature review). The calculation of degraded land was performed by using Google Earth. The data were analysed in the form of descriptive quantitative. The calculation of loss caused by environmental damage was approached with ecological loss following the calculation done by Wasis which was used by the Ministry of Environment; it consisted of the cost ecological loss, economic loss and ecological recovery [6]. The table of losses count due to environmental damage could be seen in Table 1.

Table 1. Valuation Analysis Tools of Environmental Damage Particularly Forest Damage Caused by Forest Conversion

No	Loss Component	Indicator	Description
1	Ecological Loss	Groundwater lost which was replaced by reservoir development (a)	Groundwater lost was caused by malfunction of protected forest and conservation, therefore an alternative solution in the form of reservoir was needed to restore its function as groundwater barrier
		Water system management (b)	Restoring the function of water system management was assumed by forest recovery. It took 30 years for cultivation plants which cost IDR 19,100,00 / ha and drinking

			water supply which cost IDR 3,710,000
		Erosion and surface runoff control (c)	Erosion and surface runoff control caused by protected land and nature conservation into open space construction cost IDR 6,000,000/ha
		Soil formation (d)	Soil formation of 30 ton/ha cost IDR 1,500,000 multiplied by the missing sola and divided by 2.5 mm. It was assumed that the missing soil was 10 cm and the encroached land was 9.1 ha
		Recycles of nutrient (e)	As a result of housing development was IDR 10,447,000/ha
		Waste Decomposer (f)	The cost spent for waste composer was IDR 435,000/ha.
		Biodiversity Recovery (g)	The effects of protected and conservation forests

			damage due to the conversion of protected and conservation forests into public facilities caused the vanishing biodiversity as much as IDR 2,700,000/ha.
		Genetic Resources (h)	The cost for restoration due to the loss of genetic resources was IDR 410,000.
		The Release of Carbon (i)	The cost of carbon release was IDR 90,000/ton/ha.
	Total of Ecological Loss (TEL)		**TEL = a+b+c+d+f+g+h+i**
2	Economic Loss	The value of forest standing timber (j)	The value of forest standing timber was as much as IDR 3,330,000/m^3.
		The use value of land (k)	The loss of age wear = 100 years In 1 ha of land, the land use value for cultivation was IDR 32,000,000/ha
	Total of Economic Loss		**Total of Economic Loss = j+k**

3	Ecological Recovery Cost	Providing water by building reservoir (a)	The total cost was as much as the total of ecological recovery cost (excluding point b and d)
		Controlling erosion and surface runoff (c)	
		Nutrient recycler (e)	
		Waste decomposer (f)	
		Biodiversity recovery (g)	
		Genetic resources (h)	
		Carbon release (i)	
	Total of Ecological Recovery Cost (TERC)		**TERC= a+c+e+f+g+h+ i**

Source : Ministry of Environment (2014) [6] modifed from various literature

The data of fishery production was from the secondary data, it was in the form of fishery annual report on catch in South Area of Malang Regency from 2004 – 2015. Its impact on fishery sector was analyzed by using graphic analysis in Excel.

III. FINDINGS AND DISCUSSION

Intentionally or not, natural resources, e.g. protected forest and conservation forest, suffer from serious damage. It could be caused by a wrong paradigm in a society in understanding the environmental system and the benefits of the natural resources. The wrong paradigm originated from the unknowingness and incapability in assessing and doing economic valuation of the natural resources (Harahab, 2015)[8]. Harahap's idea supports the findings by Matt Hansen from University of Maryland 2012 that it was unfortunate when a logging moratorium had been done, but deforestation still continued and increased. Based on the data in a new published journal article of science, forests in Indonesia have disappeared significantly over the last 12 years. In addition, a study led by Matt Hansen found that Indonesia had lost 15.8 million hectares of forest between 2000 and 2012, the fifth rank after Rusia, Brazil, United States and Canada. During the period, about 7 million hectares were planted. However, among the other countries, based on the percentage, Indonesia is in the first rank seen from the rate of the forest loss (8.4%). As the comparison, Brazil only lost half of the proportion.

Based on the information from the key informant in water area in south of Malang, the forest lost also happens in a coastal area, Goa Cina, Sitiarjo village. The forest there was a conservation forest and it now becomes protected forest or even production forest. As an example, some forest area in Goa Cina has been converted into 61 stalls and parking lots made for tourists, which causes the forest to lose its function as conservation area. Conservation forest is the areas whose main functions are to protect biodiversity and support lives there. National forest areas have been divided into three classes; conservation forest, protected forest and production forest. Conservation forest is intended to protect biodiversity (gene level up to ecosystems). Protected forest is intended to protect water and soil, and production forest is intended to produce timber and non-timber forest products. Conservation forest can be national park, hundreds of nature reserves, wildlife reserves, park, hunting park, forest park, etc.

In Indonesia, forest is divided into 5; they are mangrove forest, swamp forest, savannah, monsoon forest, and tropical rain forest. Mangrove forest grows on the coasts and muddy ramps exposed to tidal waves. This forest is very important as it is a place for various species of fish and shrimp. It can also protect lands from abrasion effect and flood. The dominant forest in Indonesia is a tropical rain forest, which is the most famous type of forests in Indonesia that gets a lot of sunshine, is of high rainfall and average high temperatures. This forest is of abundant biodiversity, becomes the primary world's lungs (the world owes Indonesia because of this), and becomes a place to live for various species of animals and plants. [9]

The most unique feature of the Earth is the life existence, and the most remarkable feature in life is its diversity. Two decades ago, in the first Earth ASEAN summit, it was stated that human

actions had damaged earth ecosystems. The loss of biodiversity will change the function of ecosystems and their ability in providing goods and services needed to achieve public welfare.

Forests in Goa Cina coastal area consist of mangrove and tropical rain forests. Converting forests into masstourism will remove the functions of the forest. Therefore, to restore the functions, it is necessary to calculate the loss caused by the forest conversion as a problem to think by the society to support the conservation. Since the forest has been converted into some tourism facilities, it is necessary to build an artificial reservoir. Land clearing by deforestation will eliminate timber and non-timber products. Besides, the benefits of the forests also disappear [19]

According to a key informant, the water reserve remains 70% and drought will happen during dry season due to the damaged conservation land. The estimated loss caused by the damaged protected forest in Goa Cina includes the costs of the protected forest restoration (9.1 h a) consisting of the costs of ecological loss, economic loss, and ecological restoration. The costs are as follows:

THE COST OF ECOLOGICAL LOSS

The roles of Economic valuation in managing and policymaking are very important to be used by stakeholders. Valuation is used to increase the social awareness and the support of decision making [10]

1. To reserve rain water as much as 350 m3/ha, it needed an artificial reservoir with the size of 20 m x 15 m x 1.2 m (L x W x H). The cost per m2 was assumed as IDR 150,000, for the damaged protected and conservation forests, then it needed {(2 x 1.2 x 15 m) + (2 x 1.2 m x 20 m) + (15 x 20 m)} x IDR 150,000/m2 = IDR 57,600,000 / ha.
   The cost of the loss of nature caused by forest-damaging activities for 9.1 ha by building an artificial reservoir = 9,1 ha x IDR 57,600,000 = IDR 524,160,000
   Maintenance cost of reservoir until the degraded 9.1 ha protected and conservation forests was restored to be natural forest again (assumed for 100 years and IDR 200,000/Ha for the maintenance cost)
   = 200,000/ha x 100 years x 9.1 ha
   = IDR 182,000,000
   The cost needed to build and maintain the reservoir :
   = IDR 524,160,000 + IDR 182,000,000
   = IDR 706,160,000

2. Managing the water system
   Managing the water system was based on the functions of water which was for cultivation in watershed ecosystem for cultivation plants, it needed IDR 19,100,000/ha and drinking water supply needed IDR 3,710,000. Assuming the maintenance for 30 years:
   = (IDR 19,100,000/ha + IDR 3,710,000) x 30 years x 9.1 ha = IDR 6,227,130,000

3. Control of Erosion and Surface Runoff
   The cost of erosion and surface runoff control due to converted protected land and conservation lands into public facilities was based on the calculation as much as IDR 6,000,000/ha. Thus the cost needed to control erosion and runoff for 9.1 ha was:
   = 9,.1 ha x IDR 6,000,000 = IDR 54,600,000

4. Soil Formation
   Soil formation was as much as 30 ton/ha and the cost of soil formation was IDR 1,500,000/ha. The cost was then multiplied by the missing sola and then divided by 2.5 mm. Assuming that the missing soil was 10 cm and the encroached land was 9.1 ha.
   = 100 mm/2,5 mm x IDR 1,500,000/ha x 9.1 ha
   = IDR 546,000,000

5. Recycler of nutrients
   As a result of housing development, the cost was IDR 10,447,000/ha. The cost for recycling nutrients covering 9.1 ha needed funds as much as:
   = 9.1 ha x IDR 10,447,000/ha = IDR 95,067,700

6. Waste Decomposers
   The cost spent for waste decomposer was IDR 435,000/ha. So, the cost needed to decompose the waste covering 9.1 ha was:
   = 9.1 ha x IDR 435,000/ha = IDR 3,958,500

7. Biodiversity Recovery
   The effects of damaged protected and conservation forests due to the conversion of protected and conservation forests into public facilities caused the vanishing biodiversity as much as IDR 2,700,000/ha. The cost needed to restore biodiversity in a land of 9.1 ha was:
   = 9.1 ha x IDR 2,700,000 = IDR 24,570,000

8. Genetic Resources
   The cost for restoration due to the loss of genetic resources was IDR 410,000. So, for the land of 9.1 ha, the cost needed to restore was:
   =9.1 ha x IDR 410,000 = IDR 3,731,000

9. The Release of Carbon
   The cost of carbon release was IDR 90,000/ton/ha. So, the cost needed for a land of 9.1 ha was:
   = 9,.1 ha x IDR 90,000 = IDR 819,000
   The total of ecological cost = reservoir cost + the cost of water system management + the cost of erosion and surface runoff control + the cost of soil formulation + the cost of nutrient recycler + the cost of waste decomposer + the cost of biodiversity recovery + the cost of genetic resources + the cost of carbon release
   = IDR 706,160,000 + IDR 6,227,130,000 + IDR 54,600,000 + IDR 546,000,000 + IDR 95,067,700 + IDR 3,958,500 + IDR 24,570,000 + IDR 3,731,000 + IDR 819,000 = IDR 7,662,036,200

THE COST OF ECONOMIC LOSS

1. The value of forest standing timber
   The value of forest standing timber was as much as IDR 3,330,000/m3. The cost needed for a land of 9.1 ha was:
   = IDR 3,300,000/m3 x 100 m3/ha x 9.1 ha
   = IDR 3,003,000,000
2. The land and forest age wear
   The loss of age wear = 100 years
   In 1 ha of land, the land use value for cultivation was IDR 32,000,000/ha
   The cost spent for land of 9.1 ha was
   = 100 years x IDR 32,000,000 x 9.1 ha
   = IDR 29,120,000,000
   The total of economic loss = the value of forest standing timber + the land and forest age wear:
   = IDR 3,003,000,000 + IDR 29,120,000,000
   = IDR 32,123,000,000

THE COST OF ECOLOGICAL RECOVERY

The cost of ecological recovery consisted of:

1. Providing water by building reservoir = IDR 706,160,000
2. Controlling erosion and surface runoff = IDR 54,600,000
3. Nutrient recycler = IDR 95,067,700
4. Waste decomposer = IDR 3,958,500
5. Biodiversity recovery = IDR 24,570,000
6. Genetic resources= IDR 3,731,000
7. Carbon release = IDR 819,000

THE TOTAL OF ECOLOGICAL RECOVERY
= IDR 888,906,200

TOTAL LOSSES

1. Ecological Damage = IDR IDR 7,662,036,200
2. Economic Damage = IDR IDR 32,123,000,000
3. Ecological Recovery = IDR 888,906,200

THE TOTAL LOSSES
= IDR 40,673,942,400

The results of the calculation show the enormous value that must be spent by the government and society to restore the function of the damaged conservation forest. One of the ways to restore the function is by development. Target development of climate change will be achieved through the achievement of the development targets: (a) the reduced critical lands through forest rehabilitation and reclamation; (b) the preserved and controlled functions of inland water ecosystems to support mitigation and adaptation to climate change; (c) the implementation of integrated watershed management in priority watershed; (d) the increased forest management through community empowerment; (e) the decreased critical lands and the increased household incomes; (f) the preserved biodiversity and controlled land damage to support mitigation and adaptation to climate change; (g) the implementation of environmental management based on the environment capacity; (h) the implementation of mitigation and conservation of atmospheric functions in order to mitigate and adapt to climate change; (i) the implementation of adaptation of climate change; (j) the managed marine protected area in a sustainable manner; the improved water conservation and the managed endangered and protected aquatic biodiversity; (k) the formulated policies of increasing support for research and development for CO2 emission reduction and adaptation to climate change; (i) scientific documents of Indonesia's contribution to climate change.

Based on the control of environmental damage with a view to achieving reduction of environmental pollution by monitoring the adherence to waste pollution and emission controls in 680 industrial activities in 2010 and the next year, a decrease in number of forest fire hotspots was 20% per year, the decline in overall pollution level was 50% in 2014, and the environmental damage in 11 watershed stopped since 2010 onwards. The purpose of this environmental damage control will be achieve in

2014 by achieving these development targets: (a) the decreased environmental pollution and controlled environmental damage caused by manufacturing, infrastructure and services; (b) the decreased air pollution from mobile sources; (c) the decreased environmental pollution and controlled environmental damage caused by mining, energy, and oil and gas. One efforts to tackle climate change and global warming is to multiply the absorption of the harmful gases, which is by planting more trees. In addition to prevent forest-damaging activities, to preserve the existing, forest and land rehabilitation needs to be carried out. Today, the critical lands that needs to be rehabilitated covering 2.2 million ha [11]. The ministry of forestry makes forest and land rehabilitation one of national priority policy. The policy is very relevant to answer the problem faced by the region (Province – District/City) related to the increasing environmental degradation, including forest and land damages, as well as the reducing environmental quality that may cause floods, landslides, high level of abrasion, sea water intrusion and global warming. Based on Government Regulation No. 55 Year 2005 on equalization fund, forest and land rehabilitation activities and its supporters, which is a regional authority, it can be funded from the state budget of the ministry of forestry through special allocation fund scheme in forestry.

Our preliminary results indicate that economic growth actually makes people dependent on ecosystem services and biodiversity. As a consequence, policies and implementation of economic development and ecosystem/biodiversity conservation should be formulated and implemented in the context of increasing human dependence on ecosystem services together with economic growth [12]

Public concern over the loss of biodiversity is often rationalized as a threat to the ecosystem functions, but the functions of ecosystem diversity is empirically difficult to quantify [13]. However, based on the results of the previous study, some standards for calculating losses due to ecosystem damages are used as data source in this study. The illustration from beautiful Kyoto city is expected to offer some insight on how to create a sustainable urban resilience with historical heritage and biodiversity. The development concept and responses can reduce the negative impact of urbanization (severely damaged river, wetlands, etc) on biodiversity and ecosystem services. Modern urban planning considering natural amenities, Fengshui, geomancy theory can preserve the surrounding mountains, theory of Biogeography Island, and green size of the most important factors for species richness of all taxonomic groups. Some important things, which are the heterogeneity of the environment, design and management, play an important role in the enrichment of the species, wildlife, national monuments with high biodiversity. Those are a good solution for biodiversity and smart adaptation to the increasing flood risk by climate change [14]. In Sitiarjo village, Malang District, if we do not pay attention to these important issues in Goa Cina coast as conservation ecosystem, it will cause great harm.

The target of global protected is at least 17% of the land and 10% of the ocean in 2020 set by the dominant by political expediency. The question of how many natural needs to be protected to prevent the loss of biodiversity and to ensure the important ecosystem services is not well understood and answering it would pose many challenges. First, only 2.5% of known species have been assessed for their conservation status and only a fraction of the estimated number of species has been described by science. Second, there is still a poor understanding of key issues such as the basics of ecology of ecosystem services. Third, we have limited the tipping points in ecological systems and yet we cannot predict the effect of potential climate change and the anthropogenic pressures on biodiversity and ecosystems. The protected of natural habitats is an effective way to ensure the sustainable carbon sequestration, assuming the effective management ro prevent degradation [15].

It has been explained that the composition of forests in Goa Cina consists of mangrove forest that is very beneficial for sustainability of fishery production. The fishery production data in water south of Malang show an increase in certain periods on the charts and of course for some certain periods decreases started from 2012 to 2014. The chart of fishery production appears is as follows:

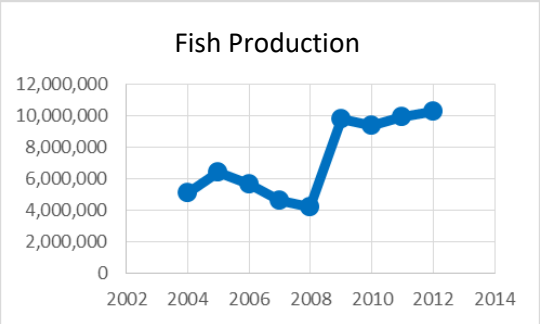

Figure 1. Fishery Production in South of Malang Regency
Source : Annual Report of Fishery Department of Malang Regency in 2004-2012

Based on the information from environmentalists, the key informant in this research, in 2004, the activities of communities and authorities in environmental conservation slowly started to give some effect on the damaged conservation forest ecosystem. Since the forest area is adjacent to the coastal area, the trees are the combination of mangrove and tropical rain forests. If the mangrove forest in the fishing areas is damaged, it will affect fishery production. The biggest effect was seen in 2008 when the conservation forest was converted into public facilities. A research in Nusa Penida shows that biodiversity is threatened due to various human activities; poisoning, blast fishing, and overfishing. Those activities are serious threats to coral reef ecosystem as a source of life. The lack of zoning and regulation system causes conflicts between marine tours and fishery activities [16].

The environmentalists are struggling to restore the function of conservation forest and its benefits to fishery production. To restore the conservation ecosystem, the tourism development should not damage the ecosystem that serves as protected land and conservation area. The loss of biodiversity is the ecological problem. Related to the sectors of fisheries and marine, marine protected areas and marine conservation forest network is often constrained by politics, financial problems, and misleading information [17].

Therefore, ecotourism needs to be developed, not only masstourism. Both are of these major characteristics:

Masstourism:

- Concentrated on high volume sales with high throughput and circulation.
- The shift of a large group of people (tourists) for specific purpose (ability to absorb large quantities).
- Using full packaged component holiday that is offered as one product with all-inclusive price, usually with short-term time frame.
- The development of a large-scale system of transportation, infrastructures, accommodation, supporting facilities, and attraction, it is usually quick.
- The marketing approach is centered around a more hedonistic motive for the trip, especially for the tourism products of sun, sea, and land.
- The keywords for masstourism are high volume, large scale, high speed, hedonistic motive.

Ecotourism, on the other hand, should have these characteristics:

- Be a nature-based experiences
- Be low-impacts and small scale
- Promote a conservative ethic
- Provide supports for local communities
- Provide learning opportunities
- Help maintain the integrity of certain nature and cultural tourism areas
- Utilize the environmental-friendly techniques and technologies.

Ecotourism has emerged in the last fifteen years from the convenient keywords for an international movement. This is an attempt to balance the economic development of tourism with conservation and protected of natural areas and traditional culture. It supports the very concept of sustainable development through tourism. [18]

CONCLUSION

It can be concluded that

a) total losses is IDR 40,673,942,400 (Ecological Damage = IDR IDR 7,662,036,200, Economic Damage = IDR IDR 32,123,000,000, Ecological Recovery = IDR 888,906,200). The human behaviors which damage the conservation ecosystem cost a fortune in recovery and takes time. Instead of implementing masstourism management, ecoturism is better for maximizing the function of conservation forest and yet enjoying its beauty.
b) the impact on fisheries production decreased from year to year

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