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COST AND BENEFIT ANALYSIS OF ESTABLISHED MARINE CONSERVATION

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ABSTRACT

Climate change, which is happening now and has affected the level of ecosystems and populations of Marine Biodiversity. The influence will continue to remember the fishermen on the beach also took the fish with the principle of harvest without planting.This study aims at determining the analysis of the maintenance and preservation of biodiversity in the ocean. This research was conducted in the marine around Lamongan, Indonesia. The analysis technique used is the qualitative analysis carried out to determine the characteristics of Lamongan and quantitative analysis conducted to determine the costs and benefits of the implementation of the Bureau of Marine Biodiversity Conservation. The results of the analysis of costs and benefits of the implementation of Marine Biodiversity Conservation Bureau showed that the benefits received from the operation of the Bureau of Marine Biodiversity Conservation outweigh the costs, shown by Benefit Cost Analysis>1, it means that policy is feasible. Such benefits include the maintenance and preservation of the benefits that are expected to be a solution to the scarcity of damage and biodiversity in oceans surrounding Lamongan, Indonesia.

Keywords: Cost Benefit Analysis, Bureau of Marine Biodiversity Conservation, Maintenance, Preservation

1 INTRODUCTION

Indonesia is one of the countries that have more than 70% area in water. That makes many people have desire to explore diversity of marine, because Indonesia hasa lot of diverse fish, seaweed, coral reefs, etc. Many fisherman explore marine diversity greedily, they do not aware that they “more harvest” without “planting” even replant. This resulted, if later than years ago we can look for fish just from the shoreline, but now we must explore out to sea.Base from the Fishery data, explain East Java have the largest fish production, especially Lamongan district, there are 70,150 ton/year.

Government need an institution like a bureau to organize biodiversity of marine conversation so that our marine can be sustainable.This bureau can implement policies like picking up some money to fisherman who catch fish more than 1 (one) ton as Rp. 100,000,-.This policy is expected, fisherman have responsibility for establish fish in the marine and government have budgets to organize conservation of marine.

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2 LITERATURE REVIEW

2.1 Theory of Climate Change

Climate change proposed by Tjasyono (2004) that climate change is likely to have a tendency that can be caused by two factors. The first factor is the human activity such as urbanization, deforestation and industrialization. The second factor is due to the nature activities such as shifting continental, volcanic eruptions, changes in the Earth's orbit of the sun, and the sun stains the El-Nino events. Uncontrolled human activities will increasingly lead to irregularities in the climate system, if it cannot be controlled impact can threaten human life.

2.2 Theory of Environmental Management

The environmental crisis arising from the impact of human activities, the environmental management is the responsibility of man. Three efforts have to run balanced by man's attempt technology, behavior or attitude efforts and efforts to understand and accept the natural correction that occurs due to the impact of the interaction of humans and the environment according to Soeradji (1988). Clearly theory by Soeradji environmental management mentions that efforts tend to perform maintenance actions and the preservation or conservation of natural resources. By the law of conservation goals set forth in the Law of the Republic of Indonesia No. 5 of 1990 on Conservation of Natural Resources and Ecosystems which aims pursue the realization of conservation of natural resources as well as the balance of its ecosystem so that it can better support efforts to improve the welfare of society and the quality of human life.

2.3 Conservation theory

Conservation was born as a result of a need to preserve natural resources that are known to be sharply degraded in quality. In general conservation and or preservation means that conserve / preserve carrying capacity, quality, functions, and capabilities in a balanced environment (MPL 2010; Grace 2008). Indonesia has 73% water with a huge ecosystem, so that conservation measures should be made considering the human activities will continue. Conservation through marine conservation bureau was established on the basis of active community action to help preserve and marine conservation fund itself.

3 METHODOLOGY

3.1 Research Scope

This was an application of benefit cost method to reveal the establishment of bureau use values to biodiversity the marine conservation. This study used descriptive research methods and statistics.

3.2 Data type

Data used in this study are secondary data. The data obtained from Office of the Central Bureau of Statistics (BPS) and the Office website of East Java and Lamongan district.

3.3 Method

We performed a cost-benefit method to analyze the implementation of the Bureau of Marine Biodiversity Conservation. Financial data obtained by estimating the costs include the cost of establishing the bureau, the operational costs of personnel, non-personnel operating costs, annual maintenance cost and maintenance costs of marine conservation. The primary outcome measure was the net financial benefit or cost the Bureau of Marine Biodiversity Conservation for a 5-year period.

Cost-Benefit Analysis Methods used includes:

3.3.1 Net Present Value (NPV)

NPV is the net benefit that has been discounted using the Social Opportunity Cost of Capital (SOCC) as the discount factor.

$$NPV = \sum_{i=1}^{n} NB_i (1+i)^{-n} \quad \text{..... (1)}$$

Or

$$NPV = \sum_{i=1}^{n} \frac{NB_i}{(1+i)^n} \quad \text{..... (2)}$$

Or

$$NPV = \sum_{i=1}^{n} \overline{B_i} - \overline{C_i} = \sum_{i=1}^{n} N\overline{B_i} \quad \text{..... (3)}$$

Where:

NB = Net benefit = Benefit - Cost

C = Investment cost + Operating costs = Benefit that has been discounted= Cost that has been discounted

i = Discount Factor

n = year (time)

Criteria:

NPV> 0 (zero) → business/project is feasible

NPV <0 (zero) → business/project is not feasible

NPV = 0 (zero) →business/project in a state where the BEP TR = TC

in the form of present value.

To calculate the required data on the estimated NPV of investment costs, operating costs, and maintenance as well as the estimated benefits of the planned project.

3.3.2 Internal Rate of Return (IRR)

IRR is a discount rate that results in NPV = 0 (zero).

If IRR> SOCC so the project is feasible

IRR = SOCC means the project on BEP

IRR <SOCC said that the project is not feasible.

To determine the value of IRR should be calculated first NPV1 and NPV2 by trial and error. If discount factor of NPV1is positive so the second must be greater than SOCC, and otherwise.

From these experiment, it is,explained the IRR value is between positive NPVand negative NPV, so there is the NPV = 0.

$$IRR = i_1 + \frac{NPV_1}{(NPV_1 - NPV_2)}(i_2 - i_1) \quad \text{..... (4)}$$

Where: i_1 = discount rate that produces NPV1
i_2 = discount rate that produces NPV2

3.3.3 Net Benefit Cost Ratio (Net B/C)

Net B/C is the ratio between the discounted net benefit is positive (+) with a net negative benefits, which has been discounted.

$$NetB/C = \frac{\sum_{i=1}^{n} N\overline{B_i}(+)}{\sum_{i=1}^{n} N\overline{B_i}(-)} \quad \text{..... (5)}$$

If: Net B / C> 1 (one) means the project (business) feasible

Net B / C <1 (one) means the project is not feasible

Net B / C = 1 (one) means cash inflows = cash outflows(BEP) or TR = TC

3.3.4 Pay Back Period (PBP)

PBP is a specific period of time indicating the occurrence of flows (cash inflows) are cumulatively equal to the amount of investment in the form of present value. PBP is used to determine how long the project can recover the investment.

$$PBP = T_{p-1} + \frac{\sum_{i=1}^{n} \overline{I_i} - \sum_{i=1}^{n} \overline{B_{icp-1}}}{\overline{B_p}} \quad \text{..... (6)}$$

Where:
PBP = Pay Back Period
Tp-1 = The year before PBP
Ii = investment amount has been discounted
Bicp-1 = Number of benefits that have been discounted before PBP
Bp = Number of benefit to the PBP

4 EMPIRIC RESULT

4.1 Economical approach

This approach discusses the calculation of investment costs and estimation, including:

a. This analysis includes only the cost factor and the benefits that can be expressed in money

b. The discount rate is set at 12%, the loan interest rate in effect on government investment projects

c. The project is expected 3 years for economic age

Investment cost is the first cost which be taken out for maintaining Bureau of Marine Biodiversity Conservation.

Table 1. Cost of maintaining marine biodiversity conservatiom Berau

No	Activity	Unit	Amount	Unit Price	Cost	Information
				FIRST YEAR		
1	Establish Bureau Cost	Unit	1	15,000,000	100,000,000	
2	Renting Place Cost	Unit	1	25,000,000	25,000,000	
3	Head Personnel Cost	Person	1	5,000,000	60,000,000	
4	Personnel Cost	Person	4	3,000,000	144,000,000	
5	Non Personnel Cost	Unit		-	100,000,000	Total Value of Inventory Purchases
6	Marine Conservation	Unit	95,000	70,000	6,650,000,000	
	TOTAL				**7,079,000,000**	
				SECOND YEAR		
1	Renting Place Cost	Unit	1	25,000,000	25,000,000	
2	Personnel Cost	Person	5		204,000,000	
3	Maintanance of Inventory	Month	12	1,000,000	12,000,000	Maintainance and Purchase of Stock Every Month for a Year
4	Marine Conservation	Unit	95,000	70,000	6,650,000,000	
	TOTAL				**6,891,000,000**	
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4	Marine Conservation	Unit	95,000	70,000	6,650,000,000	
	TOTAL COST				**6,891,000,000**	

Benefit Estimation is the benefits that can be expressed in money, there are one-hundred thousand rupiah (Rp 100,000,-) per ton of fisherman trawling.

Table 2. Benefit of maintaining marine biodiversity conservatiom Berau

Benefit	Information	Detailed	Total
Fee Income	Fisherman Catch Each 1 Ton	Every 1 Ton Fishing Charged Rp 100,000,-	Rp 7,000,000,000.00
	TOTAL BENEFIT		**Rp 7,000,000,000.00**

4.2 Evaluation Project

4.2.1 Net Present Value (NPV)

Table 3. Net present value (NPV) of maintaining marine biodiversity conservatiom Berau

YEARS	BENEFIT	COST	B/C	NB	DF (12%)	NPV (12%)
Y1	7,000,000,000	7,079,000,000	0.99	(79,000,000)	0.892	(70,468,000)
Y2	7,000,000,000	6,891,000,000	1.02	109,000,000	0.797	86,873,000
Y3	7,000,000,000	6,891,000,000	1.02	109,000,000	0.712	77,608,000
TOTAL	**21,000,000,000**	**20,861,000,000**	**1.01**			**94.013,000**

The result value of NPV showing that NPV > 1, so this indicated Bureau Marine Biodiversity Conservation is feasible.

4.2.2 Internal Rate of Return (IRR)

Table 4. Internal rate of return (IRR) of maintaining marine biodiversity conservatiom Berau

YEARS	BENEFIT	COST	B/C	NB	NPV (12%)	NPV (13%)	IRR
Y1	7,000,000,000	7,079,000,000	0.99	(79,000,000)	(70,468,000)	(69,915,000)	12.502
Y2	7,000,000,000	6,891,000,000	1.02	109,000,000	86,873,000	85,347,000	12.504
Y3	7,000,000,000	6,891,000,000	1.02	109,000,000	77,608,000	75,537,000	12.507
TOTAL	**21,000,000,000**	**20,861,000,000**	**1.01**		**94,013,000**	**90,969,000**	**12.508**

This analisis uses discount factor level 12% and 13%, so we can see the result of IRR = 12.508 explained IRR is bigger than social discount rate (12%). That means Bureau in Marine Biodiversity Conservation is feasible.

4.2.3 Net Benefit Cost Ratio (Net B/C)

We can find Net Benefit Cost Ratio (Net B/C) from divide NPV1 (discount factor 12%) with NPV2 (discount factor 13%)

Table 5. Net benefit cost ratio (Net B/C) of maintaining marine biodiversity conservatiom Berau

NPV (12%)	NPV (13%)	BCR
(70,468,000)	(69,915,000)	1.008
86,873,000	85,347,000	1.018
77,608,000	75,537,000	1.027
94,013,000	90,969,000	**1.033**

The result of Net Benefit Cost Ratio (Net B/C) is 1.033, so Net B/C more than 1, so that explain Bureau Marine Biodiversity Conservation is feasible.

4.2.4 Pay Back Period (PBP)

Table 6. pay back period (PBP) of maintaining marine biodiversity conservatiom Berau

YEARS	BENEFIT	COST	NB	NPV (12%)	PBP
Y1	7,000,000,000	7,079,000,000	(79,000,000)	(70,468,000)	(70,468,000)
Y2	7,000,000,000	6,891,000,000	109,000,000	86,873,000	16,405,000
Y3	7,000,000,000	6,891,000,000	109,000,000	77,608,000	94,013,000

Base on the analysis, the calculation of NPV reduction sequentially indicates that PBP was paid during the period of 3 years, it means that the Bureau in Marine Biodiversity Conservation is feasible.

5 CONCLUSION

a. The results of the analysis of the Net Present Value (NPV) indicate that the NPV = 94.013 million. It shows NPV> 1, so the Bureau in Marine Biodiversity Conservation is feasible.

b. The results of the analysis of the Internal Rate of Return (IRR) indicate that the IRR = 12,508 explained IRR is bigger than sosial discount rate (12%), so Bureau Marine Biodiversity Conservation is feasible.

c. The results of the analysis of the Net Benefit Cost Ratio (Net B/C) indicate that the Net B/C more than 1, so Bureau Marine Biodiversity Conservation is feasible.

d. The results of the analysis of the Pay Back Period (PBP) indicate that the PBP was paid during the period of 3 years, it means Bureau Marine Biodiversity Conservation is feasible.

6 POLICY IMPLICATION

Bureau Marine Biodiversity Conservation must be organized to support the preservation of the diversity of fish in the sea.

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by Evi Gravitiani

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4.1 Economical approach

This approach discusses the calculation of investment costs and estimation, including:

a. This analysis includes only the cost factor and the benefits that can be expressed in money

b. The discount rate is set at 12%, the loan interest rate in effect on government investment projects

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Table 1. Cost of maintaining marine biodiversity conservatiom Berau

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	TOTAL COST				**6,891,000,000**	

Benefit Estimation is the benefits that can be expressed in money, there are one-hundred thousand rupiah (Rp 100,000,-) per ton of fisherman trawling.

Table 2. Benefit of maintaining marine biodiversity conservatiom Berau

Benefit	Information	Detailed	Total
Fee Income	Fisherman Catch Each 1 Ton	Every 1 Ton Fishing Charged Rp 100,000,-	Rp 7,000,000,000.00
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TOTAL	**21,000,000,000**	**20,861,000,000**	**1.01**			**94.013,000**

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This analisis uses discount factor level 12% and 13%, so we can see the result of IRR = 12.508 explained IRR is bigger than social discount rate (12%). That means Bureau in Marine Biodiversity Conservation is feasible.

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We can find Net Benefit Cost Ratio (Net B/C) from divide NPV1 (discount factor 12%) with NPV2 (discount factor 13%)

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4.2.4 Pay Back Period (PBP)

Table 6. pay back period (PBP) of maintaining marine biodiversity conservatiom Berau

YEARS	BENEFIT	COST	NB	NPV (12%)	PBP
Y1	7,000,000,000	7,079,000,000	(79,000,000)	(70,468,000)	(70,468,000)
Y2	7,000,000,000	6,891,000,000	109,000,000	86,873,000	16,405,000
Y3	7,000,000,000	6,891,000,000	109,000,000	77,608,000	94,013,000

Base on the analysis, the calculation of NPV reduction sequentially indicates that PBP was paid during the period of 3 years, it means that the Bureau in Marine Biodiversity Conservation is feasible.

5 CONCLUSION

a. The results of the analysis of the Net Present Value (NPV) indicate that the NPV = 94.013 million. It shows NPV> 1, so the Bureau in Marine Biodiversity Conservation is feasible.

b. The results of the analysis of the Internal Rate of Return (IRR) indicate that the IRR = 12,508 explained IRR is bigger than sosial discount rate (12%), so Bureau Marine Biodiversity Conservation is feasible.

c. The results of the analysis of the Net Benefit Cost Ratio (Net B/C) indicate that the Net B/C more than 1, so Bureau Marine Biodiversity Conservation is feasible.

d. The results of the analysis of the Pay Back Period (PBP) indicate that the PBP was paid during the period of 3 years, it means Bureau Marine Biodiversity Conservation is feasible.

6 POLICY IMPLICATION

Bureau Marine Biodiversity Conservation must be organized to support the preservation of the diversity of fish in the sea.

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