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International Journal of Marine Science, 2018, Vol. 8, No. 19

Valuation Economy Restoration Program of Mangrove Forest Pasarbanggi Village District of Rembang

Muhammad Bimo Agung Krestiono, Aulia Hapsari Juwita ✉, Evi Gravitaniani, Mugi Rahardjo

Faculty of Economics and Business, Universitas Sebelas Maret, Ir. Sutami No. 36 A, Surakarta, Central Java, Indonesia

✉ Corresponding author email: aulahjuwita@yahoo.com

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Abstract This study aims to identify the problems and find the economic value of mangrove forest restoration program utilization of village Pasarbanggi Rembang. The research of using the DPSIR analysis and cost-benefit analysis methods which include Net Present Value (NPV), Interest Rate of Return (IRR), Net B/C Ratio, and Payback Period. DPSIR analysis results known that human activity is divided into two types, namely constructive and destructive. constructive activity derives from the awareness of local people who have had a positive outlook towards the sustainability of mangrove resources and desire to contribute to conservation. More destructive activity resulting from external factor. The results of the cost-benefit analysis method shows that the NPV is obtained by using the discount factor of 9% amounting to IDR 4.990.339.459- with an IRR of 16.73%, Net B/C Ratio of 1.77 with the returns can be achieved after 8 years 9 the moon. The value of mangrove forest to reviewed by value to the option with the highest biodiversity of mangrove forests is IDR 12.328.200- per year.

Keywords Restoration; Mangrove Forest; DPSIR Analysis; Cost-Benefit Analysis

Background

The mangrove forest is one of the rare ecosystems, due to the extent of only 2% of the Earth's surface (Setyawan and Kusumo, 2006). Indonesia is the world's largest mangrove ecosystem according to FAO 2003 (Kustanti, 2011) mangrove forests in Indonesia have a percentage of 22% then followed the country Brazil, Australia, and Nigeria as much as 6%. The total area of mangrove forests in Indonesia there are 8.6 million hectares (nationalgeographic.co.id, 2012). Mangrove forests can only grow on the coast so that the forest is used as a breakwater in natural sea water. The mangrove forest is used as a place of conservation because in addition to prevent the occurrence of abrasion, sea water sea, breakwaters and sea-water intrusion towards the ground so well around the roots of plants, mangroves or mangrove is used to Depression living creatures such as sea water sea fish and prawn.

Rembang's government has mangrove forest area which currently restoration program has been implemented to preserve the mangrove plants. Before the program was implemented, the mangrove forest was targeted the illegal loggers and residents around. Logging of freely conducted led to the declining quality of mangrove forests.

Logging is done as part of a livelihood. Loss of quality gives a negative impact especially the existence of the existing inhabitants of the surrounding population. Sustainability of mangrove threatened. Therefore, restoration program began to be applied to the conservation of mangrove in the long term. The transition of livelihoods also occurred. Today, the area of mangrove forests as land added and tourist attractions for the new population is about livelihood and introduced to the public at large will be the existence of mangrove forests.

1 Literature Review

The results of research conducted by Suzana et al. (2011) stated that the total economic value of mangrove forests in the village of Palaes amounting to IDR 10.888.218.123 per year, counted from the direct benefits (\$175.293.000 per year), the indirect benefits (USD 10.671.627.483 per year) and benefit options (IDR 41.297.640 per year). If the advantage of a potential exploit wood of IDR 273.617.273 per year, it can be concluded that if the mangrove forests is maintained, then the profits will 39.8 times greater compared to exploit

the natural resources of mangrove forests of the village Palaes. The acquisition of the calculation of the IVI mangrove forest Palaes Village is dominated by the kind of *Rhizophora* amounted to 109,499. Data from other types of IVI respectively i.e. type *Brugiera* of *Ceriops* 58,088, types of 57,492, *Xilocarpus* type of 41,491, type *Sonneratia* of 20,860 and type *Avicennia* of 12,860.

The results of research conducted by Fatimah (2014) obtained the value of NPV per Ha of Rp 447,498,856.00. and the value of Net B/C of 5.41, as well as the value of the IRR of 30.52%. The results of this investment criteria analysis shows these people's rubber plantation business profitable (profitable) to run. The median income of farmers averaged – rubber was Rp. 1.491.663,-per month. The results of the sensitivity analysis are derived from three aspects, namely production levels changes, changes in price of input, output and price changes.

Maxim et al. (2009) uses the DPSIR analysis. They pressure that the description causal apparently deterministic environment problems are definitely underestimating uncertainty and various dimensions of causality inherent in the socioeconomic system and complex environment. As a result, the work of equipping and declare using DPSIR methodology of complex systems that are based on the difference between the four balls of sustainability (environmental, economic, social and political) and analysis of functions and relations. Aspects of pairwise interfaces are marked through the investigation of ‘claims’ and ‘supply’ any ball relative to the other.

2 Materials and Methods

2.1 DPSIR analysis

DPSIR analysis is often used to provide information and organize the information and data related to the environment (Song et al., 2012). Analysis of the Driving Force is human activity due to the pressure of a given environmental factor triggers. Pressure is the pressure that drives environmental change. State results on the condition and quality of the environment. The impact of environmental change impacts is both positive and negative that was felt by the community such as health. Response is the solution given for taking a policy. Data from interview with Farmers group Sidodadi. The description of the DPSIR analysis framework can be illustrated as Figure 1.

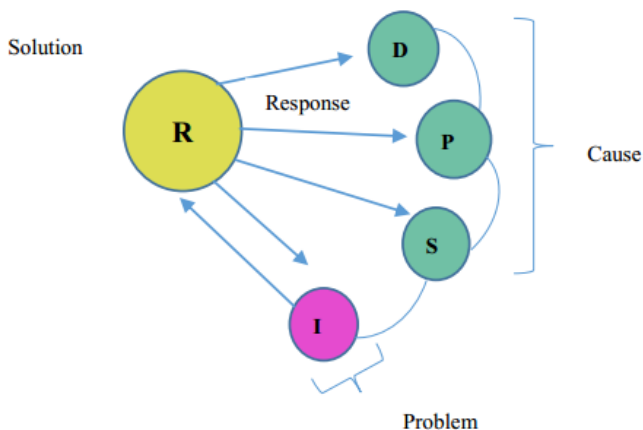


Figure 1 DPSIR analysis framework

Note: Sources: Vazquez (2003)

2.2 Benefit-cost analysis

2.2.1 Calculation of costs

Cost or cost of the restoration consisted of mangrove seedlings purchases, wages are up to operational cost and maintenance and care after the implementation of the program, completed in order to enliven the program benefits are achieved in the optimal time.

2.2.2 Calculation of benefits

Benefits or benefit all of the benefits that can be money and calculated directly impacting on the community around the village of pasarbanggi and tourists as well as visiting the community.

2.2.3 Net Present Value (NPV)

NPV ≥ 0 , then the project is ready to run and continue. If the NPV = 0, then the project in case of break event (Grey, 2005). The equation can be written as follows:

$$NPV = \sum_{t=0}^n \frac{Bt - Ct}{(1+i)^t} \quad (1)$$

NPV = net present value; BT = benefits have been calculated by a discount factor

CT = cost has been calculated by a discount factor; I = the interest rate or discount rate (%); t = year

2.2.4 Net Benefit Cost Ratio (B/C Ratio)

The value of the B/C Ratio > 1 then the project proposal was accepted, but the B/C Ratio < 1 , then the project proposal is rejected or not accepted (Grey, 2005).

$$B/C_Ratio = \frac{\sum_{t=0}^n Bt/(1+i)^t}{\sum_{t=0}^n Ct/(1+i)^t} \quad (2)$$

B/C Ratio = benefit-cost ratio; BT = gross social benefit projects in the year t; CT = cost of social project in t
 N = the age of economical project; I = social discount rate; T = the year in question

2.2.5 Internal Rare of Return (IRR)

A project will be said to be worth when the IRR $>$ SOCC, while the IRR $<$ SOCC, then such project will be rejected (Grey, 2005).

$$IRR = i' + \frac{NPV'}{NPV' - NPV''} x (i'' - i') \quad (3)$$

IRR = internal rare of return

I' = the interest rate that generates a positive NPV; I'' = the interest rate " that produces a negative NPV

' NPV = net present value is positive; " NPV = net present value negative

2.2.6 Payback Period (PBP)

Payback Period to see the length of time it takes to pay back the initial capital, and time of project activities. If the PP project, mean age $<$ activity profitable and viable implemented so instead (Grey, 2005).

$$PP = \frac{P}{\frac{A}{(1+i)^t}} \quad (4)$$

P = initial investment; I = interest rate; A = major installment; t = year

2.2.7 Value to mangrove forests

The value to or use value is a value generated from the actual utilization of funds services such as catch a fish, crabs, shrimp, cut down trees and so on. The value is the value that is perceived by the community is assessed using market prices and therefore this value is more easily calculated than the value of the non-value of mangrove forests (Fatimah, 2014). The value to be divided into three kinds, namely the direct value, indirect value, and the option value. On this analysis to value of mangrove forests is reviewed from the side i.e. options to value biological diversity or biodiversity.

3 Results

3.1 DPSIR analysis

The passage of the program of restoration of mangrove forests, communities increasingly understand and Rembang's government realized the importance of to maintain the sustainability of mangrove forests. Following are the results from the analysis of the DPSIR.

3.2 Driving force

The impact of the program of restoration of mangrove forests and coral reefs based on studies of driving force due to human activities that have the nature of constructive and destructive. The constructive nature of the cause of the quality of resources increases. The community is already aware of the preservation of mangrove forests and coral reefs. Destructive nature will cause the quality of the resources decline. Destructive nature are likely to be caused by human activity that exists outside of the residents of the community. The existence of the garbage that is trapped in mangrove plants resulting from the exhaust of the ship conducted while sailing. The existence of a program of restoration, the surrounding communities take advantage of opportunities to open the kiosk as an additional income. The majority of the kiosk was used as a place of food stalls and selling accessories and gift shop. Waste from food stalls is currently not yet well-organized. So some times found dirty water waste disposal into the existing reservoir near preservation mangrove forests. Impact of water quality provided the longer can decrease.

3.3 Pressure

The problem that arises is the lack of human resources for picking up litter that caught on the edge of the mangrove, an increasing number of tourism an increase of residents who open a restaurant around conservation areas. Human resources population feel tired because of the rubbish coming from the middle of the sea. In the morning it's been cleaned up, when the afternoon of trash will be there again because of the carried away by the waves. An increasing number of travelers are indeed provide increased revenue to the community as well as the region. On the other hand, the awareness of the tourists must also be upgraded again so as not to throw junk freely. The more restaurant, there is a tendency of waste disposal are also more and more.

3.4 State

Changes to the existing conditions in the area of mangrove Rembang Looks rubbish on the edge of the forest, near the entrance to mangrove tour. The number of kiosks is growing. The nature of human activity are causing an increase in the quality of the constructive resources and destructive properties cause a decrease in the quality of the resource.

3.5 Impact

The impact obtained is politically subdivided into 2, directly and indirectly. Restoration programs produce the quality and economic value of coastal resources is increasing. At the time of the rain with high intensity, increased the volume of water and the sea waves hindered by mangrove thus reducing the intensity of the perceived flood of residents of the community. The population is about obtaining revenue sources other than farming and sailing. Indirect impact is the edge of the mangrove forests are often snagged trash-waste from the sea. Human resources a little bit can't afford such rubbish regularly. The kiosk managed by the population is about giving an indirect impact in particular the negative impact. Waste from discarded some stalls in the reservoirs. Disposal periodically if there is coordinated properly, will cause a decline in water quality and fish and a decrease in the number of fish production.

3.6 Response

As government agencies and the legislature made a regulation, to conduct surveillance. Administering punishment and coaching. As researcher can do for research and development of technology. NGOs can supervise coastal routinely in the salvation of the coastal resource sustainability. So the stakeholders or authorized agencies can provide related policies the disposal of litter at sea in particular-could not break down in the sea.

3.7 Benefit cost analysis

3.7.1 Net Present Value (NPV) and Net Benefit Cost Ratio (B/C Ratio)

Net Present Value (NPV) is the difference between benefits and costs that have been multiplied by a discount factor. Net Benefit-Cost Ratio (Net B/C Ratio) is the ratio between the benefits includes the years from projects that have been calculated and costs which have been calculated as well. Based on the results of calculation of the value of NPV discount factor 9% is value Rp 4.990.339.459 posited meaning of this restoration program and the value of net benefit ratio (B/C Ratio) is 1.77 %. Results of B/C Ratio >1 then program said go project.

3.7.2 Internal Rate of Return (IRR)

Based on the results of the calculation, the IRR is found of 16.73% and the value of the IRR > discount factor 9% so that the proposed investment project is accepted.

3.7.3 Payback Period (PBP)

Based on the results of the calculations that the capital could be benefit with the rest of the money returns 1,132,373,381 when the project enters 8th year 9th more month.

3.7.4 Value to Mangrove Forests

Value to mangrove forest in terms of value to the option with the existing biodiversity in mangrove forest villagr of Pasarbanggi. The value of biological diversity or biodiversity according, Mayudin (2012) was US \$15 ha/year with the exchange rate now is US \$1 = IDR 13.522,20 and extensive mangrove forest Pasarbanggi village is 60 ha the value to forest options mangrove is IDR 12.328.200.

4 Conclusion

DPSIR analysis results known that human activity is divided into two types, namely constructive and destructive. constructive activity derives from the awareness of local people who have had a positive outlook towards the sustainability of mangrove resources and desire to contribute to conservation. More destructive activity resulting from external factor. As government agencies and the legislature made a regulation, to conduct surveillance. Administering punishment and coaching. As researcher can do for research and development of technology. NGOs can supervise coastal routinely in the salvation of the coastal resource sustainability. So the stakeholders or authorized agencies can provide related policies the disposal of litter at sea in particular-could not break down in the sea.

Calculation results of NPV and Net B/C Ratio was found that NPV indicates value positive and Net B/C Ratio has a value of 1 means that the restoration program > is judged worthy to proceed and go project. Results of NPV is IDR 4.990.339.459 and Net B/C is 1.77%. The value of the IRR and Payback Period found that the value of the IRR > discount factor 9% with a payback period on 8 year more 9 months. The value of mangrove forest to reviewed by value to the option with the highest biodiversity of mangrove forests of the village Pasarbanggi amounting to IDR 12.328.200 per year.

Authors' contributions

MBAK is the team leader, analyst and paper writer. AHJ is responsible for sample collection. EG is responsible for field investigations and processing. MR is responsible for conducting a survey.

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Valuation Economy Restoration Program of Mangrove Forest Pasarbanggi Village District of Rembang

Muhammad Bimo Agung Kresno, Aulia Hapsari Juwita, Evi Gravitiani, Mugi Rahardjo

Faculty of Economics and Business, Universitas Sebelas Maret, Ir. Sutami No. 36 A, Surakarta, Central Java, Indonesia

✉ Corresponding author email: auliahjuwita@yahoo.com

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The results of research conducted by Suzana et al. (2011) stated that the total economic value of mangrove forests in the village of Palaes amounting to IDR 10.888.218.123 per year, counted from the direct benefits (\$175.293.000 per year), the indirect benefits (USD 10.671.627.483 per year) and benefit options (IDR 41.297.640 per year). If the advantage of a potential exploit wood of IDR 273.617.273 per year, it can be concluded that if the mangrove forests is maintained, then the profits will 39.8 times greater compared to exploit

the natural resources of mangrove forests of the village Palaes. The acquisition of the calculation of the IVI mangrove forest Palaes Village is dominated by the kind of Rhizophora amounted to 109,499. Data from other types of IVI respectively i.e. type Brugiera of Ceriops 58,088, types of 57,492, Xilocarpus type of 41,491, type Sonneratia of 20,860 and type Avicennia of 12,860.

The results of research conducted by Fatimah (2014) obtained the value of NPV per Ha of Rp 447,498,856.00. and the value of Net B/C of 5.41, as well as the value of the IRR of 30.52%. The results of this investment criteria analysis shows these people's rubber plantation business profitable (profitable) to run. The median income of farmers averaged – rubber was Rp. 1.491.663,-per month. The results of the sensitivity analysis are derived from three aspects, namely production levels changes, changes in price of input, output and price changes.

Maxim et al. (2009) uses the DPSIR analysis. They pressure that the description causal apparently deterministic environment problems are definitely underestimating uncertainty and various dimensions of causality inherent in the socioeconomic system and complex environment. As a result, the work of equipping and declare using DPSIR methodology of complex systems that are based on the difference between the four balls of sustainability (environmental, economic, social and political) and analysis of functions and relations. Aspects of pairwise interfaces are marked through the investigation of 'claims' and 'supply' any ball relative to the other.

2 Materials and Methods

2.1 DPSIR analysis

DPSIR analysis is often used to provide information and organize the information and data related to the environment (Song et al., 2012). Analysis of the Driving Force is human activity due to the pressure of a given environmental factor triggers. Pressure is the pressure that drives environmental change. State results on the condition and quality of the environment. The impact of environmental change impacts is both positive and negative that was felt by the community such as health. Response is the solution given for taking a policy. Data from interview with Farmers group Sidodadi. The description of the DPSIR analysis framework can be illustrated as Figure 1.

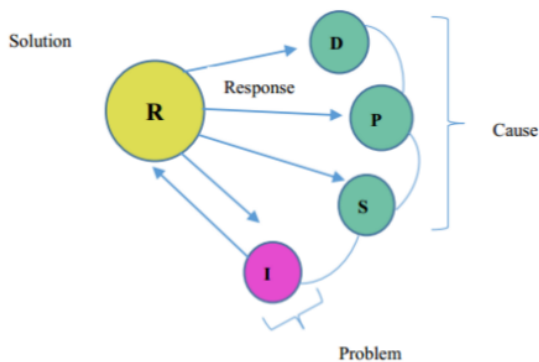


Figure 1 DPSIR analysis framework

Note: Sources: Vazquez (2003)

2.2 Benefit-cost analysis

2.2.1 Calculation of costs

Cost or cost of the restoration consisted of mangrove seedlings purchases, wages are up to operational cost and maintenance and care after the implementation of the program, completed in order to enliven the program benefits are achieved in the optimal time.

2.2.2 Calculation of benefits

Benefits or benefit all of the benefits that can be money and calculated directly impacting on the community around the village of pasarbangi and tourists as well as visiting the community.

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2.2.3 Net Present Value (NPV)

NPV ≥ 0 , then the project is ready to run and continue. If the NPV = 0, then the project in case of break event (Grey, 2005). The equation can be written as follows:

$$NPV = \sum_{t=0}^n \frac{Bt - Ct}{(1+i)^t} \quad (1)$$

NPV = net present value; BT = benefits have been calculated by a discount factor

CT = cost has been calculated by a discount factor; I = the interest rate or discount rate (%); t = year

18

2.2.4 Net Benefit Cost Ratio (B/C Ratio)

The value of the B/C Ratio > 1 then the project proposal was accepted, but the B/C Ratio < 1 , then the project proposal is rejected or not accepted (Grey, 2005).

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$$B/C_Ratio = \frac{\sum_{t=0}^n Bt/(1+i)^t}{\sum_{t=0}^n Ct/(1+i)^t} \quad (2)$$

5

B/C Ratio = benefit-cost ratio; BT = gross social benefit projects in the year t; CT = cost of social project in t

N = the age of economical project; I = social discount rate; T = the year in question

2.2.5 Internal Rate of Return (IRR)

A project will be said to be worth when the IRR $>$ SOCC, while the IRR $<$ SOCC, then such project will be rejected (Grey, 2005).

$$IRR = i' + \frac{NPV'}{NPV' - NPV''} \times (i'' - i') \quad (3)$$

7

IRR = internal rate of return

I' = the interest rate that generates a positive NPV; I'' = the interest rate " that produces a negative NPV

' NPV = net present value is positive; " NPV = net present value negative

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2.2.6 Payback Period (PBP)

Payback Period to see the length of time it takes to pay back the initial capital, and time of project activities. If the PP project, mean age $<$ activity profitable and viable implemented so instead (Grey, 2005).

$$PP = \frac{P}{A} \quad (4)$$

P = initial investment; I = interest rate; A = major installment; t = year

2.2.7 Value to mangrove forests

The value to or use value is a value generated from the actual utilization of funds services such as catch a fish, crabs, shrimp, cut down trees and so on. The value is the value that is perceived by the community is assessed using market prices and therefore this value is more easily calculated than the value of the non-value of mangrove forests (Fatimah, 2014). The value be divided into three kinds, namely the direct value, indirect value, and the option value. On this analysis to value of mangrove forests is reviewed from the side i.e. options to value biological diversity or biodiversity.

3 Results

3.1 DPSIR analysis

The passage of the program of restoration of mangrove forests, communities increasingly understand and Rembang's government realized the importance of to maintain the sustainability of mangrove forests. Following are the results from the analysis of the DPSIR.

3.2 Driving force

The impact of the program of restoration of mangrove forests and coral reefs based on studies of driving force due to human activities that have the nature of constructive and destructive. The constructive nature of the cause of the quality of resources increases. The community is already aware of the preservation of mangrove forests and coral reefs. Destructive nature will cause the quality of the resources decline. Destructive nature are likely to be caused by human activity that exists outside of the residents of the community. The existence of the garbage that is trapped in mangrove plants resulting from the exhaust of the ship conducted while sailing. The existence of a program of restoration, the surrounding communities take advantage of opportunities to open the kiosk as an additional income. The majority of the kiosk was used as a place of food stalls and selling accessories and gift shop. Waste from food stalls is currently not yet well-organized. So some times found dirty water waste disposal into the existing reservoir near preservation mangrove forests. Impact of water quality provided the longer can decrease.

3.3 Pressure

The problem that arises is the lack of human resources for picking up litter that caught on the edge of the mangrove, an increasing number of tourism an increase of residents who open a restaurant around conservation areas. Human resources population feel tired because of the rubbish coming from the middle of the sea. In the morning it's been cleaned up, when the afternoon of trash will be there again because of the carried away by the waves. An increasing number of travelers are indeed provide increased revenue to the community as well as the region. On the other hand, the awareness of the tourists must also be upgraded again so as not to throw junk freely. The more restaurant, there is a tendency of waste disposal are also more and more.

3.4 State

Changes to the existing conditions in the area of mangrove Rembang Looks rubbish on the edge of the forest, near the entrance to mangrove tour. The number of kiosks is growing. The nature of human activity are causing an increase in the quality of the constructive resources and destructive properties cause a decrease in the quality of the resource.

3.5 Impact

The impact obtained is politically subdivided into 2, directly and indirectly. Restoration programs produce the quality and economic value of coastal resources is increasing. At the time of the rain with high intensity, increased the volume of water and the sea waves hindered by mangrove thus reducing the intensity of the perceived flood of residents of the community. The population is about obtaining revenue sources other than farming and sailing. Indirect impact is the edge of the mangrove forests are often snagged trash-waste from the sea. Human resources a little bit can't afford such rubbish regularly. The kiosk managed by the population is about giving an indirect impact in particular the negative impact. Waste from discarded some stalls in the reservoirs. Disposal periodically if there is coordinated properly, will cause a decline in water quality and fish and a decrease in the number of fish production.

3.6 Response

As government agencies and the legislature made a regulation, to conduct surveillance. Administering punishment and coaching. As researcher can do for research and development of technology. NGOs can supervise coastal routinely in the salvation of the coastal resource sustainability. So the stakeholders or authorized agencies can provide related policies the disposal of litter at sea in particular-could not break down in the sea.

3.7 Benefit cost analysis

3.7.1 Net Present Value (NPV) and Net Benefit Cost Ratio (B/C Ratio)

Net Present Value (NPV) is the difference between benefits and costs that have been multiplied by a discount factor. Net Benefit-Cost Ratio (Net B/C Ratio) is the ratio between the benefits includes the years from projects that have been calculated and costs which have been calculated as well. Based on the results of calculation of the value of NPV discount factor 9% is value Rp 4.990.339.411. The positive meaning of this restoration program and the value of net benefit ratio (B/C Ratio) is 1.77 %. Results of B/C Ratio >1 then program said go project.

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3.7.2 Internal Rate of Return (IRR)

Based on the results of the calculation, the IRR is found of 16.73% and the value of the IRR > discount factor 9% so that the proposed investment project is accepted.

3.7.3 Payback Period (PBP)

Based on the results of the calculations that the capital could be benefit with the rest of the money returns 1,132,373,381 when the project enters 8th year 9th more month.

3.7.4 Value to Mangrove Forests

Value to mangrove forest in terms of value to the option with the existing biodiversity in mangrove forest village of Pasarbanggi. The value of biological diversity or biodiversity according, Mayudin (2012) was US \$15 ha/year with the exchange rate now is US \$1 = IDR 13.522.20 and extensive mangrove forest Pasarbanggi village is 60 ha the value to forest options mangrove is IDR 12.328.200.

4 Conclusion

DPSIR analysis results known that human activity is divided into two types, namely constructive and destructive. constructive activity derives from the awareness of local people who have had a positive outlook towards the sustainability of mangrove resources and desire to contribute to conservation. More destructive activity resulting from external factor. As government agencies and the legislature made a regulation, to conduct surveillance. Administering punishment and coaching. As researcher can do for research and development of technology. NGOs can supervise coastal routinely in the salvation of the coastal resource sustainability. So the stakeholders or authorized agencies can provide related policies the disposal of litter at sea in particular-could not break down in the sea.

Calculation results of NPV and Net B/C Ratio was found that NPV indicates value positive and Net B/C Ratio has a value of 1 means that the restoration program > is judged worthy to proceed and go project. Results of NPV is IDR 4.990.339.459 and Net B/C is 1.77%. The value of the IRR and Payback Period found that the value of the IRR > discount factor 9% with a payback period on 8 year more 9 months. The value of mangrove forest to reviewed by value to the option with the highest biodiversity of mangrove forests of the village Pasarbanggi amounting to IDR 12.328.200 per year.

1

Authors' contributions

MBAK is the team leader, analyst and paper writer. AHJ is responsible for sample collection. EG is responsible for field investigations and processing. MR is responsible for conducting a survey.

1

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