

Coral reefs eco tourism sustainability management In the Gili Labak Island using rapfish method

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ABSTRACK

The purpose of this research is to give direction of management of Gili Labak Island by considering multidimensional factors. The method used is Rapfish. This method uses the ecological, resource, economic, social, legal and institutional dimensions. Rapfish Gili Labak's analysis results for the ecological dimension show a value of 62.3 in a fairly sustainable category. The resource dimension shows a value of 63.07 in fairly sustainable categories. The economic dimension shows the value of 10.15 in the unsustainable category. The social dimension of value of 17.8 in the unsustainable category. Legal dimensions and institutional values of 5.36 in non-sustainable categories. Multidimensional analysis results show sustainability index in less sustainable category (value 34,24). After interference is increased it becomes quite continuous (value 74.99). This interference is described in the recommendations. Recommendations are made on the lesser dimensions, namely the legal and institutional fields, the economic field and the social field.

Keywords: *Rapfish, Gili Labak, Coral Reefs, Sustainable Management*

I INTRODUCTION

The largest island in East Java is Sumenep regency, with 126 island islands (Sumenep Regent's Regulation No. 11 of 2006). Sumenep regency consists of 25 districts and 331 villages. The total area of Sumenep Regency is 212,410.2 Ha. Sumenep district has the largest coral reef and mangrove in East Java with good condition compared with other districts in East Java. This shows that Sumenep Regency has huge potential of untapped natural resources (F. Muhsoni, Syarief, and Effendi 2011). The mangrove area in Sumenep regency is 12,558 ha, with density of thickness of 1,719,3 ha (14%). Coral reef area 73,911 ha (F. F. Muhsoni 2015).

Gili Labak Island is one of the islands in Sumenep Regency. Coral reefs in this area reached 66 ha, with living coral conditions 48.7%. Coral species that dominates is the Stylophora (Branching) (29.4%). The island is suitable for dive

ecotourism. Carrying capacity of ecotourism immersion reached 133 people / day, snorkeling ecotourism reached 44 people / day and coastal ecotourism reached 86 people / day. Total visitors in Gili Labak Island are 263 persons / day (F. F. Muhsoni 2016). The purpose of this research is to give direction of management of Gili Labak Island by considering multidimensional factors.

II MATERIALS AND METHODS

Rapfish (Rapid Appraisal for Fisheries) is a method used to draw conclusions related to the sustainable management of fisheries resources. In this study using sustainability management strategies with several dimensions, namely the dimensions of ecology, resources, social, economic, legal and institutional. Sustainability analysis with a multidimensional scaling approach (MDS) is called RAPSAECO. This method is an expansion of Rapfish method. Sustainability analysis is done through three

stages, namely: 1) Determination of attributes, consisting of the ecological, resource, economic, social, institutional and legal dimensions. The attribute is used as an indicator of the sustainability of the dimension. 2) Scoring of each attribute, score on an ordinal scale based on sustainability criteria and scientific judgment from scorers. Scores range from 1 - 3/4, where the value is ranged from ugly (1) to good value (3/4). Good value shows the development of ecotourism advantages, so it must be maintained.

On the contrary, bad value shows unfavorable conditions for ecotourism so it should be improved. 3) Preparation of index and sustainability status for ecotourism (table 1) (Pitcher and Preikshot, 2001; Pitcher and Preikshot, 2001; Anwar, 2011, Cissé, Blanchard and Guyader, 2014, Suresha Adiga et al., 2015). The data were collected using questionnaires and field measurements. The data taken are ecological data, potential data, economic data, social condition data, legal data and institutional.

Table 1. Sustainability Index Management

| No. | Index Score | Sustainability Category |
|-----|-------------|------------------------------|
| 1 | 0 - 25 | Not Sustained / Continued |
| 2 | >25 - 50 | Less Sustainable / Continues |
| 3 | >50 - 75 | Self Sustaining / Continuing |
| 4 | >75 - 100 | Continuing / Continuing |

(Anwar, 2011; Muhsoni and Sofarini, 2016)

III RESULTS AND DISCUSSION

3.1. Ecological Dimension

The result of Gili Labak Island management sustainability index for the ecology dimension shows a value of 62.3. This value falls into a fairly sustainable category (with index values > 50-75). The stress value in this dimension is 0,1356 with R2 equal to 94,4%. According Kavanag and Pitcher (2004), if stress value is <0.25 or <25% and coefficient of determination is > 80% or close to 100% can be said to have high accuracy. Stress value is defined as a measure to see the accuracy of the results obtained whether approaching the original data (goodness of fit), if the value of stress approaching zero, it indicates that the resulting data can be trusted. The value of coefficient of determination (R2) is defined as the level of suitability of a model whether good or not used.

Rapfish analysis results in the research location showed that salinity attributes, life form and temperature were the 3 main attributes that most influenced on the ecology dimension in Gili Labak. Salinity with leverage of attributes 7.4 is in the range of <28 ‰ and > 36 ‰. The type of life form with leverage of attributes 7.25 lies in the range of > 10 species. Temperatures with leverage of attributes 5.65 are in the range 26 - 36 ° C.

The three attributes with the highest value, namely salinity, the type of life form and

temperature, are the attributes that most influence the condition of marine waters in Gili Labak. Salinity is a measure of the number of dissolved solids in a given mass of water. Salinity is expressed in grams / per kilogram (0/00). The high salinity value is influenced by the flow or inclusion of water from the mainland. The value of salinity in the provisions of Decree of the Minister of Environment No. 51 of 2004 states that the sea water quality standards for coral reefs are ranged from 33-34 0/00. At the observation location, salinity values were obtained in the range of <28 ‰ and > 36 ‰. The salinity condition at the measurement station indicates that the salinity value is not in accordance with BMAL based on the provisions of Decree of the Minister of Environment No. 51 of 2004, so salinity becomes the attribute with the highest leverage of attributes value or 7.4.

Salinity is one of the key parameters in the waters. Salinity can affect the spread of organisms both horizontally and vertically, which indirectly leads to changes in the composition of organisms in an ecosystem. Decrease in salinity value will greatly affects the condition of the biota in it, both from the index of abundance and the index of species diversity. If the salinity falls to less than that required under the Sea Water Quality Standard based on the provisions of Decree of the Minister of Environment No. 51 of 2004, then the stability of lives in the waters of the sea will be threatened.

The type of life-form is the second highest attribute in the research location. The type of life-form is found in more than 10 species, which means that the diversity of coral species in Gili Labak is still good and can be maintained and improved. The types of coral reefs found in Gili Labak are Acropora (Branching), Echinopora (Branching), Hydnohpora (Branching), Montipora (Branching), Porites (Branching), Stylophora (Branching), Caulastrea (Meandering), Pavona (Meandering), Psammocora (Meandering), Favia (Massive), Oxypora (Thin Plates), Pachyseries (Thin Plates), Porites (Thin Plates), and Fungia.

Temperature is the third highest attribute after salinity and life-form type with temperature value is in the range 26 - 36 °C. According to Sea Quality Standard (Decree of State Minister of Environment Number 51 of 2004), temperatures in coral reef areas ranged from 28-30 °C. The results of field measurements indicate that the temperature is in accordance with BMAL to reach more than BMAL. The measured water temperature in this observation location is influenced by the depth of the water also influenced by the intensity of sunlight.

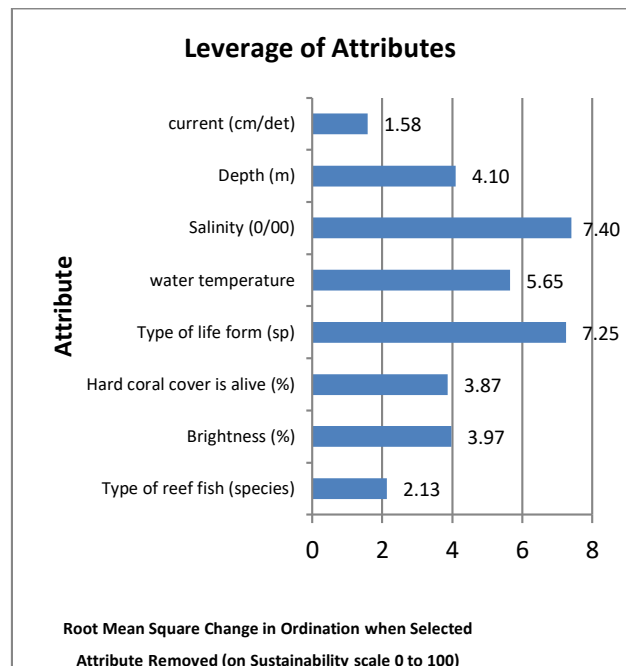
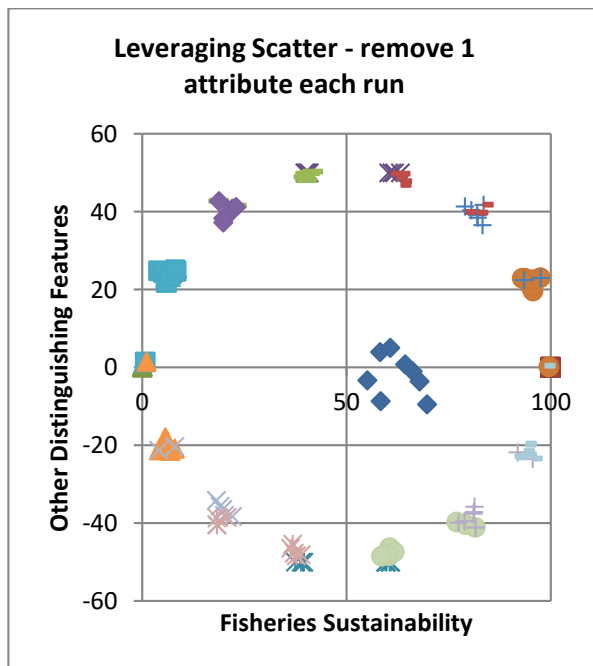


Figure 1. Index Analysis and Status of sustainable management of Gili Labak Island on ecological dimension and sensitive factors affecting ecological sustainability.

3.2. Dimension of Resource Potential of Gili Labak Island

The result of the Rapfish index of the management sustainability index of Gili Labak Island for the resource dimension shows a value of 63.07. This value falls into a fairly sustainable category (with index values > 50-75). The stress value of this dimension is 0.1419 with R² of 94.9%, it indicates that it has a high accuracy close to the original data.

The results of the analysis at the study sites showed that the attributes of distance to the fishing sites, the number of potassium users and the current number of explosive users compared to 25 years ago are the 3 main attributes most

influential on the resource dimension in Gili Labak. Compared to 25 years ago, the distance to the fishing location became somewhat to the middle of the sea, with a leverage of attributes of 9.55, the number of potassium users decreased or none with leverage of attributes 9.03, and the number of users of explosives also decreased or did not exist with leverage of attributes 8.98.

As many as 43 respondents, most of the respondents stated that comparing to 25 years ago, the distance to the fishing location became somewhat come to the middle of the sea. The operational costs of the fishermen are becoming increasingly swollen as the amount of ship fuel needed becomes more numerous to reach further fishing sites. This indicates that the number of fish

is not as much as it used to be caused by many things. Among them is the number of fish in the waters of Gili Labak less due to over fishing, coastal water quality conditions that are not suitable anymore for the life of fish due to ecotourism activities that began fairly crowded lately to the occurrence of global warming.

Interviews showed that fishermen using potassium and explosives had decreased or none. This indicates that most respondents are aware and understand that the use of potassium and explosives is very dangerous for the waters and causes the non-target fish to die. In addition, the use of potassium and explosives can also be harmful to its users.

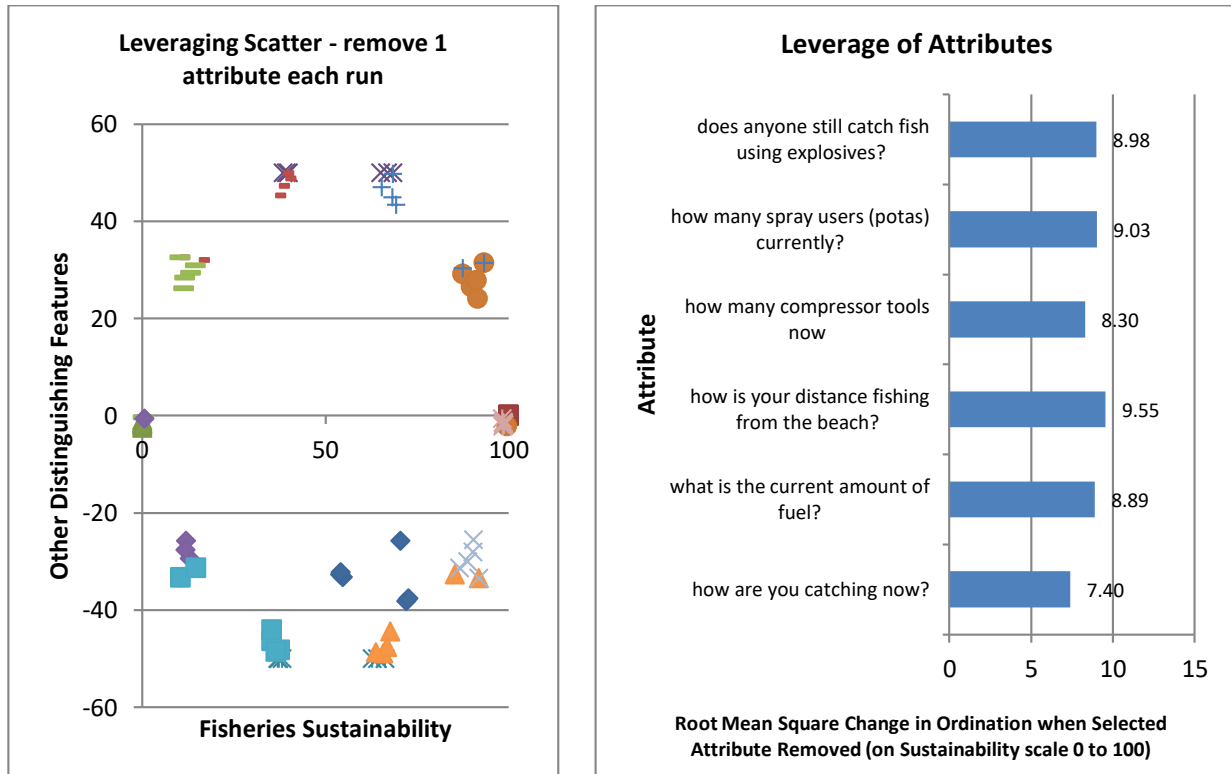


Figure 2. Index analysis and sustainability status of Gili Labak Island management dimension of potential resource and sensitive factors affecting resource sustainability potential.

3.3. Economic Dimension of Gili Labak Island

The results of the respondents' assessment for the Economic dimension indicate that most of Gili Labak's population have livelihood as fishermen (96%), only 2% utilize tourism sector and 2% have coastal sand mining. The average education of Gili Labak' population is mostly not finished primary school (98%) and only 2% is high school graduates which is also one of the causes of the absence of school facilities in Gili Labak Island. The contribution of tourism and fisheries to taxes and regional restitution is still very low (only 85%). The income of the community on Gili Labak Island is still very low at an average of 98% still under the MSE of Sumenep Regency. The absorption of manpower in the tourism sector is still very low for only certain people (77%).

The result of Gili Labak Island management sustainability index analysis for the economic dimension shows a value of 10.15. This value falls into an unsustainable category (with an index value of ≤ 25). The stress value of this dimension is 0.1374 with R2 of 95.1%, it indicates a high accuracy close to the original data.

The result of *leverage* analysis of economic sustainability as in the picture below, is to determine which attributes are sensitive to change ordination. The result of Rapfish analysis in the research location shows that the attributes of livelihood of most of the people around the area, the absorption of labor in Gili Labak tourism sector and the amount of population's income are the 3 main attributes that have the most influence on the economic dimension in Gili Labak. The

livelihood of most communities around the area is fishermen, with leverage of attributes 10.43, the absorption of manpower in Gili Labak tourism sector is low or only for certain people with leverage of attributes 4.98, and the average income of the community is below 1 million rupiah with leverage of attributes 3.6.

The development of the Gili Labak area as an ecotourism area should also consider several dimensions, including the economic dimension.

The livelihood of most of Gili Labak community as fisherman, little by little can be given an alternative in the form of livelihood in tourism sector. The absorption of manpower in the tourism sector should be carried out equitably, not only for certain parties, but the opportunity should be open to the general public. With the opening of job opportunities in the tourism sector is expected to increase the incomes of people around Gili Labak.

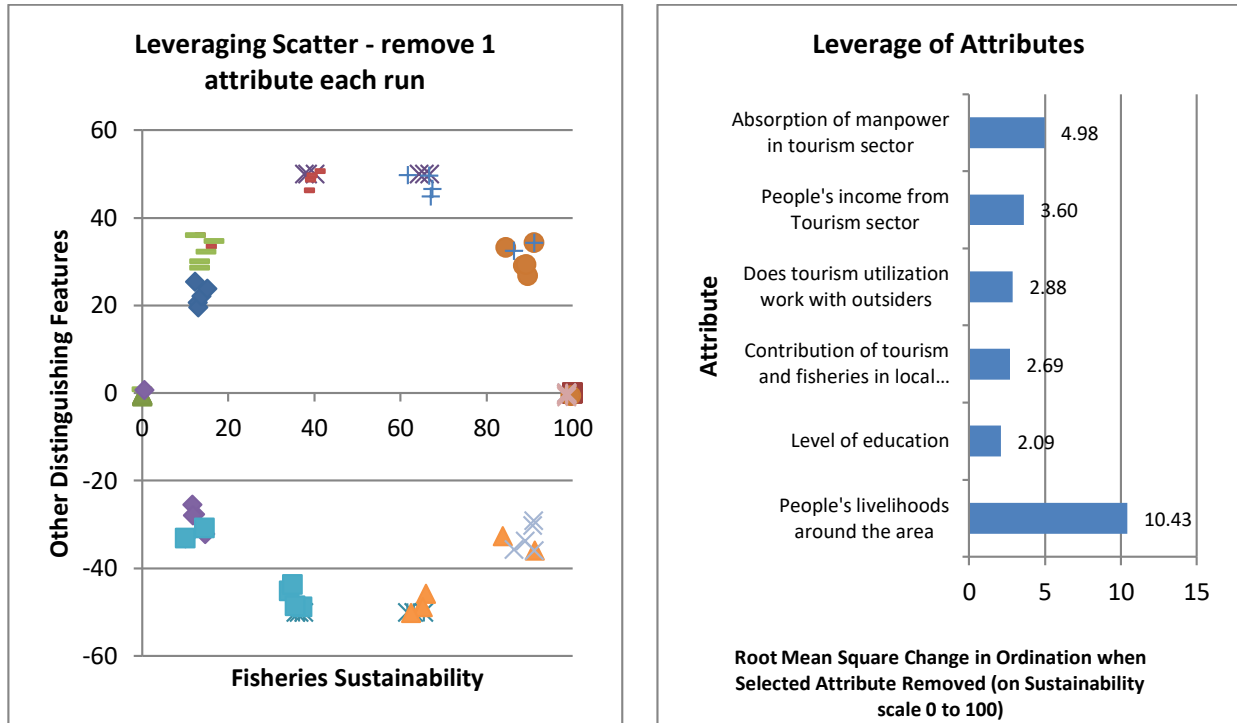


Figure 3. Index Analysis and Status of sustainable management of Gili Labak Island economic dimension and sensitive factors affecting economic sustainability.

3.4. The Social Dimension of Gili Labak Island

The result of social dimension shows that 67% of the population argue that there is no conflict in the utilization of tourism potential and only 33% say little (1-2 times a year). 70% of the population do not know / do not understand if coral reefs are important to protect the beach and coast from the waves, and 30% of people already understand. 65% of people do not understand if coral reef protection will ensure the sustainability of resources for the next generation's livelihood, and only 35% of the community understands. 53% of the people do not know if coral reef catches need to be regulated to provide fish and coral growth opportunities, while 47% of people agree / understand. 77% of people do not take

coral reefs for buildings and others, while 23% still take a little (once a month). 72% of people understand if coral or coral damage can be punished. 77% of the community still has no participation in coral reef guard and 23% have community guard.

The result of Gili Labak Island management sustainability index analysis for social dimension shows a value of 17.8. (figure 4). This value falls into an unsustainable category (with an index value of ≤ 25). The stress value of this dimension is 0.1397 with R² of 92.3%, it indicates a high accuracy close to the original data.

The results of the social leverage analysis are as described in the figure below, is to determine which attributes are sensitive to change ordination. From the Rapfish analysis on the study/research site, it appears that coral reefs' attributes for building materials, population understanding of coral reef protection for the sustainability of future generations of livelihoods and community understanding of the importance of coral reef function to protect coastal and coastal beaches from storm surges are 3 main attributes most influential on the social dimension

in Gili Labak. Coral reefs for building materials are no longer done by the local population with leverage of attributes 11.72, the population's understanding of coral reef protection for the sustainability of future generations of livelihoods is not well understood with the leverage of attributes 7.8, and the local population's understanding of the importance of function coral reefs to protect beaches and villages in the coastal areas from storm surges are also not well understood with the leverage of attributes 5.72.

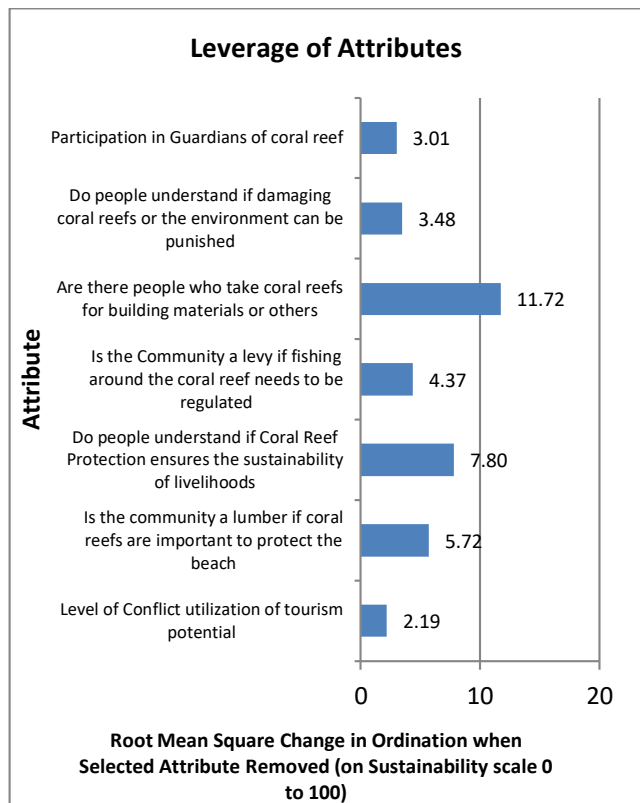
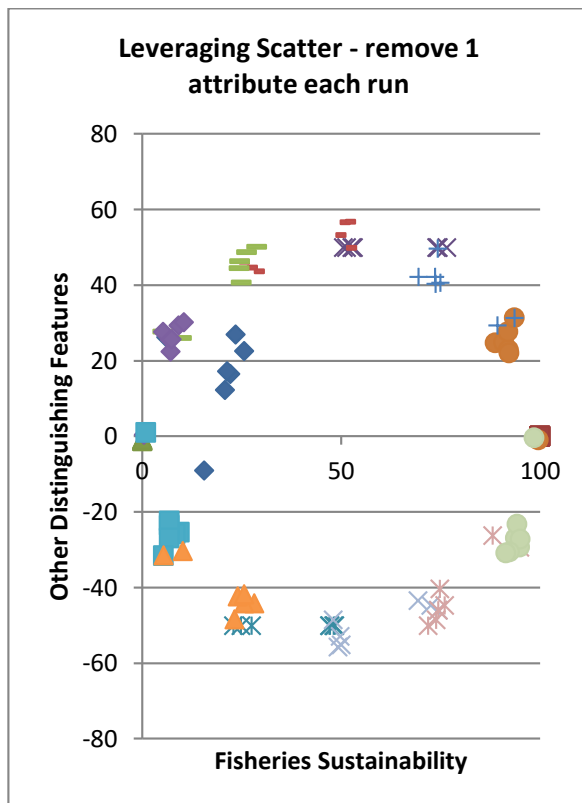


Figure 4. Index Analysis and Status of sustainable management of Gili Labak Island social dimension and sensitive factors affecting social sustainability.

Based on the results of interviews with respondents note that the population around Gili Labak are no longer do coral reefs for building materials or others. But it does not seem to mean that they understand the importance of coral reef function for the environment. Based on the 3 highest attributes on the social dimension it is well known that local communities have no understanding of coral reef protection for the sustainability of future generations of livelihoods and the importance of coral reef function to protect coastal beaches and villages in coastal areas from storm surges.

The role of fisheries extension officer and related parties is very necessary in giving understanding to the population around Gili Labak area about the importance of coral reef protection and its function as a wave holder. So, the actions of those who no longer take coral reefs for building materials have strong grounds and reasons that support each other. If these three highest attributes give each other positive response then the development of Gili Labak area as an ecotourism area can be realized well.

3.5. Legal and Institutional Dimensions

The results of the respondents' assessment for the Legal and Institutional dimension state that there is no (98%) role of government agencies in the management of Gili Labak. Private investors in providing capital for tourism development 68% still do not exist as much as 30% limited. The absence of cooperative institutions in the management of Gili Labak Island (98%). There is no banking institution in the management of Gili Labak Island (100%). There is no role in marine oversight for marine security agencies. 58% of the population thought that there were no fishermen groups and 37% were present and there was no activity. The absence of regulation of resource management in Gili Labak. Is 54% of the community expressed the involvement of fishermen in fishery policy development involved in verification of data and information however it is still limited.

The result of Gili Labak Island management sustainability index analysis for the legal and institutional dimension shows a value of 5.36. This value falls into an unsustainable category (with an index value of ≤ 25). The stress value in

this dimension is 0.1347 with R2 of 95.2%, it indicates has a high accuracy near the original data.

The results of leverage analysis of legal and institutional sustainability as in figure 5, to determine which attributes are sensitive to change ordination. From the Rapfish analysis in the research location, it can be seen that the attributes of the involvement of the fishermen, whether in the preparation of policies or in verifying the data and information, the role of government institutions in managing and contributing private investors in providing capital for tourism development are the 3 main attributes of the most influential on the legal and institutional dimension of Gili Labak. The involvement of fishermen, whether in the preparation of policies or in verifying data and information is very low with the leverage of attributes 5.57, the role of government institutions in managing very limited and even none with leverage of attributes 1.97, and the contribution of private investors in providing capital for tourism development also does not exist with the leverage of attributes 1.6.

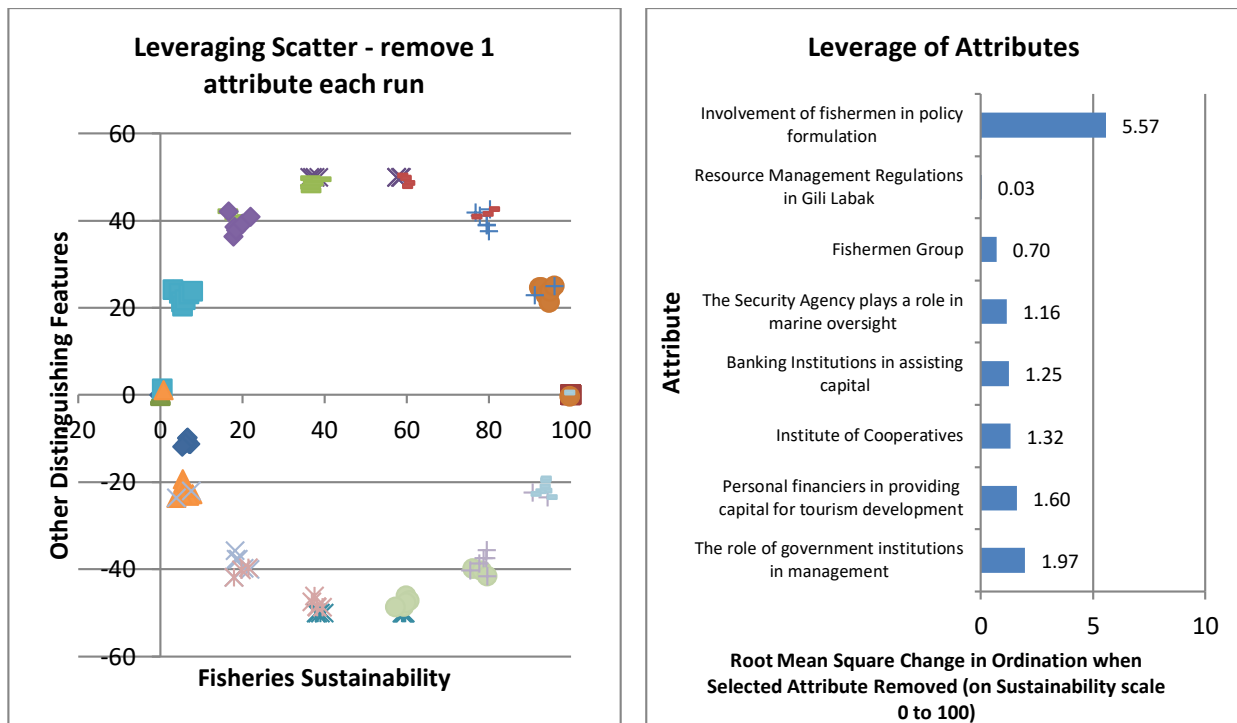


Figure 5. Index Analysis and Status of sustainable management of Gili Labak Island legal and institutional dimensions and sensitive factors affecting legal and institutional sustainability.

The three highest attributes of this legal and institutional dimension show that the government does not coordinate with fishermen in activities

that are useful for the development of Gili Labak as an ecotourism area. Policy-making activities, data and information verification, tourism area

management and the contribution of private investors are a unity that cannot be separated from one to each other. The government should also involve community representatives in carrying out the above activities, as well as lure investors to develop the ecotourism area, so that the legal and institutional dimension in Gili Labak can be run properly for the development of ecotourism area.

In the ecological dimension, salinity attributes that are key parameters in marine waters are not in accordance with Sea Quality Standard based on Decree of State Minister of Environment Number 51 of 2004 (33-34 0/00), ie $<28 \text{ ‰}$ and $> 36 \text{ ‰}$. This is also seen in the resource dimension, where the attributes of distance to fishing sites versus 25 years ago become more to the middle of the ocean waters, because the number of fish is not as much as it used to be caused by many things. Among them is the condition of coastal water quality that is no longer suitable for fish life, one of which is salinity, due to ecotourism activities that began crowded lately to the occurrence of global warming.

The economic dimension shows that the absorption of manpower in the field of ecotourism is still not evenly distributed or only focused on a certain group of people only. Equalization of employment in the field of ecotourism is one alternative in solving the problem of fishermen income. In the resource dimension it has been explained that the distance to the fishing sites is getting further, which is related to the higher

3.6. Multidimensional Analysis

The results of multidimensional Rappfish analysis using ordination technique through MDS method yielded a value of 34.24. This value indicates the sustainability index value is less sustainable (included in index value $> 25-50$). This value is obtained based on the assessment of 35

operational costs of the fishermen. In the economic dimension also explained that the consequences of the swelling of these operational costs, the income of fishermen is getting less with an average income below one million rupiah.

On the social dimension, it is seen that there is no understanding of the population around the Gili Labak ecotourism area about coral reef protection for the sustainability of next generation livelihood sources and the importance of coral reef function to protect coastal and coastal beaches from storm surges. This is closely related to the legal and institutional dimension, in which the government has no role in coordinating with fishermen in activities that are useful for the development of Gili Labak as an ecotourism area. Policy-making activities, data and information verification, tourism area management and the contribution of private investors are a unity that cannot be separated from one to each other.

The response of investors or stocks traders needs to be fostered through cooperation between the government and the relevant private parties. In addition, the government should also involve community representatives in carrying out the above activities, as in addition to fostering the community's understanding of the importance of coral reef function and protection for beaches and coastal villages, as well as to enhance the role of law and institutional dimension in Gili Labak area running properly for the development of the ecotourism area.

attributes consisting of: 8 ecological dimensional attributes, 6 attributes of resource dimension, 6 attributes of economic dimension, 7 attributes of social dimension and 8 attributes of institutional dimension.

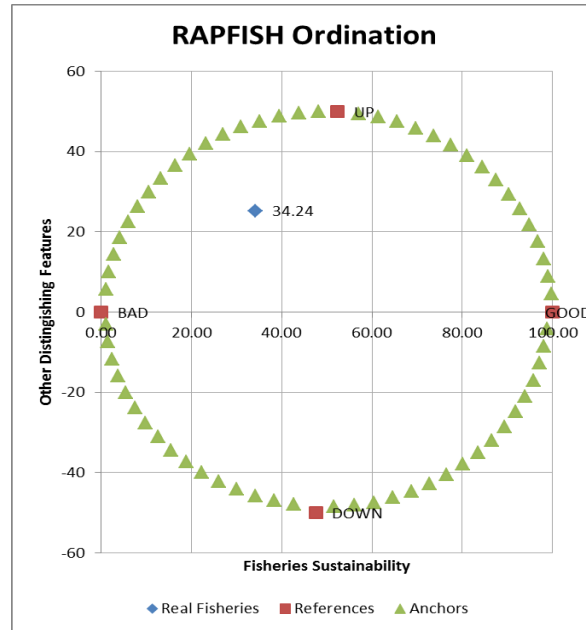


Figure 6. Rap Analysis of Ordination Points for Multidimensional

3.7. Sustainability Index in Kite Diagram

There are five dimensions analyzed by Rapfish method this time, namely the ecological dimension which is the entire habitat / ecosystem that supports the existence of biological resources in the coastal area, the dimension of resources that is the biological condition (biological) and non-biological that can be utilized by society, is the level of economic movement of society, the social dimension which is the condition of comfort and the level of community welfare and the legal and institutional dimension which is the power of institutions that manage the coastal areas under study. Of the five dimensions, the highest is the resource dimension of 63.07; then ecology dimension 62.3; social dimension 17.8; economic dimension 10.15; the last is the legal and institutional dimension of 5.36.

The management of the Gili Labak ecotourism area shows that the results are less sustainable. In this status to improve from less sustainable status to sustainable enough it is necessary to

improve the sustainability of legal and institutional dimensions, economic dimensions and social dimensions. Legal and institutional dimensions, in which the government provoked the response of investors or investors in Gili Labak through cooperation with related private parties, and coordinated with fishermen in activities useful for the development of Gili Labak as an ecotourism area. The economic dimension is the equality of employment in the field of ecotourism to increase the income of fishermen. The social dimension is to foster community understanding of the importance of coral reef function and protection for beaches and coastal villages.

Based on the table below the S-Stress value which results in a value smaller than the rule (<0.25), the smaller of 0.25 the better. While the coefficient of determination (R^2) in each dimension and multidimensional high enough (close to 1). Thus, these two statistical parameters show that all the attributes used in each dimension are good enough to explain the sustainability of the management of Gili Labak Island

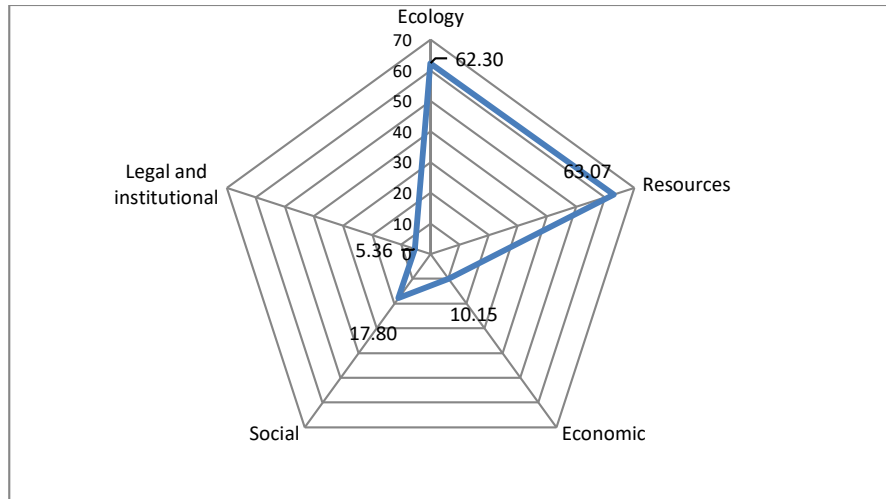


Figure 7. Overlay diagram of index analysis and sustainability status of Gili Labak Island management.

Table 2. Statistical parameters of Index analysis and availability status in each dimension

| Statistical parameters | Multidimensional | Ecology | Resources | Economic | Social | Legal and institutional |
|------------------------|------------------|---------|-----------|----------|--------|-------------------------|
| S-stress | 0,1272 | 0,13557 | 0,1419 | 0,1374 | 0,1397 | 0,1348 |
| R ² | 0,9568 | 0,9444 | 0,9494 | 0,9511 | 0,9230 | 0,9529 |

3.8. Rapfish Modeling Interference

Interferences were made on Rapfish modeling to simulate the increase of the sustainability index on Gili Labak Island. According to the results of the analysis there are several dimensions that need to be improved so that the management of Gili Labak Island can be optimal. The dimensions that need to be raised to improve from the less sustainable status to sustainable enough are the legal and institutional dimensions (sustainability value 5.36), economic dimension (value of sustainability 10.15) and social dimension (sustainability value 17.8). These dimensions still have a low value compared to the ecological dimension (Sustainability value 62.30) and power (sustainability value 63.07).

3.9. Recommendations based on Rapfish analysis results

Recommendations were based on the results of the Rapfish analysis. This recommendation is an

Interference aims to increase the value of each dimension followed by activity recommendations. The results of Rapfish analysis conducted interference for multidimension yield value of 34.24 increased to 74.99. This value indicates the increased sustainability index value of the less sustainable category (> 25-50) becomes sustainable enough (> 50-75).

Interference results showed an increase in the value of the dimensions of the intervenes, namely: the social dimension from 17.8 rose to 92.96; the economic dimension from 10.15 rose to 71.63; and the last is the legal and institutional dimension from 5.36 up to 70.30.

activity proposed to raise the value on each dimension in accordance with the interference made. Recommendations are made on weak dimensions, namely: legal and institutional dimension, economic dimension and social dimension

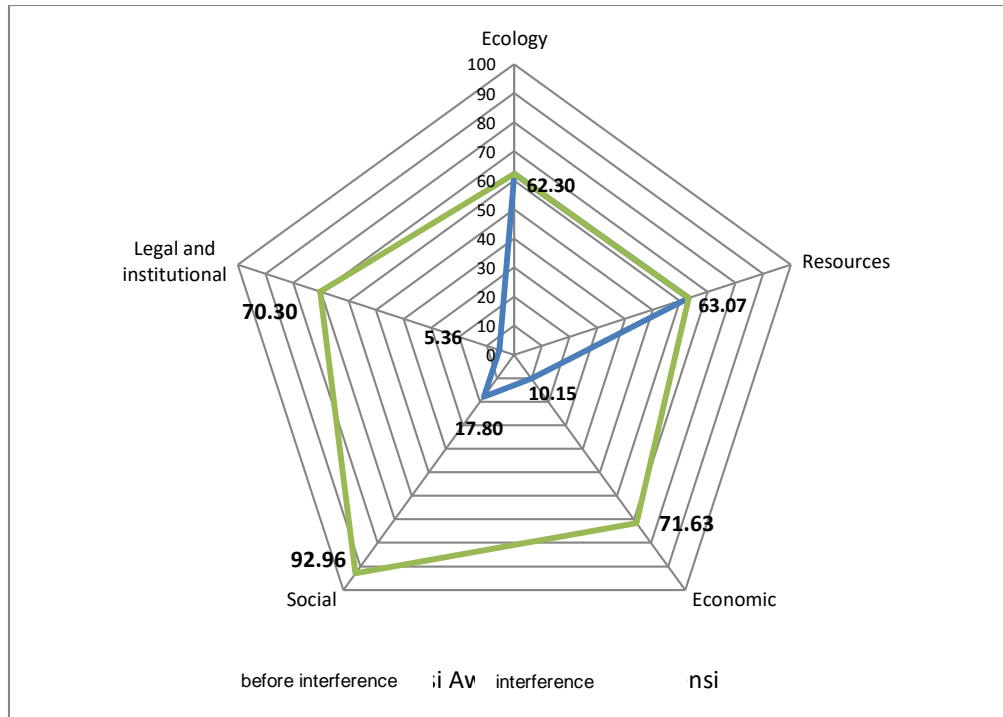


Figure 8. Switched diagram of index analysis and interference sustainability status for management of Gili Labak Island.

Table 3. Activity recommendations based on Rapfish analysis.

| No | Dimension | Recommendations |
|--|--|--|
| Legal and Institutional Dimension | | |
| 1 | Involvement of fishermen in policy formulation | Involving the community in policy formulation to make Gili Labak area as a place of Ecotourism and intensively socialize every policy to fisherman group and related society Island. |
| 2 | The role of government institutions | The relevant agencies program specific activities on Gili Labak Island, Assistance to the community on Gili Labak Island |
| 3 | Contribution of private financiers | Attracting outside investors for the development of Gili Labak |
| 4 | Cooperative institutions | Establish a cooperative institution with community membership and provide assistance |
| 5 | Banking institutions | Connecting with banks to provide soft loans to fishermen credit program (KUR) |
| 6 | Marine security agency | Perform routine patrols and crack down on violations of either dangerous arrests or using prohibited fishing gear |
| 7 | Group of fishermen | Establish a group of fishermen on Gili Labak Island and conduct assistance activities |
| 8 | Management rules | Propose local regulations for ecotourism management of Gili Labak Island |
| Economic Dimension | | |
| 1 | Livelihood and employment | Training for the community, directing the community to make tourism as a source of income (eg as a tour guide or rental of tourism facilities) |

| | | |
|---|-----------------------------|---|
| 2 | Tourism contribution (GRDP) | Propose retribution for tourism activities |
| 3 | Utilization of tourism | Providing training to the Gili Labak community to develop the island's potential. |

Social Dimension

| | | |
|---|---|---|
| 1 | Understanding the importance of Coral Reefs | Provide counseling to the community the importance of coral reef guards and their impact if coral reefs are damaged |
| 2 | Catching on coral reefs | Training by catching ornamental fish safely and without damaging corals, finding a market for live ornamental fish |
| 3 | Damage Coral Reefs punished | Socialization and counseling about legislation to protect the environment (LH, SDI, SDKP) |

CONCLUSIONS AND RECOMMENDATIONS

1. The ecological dimension shows a value of 62.3 in a fairly sustainable category. The results of the analysis show that the 3 most influential attributes on the ecological dimension are salinity in the range of <28 ‰ and> 36 ‰, the type of life form in the range> 10 species and the temperature in the range 26 - 36 ° C;
2. The resource dimension shows a value of 63.07 in fairly sustainable categories. The results of the analysis indicate that the 3 main attributes that have the most influence on the dimension of the resource are the distance to the fishing location shifted somewhat, the number of potassium users decreased or did not exist and the number of explosive users decreased or did not exist today compared to 25 years ago;
3. The economic dimension shows the value of 10.15 in the unsustainable category. The result of the analysis shows that 3 main attributes that have the most influence on the economic dimension are the livelihood of most of the people around the area as fisherman, the absorption of labor in tourism sector is only for certain people only and the average public income is less than 1 million rupiah;
4. The social dimension of value of 17.8 in the category is not sustainable. The results of the analysis show the 3 main attributes that have the most influence on the social dimension: coral reefs for building materials have not been done by the population, the population's understanding of coral reef protection for the sustainability of future generations of

livelihoods is not well understood and the population's understanding of the importance of coral reef function protecting the beach from the waves of the storm is also not understood;

5. Legal and institutional dimensions of 5.36 in non-sustainable categories. The result of the analysis shows that the 3 main attributes that have the most influence on the legal and institutional dimension are the involvement of the fishermen, both in making the policy and in verifying the data and information very limited, the role of government institution in managing the small and private investors' contribution in providing capital for tourism development does not exist;
6. Multidimensional analysis results show sustainability index in less sustainable category (value 34,24). After interference is increased it becomes quite continuous (value 74.99). This interference is described in the recommendations;
7. Recommendations are made to the lesser dimensions, namely the legal and institutional fields, the economic field and the social field.

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