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Sustainability analysis of coastal Village development Program in Indonesia

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ABSTRACT

The Resilient Coastal Village Development Program is an Indonesian government program conducted by the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia to provide impetus for the advancement of coastal villages in Indonesia. People feel the benefits of the program, but because of political changes in Indonesia the program has been stopped. The coastal villages of Malang Regency are eager to continue the program independently. The purpose of this research were to know and analyze the condition of each sustainability dimension the Resilient Coastal Village Development in coastal village of Malang Regency. The method used is Multi Dimensional Scaling (MDS) analysis using Rapfish (Rapid Appraisal for Fisheries) software. The results showed that the main dimensions of particular attention were institutional (35.84), ecological (39.31), and socio-economic (43.01).

Key words : *Ecological, Institutional, Socio-economic, Village development, Coastal village.*

Introduction

The Resilient Coastal Village Development Program is an Indonesian government program conducted by the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia. The program is expected to provide the impetus for the advancement of coastal villages in Indonesia. It goes in line with achievement and expectation of real programs for efficient village economics since it will be used as a foundation for the establishment of social and cultural environments that conform to international standards including the EU. Although, right now, EU is suffering from a declining quality (Certan and Certan, 2015; Mihalache and Negut, 2015). The Ministry of Marine Affairs and Fisheries of the Republic of Indonesia initiates the Resilient Coastal Village Development Program, since most coastal villages in Indonesia deal with several key issues as followings: 1) high coastal community poverty rate, reaching 7.8 million people; 2) high level of coastal resources damage; 3) low independence level of social village organizations; 4) faded local cultural values; 5) lack and low quality of village infrastructure and environmental health in coastal villages. These problems lead to the high vulnerability of coastal villages against natural disasters and climate change. The Resilient Coastal Village Development Program is a part of *the* National Program of Marine and Fishery Independent Community Empowerment under the coordination of the Coordinating Ministry for People's Welfare.

Resilient Coastal Village Development Program has a strategic significance as it is a concrete implementation of: a) 11 national priorities of United Indonesia Cabinet II 2011-2014; b) Presidential policies related to the improvement and expansion of propeople programs; c) a form of intervention from the

Ministry of Marine Affairs and Fisheries in relation to: the arrangement of coastal villages, enhancement of coastal community welfare, outputs that can provide real benefits to coastal communities according to the priority scale of community needs; a learning for coastal communities to find ways of independent solving problems; and encourage coastal communities as development agents. The Development of Resilient Coastal Village is expected to address the constraints as well as utilizing the potential of coastal resources. This strategic significance is in accordance with the rural life quality improvement program in EU.

It is shown by a consistent financial allocation of more than a third (38%) of total funds of European Union in the year of 2014-2020 which is used for rural development programs (Mihalache and Negut, 2015).

When the Government of Indonesia launches the program, it is warmly welcomed by the community, including coastal villages in South Malang Regency. The results of Riniwati research, indicate that, although the funds receivedper village from Resilient Coastal Village Development Program funds are small, the community spirit to run the Resilient Coastal Village Development Program is extraordinary (Riniwati, 2014). Unfortunately, due to political changes in Indonesia, the Resilient Coastal Village Development Program has been stopped in 2016 in spite of the extraordinary benefits to coastal communities in Indonesia. It is quite typical in Indonesia that every political change influences the sustainability of such programs like what Rozikin research has been shown, In most cases, political commitment is still weak, so that human resources only run primary duties and functions without adding any creativity. For example, if the program has a good impact to society then it is best to be developed rather than being deleted (Rozikin, 2012). It is also supported by research in other parts of the world that building a program for real development in the village is important. It starts from activities to create an efficient rural economy which serves as the foundation for the establishment of a social and cultural environment that corresponds to international standards (Certan and Certan, 2015; Do *et al.*, 2016). The existing programs are not eliminated, It only takes to establish relevant institutions that can effectively control unwanted influence due to the arising of social inequalities (Baogang, 2014).

The principles of sustainability refer to environmental aspects, economic, and socio-culture of an activity. To ensure long-term sustainability, the balance between the three dimensions must be well built. The perception on economic development is rather as a matter of growth, so that social and environmental factors are considered to be less important. Therefore, the development paradigm shifts to sustainable development so that there is a balance between economic, ecological and social dimensions. As in the case of Vietnam Villages, village development is accomplished by using sustainable rural development program (Do *et al.*, 2016).

Related to the Resilient Coastal Village Development Program in Coastal Village of Malang Regency, the community is determined to continue their activities that have been done in Resilient Coastal Village Development Program autonomously. So that the noble ideals embodied in the Resilient Coastal Village Development Program are achieved. To help the coastal villagers of Malang Regency being self-governing maintaining the Resilient Coastal Village Development Program, it should focus on what point is still lacking, it is necessary to do research on Sustainability Analysis of the Resilient Coastal Village Development Program in Malang Regency. Therefore, the purpose of this research were to know and analyze the condition of each sustainability dimension the Resilient Coastal Village Development in coastal village of Malang Regency.

Research Method

Data Collection and Research Sample Method

This research is case study in Malang regency. This study used primary and secondary data, where primary data such as information on ecosystem understanding and environmental quality were obtained from interviews with respondents and direct observation in the field. Interviews were conducted using a prepared list of questions/questionnaire. The secondary data needed such as social gap (equity, gini coefficient), biomass, the extent of protected areas and rehabilitation were obtained from the institutions that manage coastal areas of Sitiarjo, Sidoasri and Tambakrejo villages such as Forestry Service, Marine and Fisheries Office, Village Office.

The respondents used as samples in this research were Sitiarjo, Sidoasri and Tambakrejo villagers. Sampling technique used was Judgmental Sam-

pling. It was assumed that the selected respondents taken as samples were based on the researcher's assessment on some communities in the research area which were considered able to understand the condition of the research area well and were able to comprehend and answer the submitted questionnaire questions. This was performed because the majority of Sitiarjo, Sidoasri and Tambakrejo villagers were poorly educated so that only certain people were selected in achieving the purpose of the research. As it had been previously explained, the number of samples used was 45 samples.

Data Analysis Method

The analysis of the sustainability of the Resilient Coastal Village Development Program in Sitiarjo, Tambakrejo and Sidoasri villages was adapting Rapfish or Rapid Appraisal for Fisheries methods which was modified in accordance with the needs of this study. According to (Pitcher and Preikshot, 2001) the evaluation of sustainability could be identified using 3-5 dimensions of ecological, economic, institutional or institutional, technical and social dimensions. This study employed 3 dimensions: socio-economic, ecological and institutional / institutional dimensions.

First, each dimension's attribute was pre-determined, in this case the number of attributes per dimension were adjusted to the needs of sustainability research. The selected attribute reflected the level of sustainability in each dimension, and it was tailored to the availability of information that could be obtained from the character of the resource studied in the research area. If any attribute had been specified, then each attribute was given a scale of 1 to 3. Scale 1 was seen as poor sustainability measure, while a maximum scale of 3 had an impression of good / high sustainability measure. The number of attributes used in this study can be seen in Table 1.

The list of attributes used for each dimension was as follows:

Table 1. The Attributes Number of Each Sustainability Dimension

No.	Dimension	Number of Attribute
1	Socio-economic	9
2	Ecological	9
3	Institutional	5
	Total	23

a. Socio-economic Dimension
   1. Community Resiliency
   2. Community Independence
   3. Residence
   4. Environment
   5. Equity
   6. Sustainable Fleet Capacity
   7. Approriate Investment
   8. Food Supply
   9. Long-term Food Security

b. Ecological Dimension
   1. Catch Rate
   2. Biomass Trend
   3. Fish Size
   4. Environment Quality
   5. Species Diversity
   6. Ecosystem Diversity
   7. Rehabilitation Area
   8. Protected Area
   9. Ecosystem Knowledge

c. Institutional Dimension
   1. Effectiveness of Management
   2. Use of Traditional Method
   3. Incorporating Local Input
   4. Capacity Building
   5. Institutional Viability

Basically, the Rapfish method used Multidimensional Scaling statistics techniques. Multidimensional Scaling statistics techniques was a method commonly used for problems involving attribute components or dimensions to evaluate the effect of each component on the observed problem based on data from a group of subjects (Wickelmaier, 2003). The value for each of these attributes was obtained from both primary and secondary data. After the data was collected, the analysis process was continued with the help of Microsoft Excel 2003 software with additional RAPFISH Add-ins. The tests relating to Rapfish Multidimensional Scaling statistics techniques were feasibility tests and significance and assessment of sustainability status.

(a) Feasibility of Sustainability Model

The feasibility of sustainability model was conducted by measuring the level of goodness or goodness of fit between the distance of the point of estimation and the original point employing the calculation of S-stress. The technique used to determine goodness of fit was carried out by using least square method based on the root of Euclidian distance (squared distance) or algorithm of scale method.

$$S\text{–}stress = \sqrt{\frac{1}{m}\sum_{k=1}^{m}\frac{\sum_i\sum_j\left(d_{ijk}^2 - O_{ijk}^2\right)^2}{\sum_i\sum_j O_{ijk}^4}}$$

This algorithm of scale method optimized the squared distance to the square data of the origin. The S-Stress value was calculated by the following formula:

Low S-stress value indicated high accuracy (good fit), while high S-stress value revealed poor accuracy (poor fit). The size commonly used as a reference was if the value of S-Stress was less than 0.25, then the model of sustainability was considered to be good fit. However, if it was more than 0.25, it was meant that the model was poor fit.

b) Assessment of Sustainability Status

According to (Pitcher and Preikshot, 2001) classified and mapped the results of the sustainability measurement of each dimension's attributes into two points: bad-down point and good-up point. Classification or assessment of sustainability status was divided into four kinds and shown in Table 2.

Table 2. Category of Sustainability Status

No.	Index Value Dimension	Category	Description
1	00,00-24,99	Bad	Not sustainable
2	25,00-49,99	Less	Less sustainable
3	50,00-74,99	Fair	Quite sustainable
4	75,00-100,00	Good	Sustainable

Source : Pitcher dan Preikshot (2000)

Results and Discussion

The sustainability of the Resilient Coastal Village Development Program in Sitiarjo, Tambakrejo and Sidoasri villages was analyzed by Multidimensional Scaling statistics techniquesmethod using Rapfish assistance. In this analysis, three dimensions were used to measure the sustainability of ecological dimensions (9 attributes), socioeconomic dimensions (9 attributes) and institutional dimensions (5 attributes). A summary of the results of the Multidimensional Scaling statistics techniques-Rapfish analysis for those three dimensions is presented in Table 3.

References used as a basis for determining the goodness of the results of analysis (Goodness-of-fit) in the Multidimensional Scaling statistics techniques were as follows: the value of Stress was less than 0.25 and R-square was more than 0.90. Based on Table 1, the value of the three-dimensional Stress used was smaller than 0.25 as well as the R-Square used that showed value above 0.90. Thus, it could be said that this Multidimensional Scaling statistics techniques analysis met the Goodness-of-fit criteria so it was worthy to be discussed / analyzed further.

Table 3. Summary of Multidimensional Scaling statistics techniques -Rapfish Analysis Results

Dimension	Stress (S)	R-Square (R)
Ecological	0.1915	0.9007
Socio-economic	0.1918	0.9124
Institusional	0.2174	0.9028

Ecological Dimension

The results of the Multidimensional Scaling statistics techniques analysis for the sustainability status of the ecological dimension are presented in Figure 1, while the sensitivity (leverage) of each ecological dimension attribute is shown in Figure 2.

From Figure 1 it was known that the ecological dimension sustainability status index was 31.91. This value was in the range of 25 - 49.99 which meant less sustainable. In other words, the ecological conditions in the research area did not support the sustainability of the Resilient Coastal Village Development Program. To improve the ecological sustainability status of a resilient coastal village development program in South Malang; one such al-

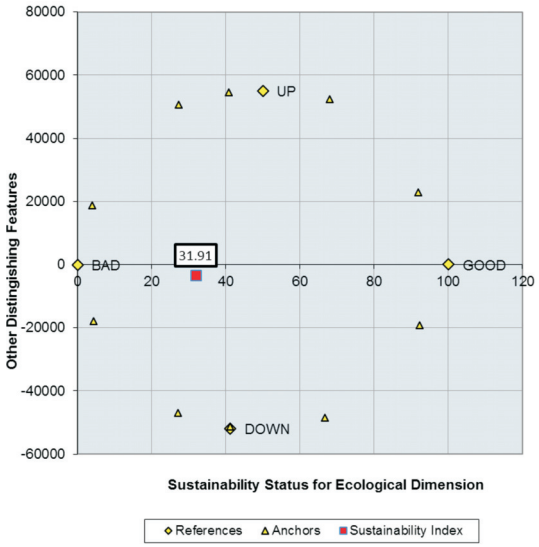

Fig. 1. Sustainability Status of Ecological Dimension

ternative developed in Nongbua-Lamphu province was a residential model for environmental conservation services. Home villages were developed for eco-conservation tourism services. Thus, it could develop knowledge, attitudes, and behaviors in the community's environment conservation by experiencing of staying at home. These people were deemed to have the awareness and responsibility for sustainable environmental conservation in the future. Sustainable village development models needed to be developed through scientific research (Kongpet *et al.*, 2014).

Based on Figure 2, the ecological dimension attributes that greatly influenced the sustainability of this dimension were environment quality, ecosystem diversity, species diversity and rehabilitation area. That was indicated by the leverage values of those attributes which were larger than the other attributes. From the attributes mentioned previously, it could be concluded that to improve the sustainability of the ecological dimension were requiring the improvement of the quality of the environment, the diversification of ecosystems, and the development of rehabilitation areas. These improvements involved a big amount of fund and certainly demanded support from following stakeholders: central government, local government, investors and local communities. Proactive or creative local governments' attitudes in accessing development funds would determine the villages' condition whether the part of the regions was prosperous or it might have shortage on development programs (Mihalache, 2016).

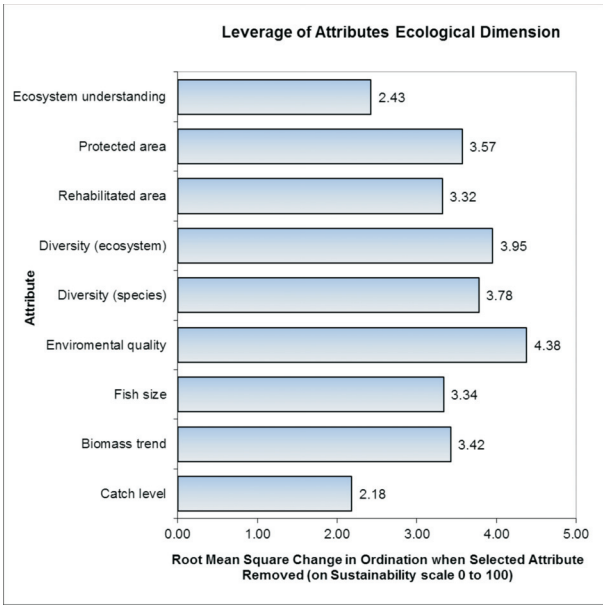

Fig. 2. Sensitivity of Ecological Dimensions Attributes

The low ecological dimension of the results of this analysis showed the environment exploitation solely for economic purposes, so that it could beinserted on sustainability classification but unfortunately it failed on keeping the balance and maintenance. It was in accordance with the research results conducted by [11], that rural households in the mining area had either positive or negative experience of coal mining activities. The mine expansion had been provided employment for local people through direct or indirect approach which helped to improve the financial as well as physical capital of the city. On the other hand, the reduction in the provision of ecosystem services due to the adverse effects of coal mining produced lower harvest number in traditional livelihood activities that involved forests, agriculture, and livestock. Stakeholder approaches were encouraged, to improve ecological productivity and coastal biodiversity (Lodhia, 2012).

Another example was the case in the coastal zone of Bangladesh that designed an integrated management system of Bangladesh's coastal zone for sustainable development. This model could be used to help policy planners to assess various policy issues and design. Why such model was developed? There were several reasons: a) The dynamics model of integrated coastal zone management system for food and ecological security had been developed; b) This model predicted the development of shrimp aquaculture industry by ensuring high food security but unfortunately it lead into increasing environmental degradation; c) This model also predicted that if the shrimp aquaculture industry was continued to rise and altered itself into super intensive aquaculture shrimp, then the increasing severe environmental degradation would cause the fall of shrimp aquaculture industry; d) This condition would ultimately change the environmentally friendly shrimp aquaculture field so that the shrimp industry would not collapse again since the preceding shrimp production system only stabilized it for a short term; e) Further shrimp production should be considered for long-term system stabilization; f) policies for sustainable development of the coastal zone of Bangladesh and also to address the problem of climate change.

Socio-economic Dimension

The sustainability status of the socio-economic di-

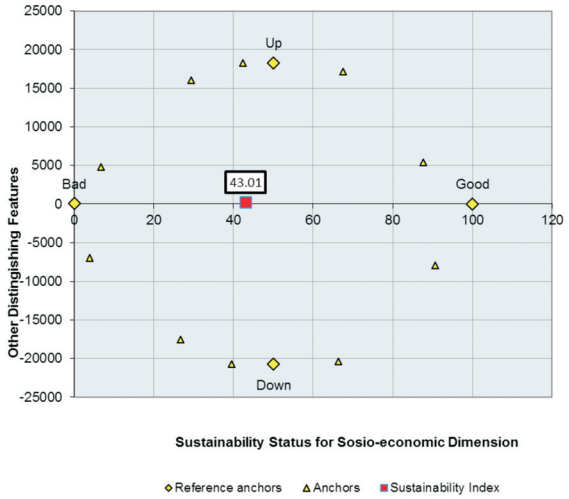

Fig. 3. Sustainability Status of Socio-Economic Dimension

mension is shown in Figure 3. The influence of each economic attribute on the sustainability of the socio-economic dimensionis depicted in Figure 4.

Figure 3 showed that the index of sustainability status of the economic dimension was 43.01, where this value was in the range of 25-49.99, or in other words, it was less sustainable. This meant that the current conditions in Sitiarjo, Tambakrejo and Sidoasri areas were less favorable in terms of socio-economic.

Based on Figure 4, attributes that had high sensitivity to the socio-economic dimension were Equity (inequality of income) and the environment (waste disposal of the community). Or in other words, there was a need of attention and management of the equity gap in the research area as this may hinder the development of the village into the Resilient Coastal Village Development Program. In addition, environmental issues related to the disposal of households' wastes also needed to be handled seriously due to common people's behavior of disposing garbage along the coastal areas, for example, on another part of the world, the coastal areas got high pressure (Turkey). Research activities conducted in coastal areas in order to take decisions were recommended in Kuleli's research (2015).

He stated that the coastal zone was very important for the Turkish national economy and the pressure on the coastal zone was also very high. To create the best decisions due to the increasing pressure on Turkey's coastal resources and its impact on society, the most up-to-date information on resource values was required. From the economic dimension, research results conducted by (Kim, 2014), the analysis showed that multi-use development approaches were better than a single economic goal. Therefore, the scale feasibility factor should be con-

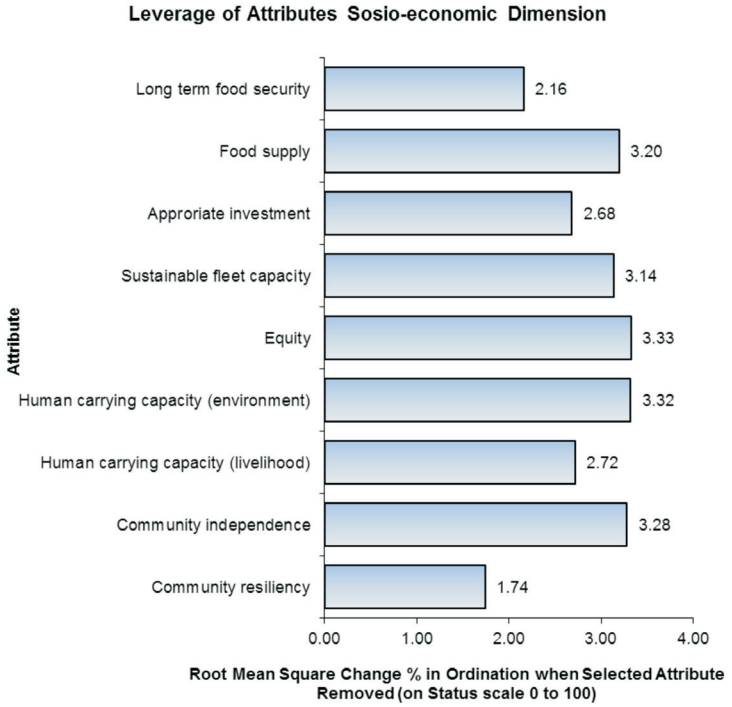

Fig. 4. Sensitivity Attributes of Socio-Economic Dimension

sidered in implementing coastal development projects.

Institutional Dimension

The result of Multidimensional Scaling statistics techniques analysis for socio-cultural dimension sustainability status can be seen in Figure 5, while the sensitivity of each attribute of socio-cultural dimension is presented in Figure 6.

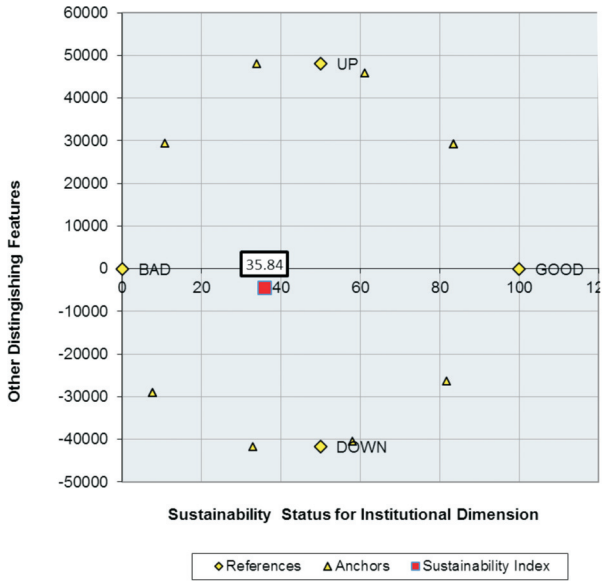

Fig. 5. Sustainability Status Institutional Dimension

From Figure 5, the index of sustainability status of the institutional dimension was 35.84. This index was in the range of 25 - 49.99 which meant less sustainable. In other words, the institutional conditions in the research area were less supportive for Resilient Coastal Village Development Program. They were in Sitiarjo, Tambakrejo and Sidoasri Villages.

From Figure 6 it could be seen that the attribute that greatly influencing the sustainability of the institutional dimension was the use of traditional method or the traditional management of resources and environment; incorporating local input or environmental management that took into account the socio-cultural of the local community. This indicated that in order to improve the sustainability of the development of coastal villages tough Resilient Coastal Village Development Program, it was necessary to improve the management of resources based on local wisdom of local communities. Learning from the results of preceding research in Manado [15], the urban waterfront development was an established urban phenomenon in developed countries based on definite concepts and principles. It enhanced urban design, quality of life and economic development of the city. But from what had had happened in the coast of Indonesia, especially in the Manado's coastal part for the development of urban public space, commercial growth and its development was integrated with city urban development

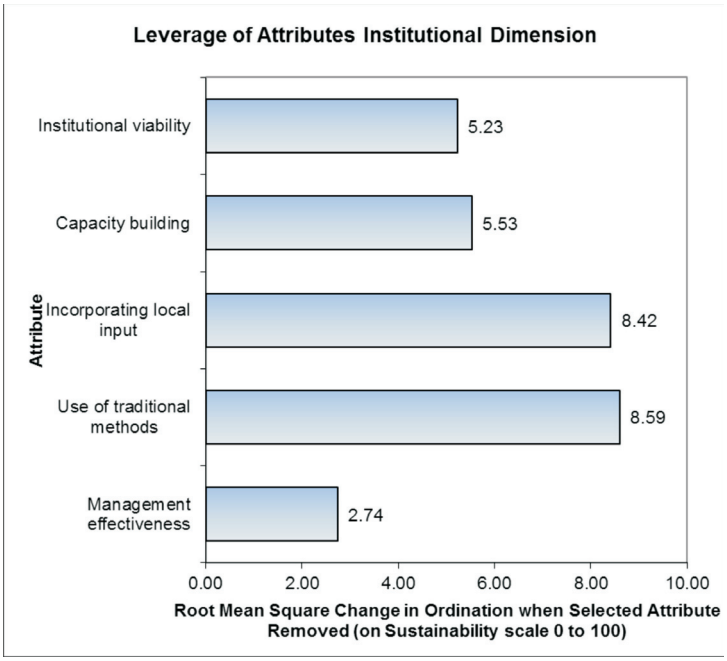

Fig. 6. Sensitivity of Institutional Dimensional Attributes

policy. In reclamation of new land currently used as a commercial area consisting of shops / malls, hotels and luxury housing, the employment of project development would not improve the quality of city life and add an aesthetic appeal but it would reflect certain physical, economic, and social problems. Therefore, this research suggested a back to nature and traditional environmental management; environmental management that took into account the socio-culture of local communities and the improvement of resources management which were based on local wisdom of the local community. Status of Sustainability of Resilient Coastal Village Development Programs when viewed from three dimensions, as shown in Fig. 7.

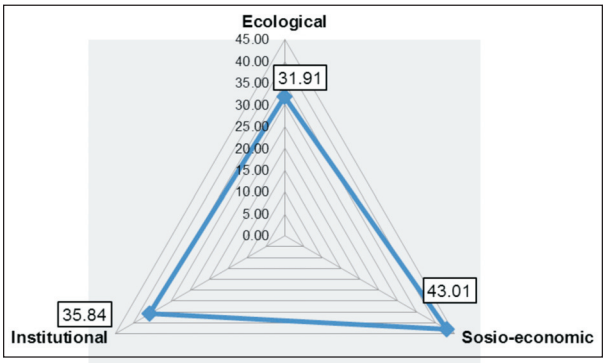

Fig. 7. Trigram Status of Sustainability of Resilient Coastal Village Development Program

Figure 7 showed a combination of three dimensions of sustainable the Resilient Coastal Village Development Program in Sitiarjo, Tambakrejo and Sidoasri villages. On average, the sustainability index value of the three dimensions was 36.92. This value indicated that with the ecological, socioeconomic and institutional conditions existing in the research area. The development of the resilient coastal villages in those three villages were appeared to be less sustainable. The results of research conducted by (Bala and Hossain, 2010) showed that it was the perfect time to design an integrated management system for Bangladesh's coastal zone for sustainable development. This model could be applied to help policy planners to assess policy issues and design policies for sustainable development of Bangladesh's coastal zone and also to address climate change issues.

Based on this trigram, if the index was getting out of or getting closer to 100, it indicated a better sustainability status, on the contrary if it got deeper or closer to 0, it shown a worsening sustainability status. Of the three dimensions, the dimensions that had the worst sustainability index value were the ecological dimension, followed by the institutional and socio-economic dimension. It could be inferred that the immediate action was needed on ecological conditions of all three research areas, as well as the integrated cooperation of institutions that managed coastal areas in Sitiarjo, Tambakrejo and Sidoasri villages. If it showed a worsening sustainability status, it was regarded that coastal areas were under increasing pressure which ultimately exacerbated economic and social balance such as the research by (Sundblad and Bergstrom, 2014), had shown the pressure on coastal ecosystems was increasing. Coastal development is a factor that had a dramatic effect on near-shore habitats in the last century and was one of the major threats to biodiversity. The same thing is conveyed by (Harahab *et al.,* 2018), regarding the vulnerability analysis of mangrove forest status as a tourism area, that mangrove ecosystems as tourist areas are very vulnerable to the socio-economic and population dimensions, and community participation. Researchers estimated annual habitat degradation due to the impacts of coastal development in relation to fish habitat. The enhancement of institution's role was one of the ports needs to be studied deeper. Whereas, the influencing factors according to (Kizielewicz, 2014), that in the world, various models of seaport management had been developed and their shape was affected by various factors: legal, historical, ownership of port area as well as economic factors and technical solutions.

Conclusion and Suggestions

The greatest influence to improve the sustainability of the ecological dimension was the improvement of environmental quality, diversification of the ecosystem and the development of rehabilitation areas, on the socio-economic dimension were equity (equity of income) and environment (household waste disposal), on the institutional sustainability dimension were the use of traditional method or traditional management of resources and environment the incorporation of local input or environmental management that took into account the socio-cultural of the local community.

The combination of three dimensions (ecological, socio-economic, institutional) of the Resilient

Coastal Village Development Program, the average value of sustainability index of those three dimensions was 36.92 (less good). The composition of dimensions, starting from the worst were ecological (31.91), institutional (35.84) and socioeconomic (43.01).

Suggestions

1. In order to improve the sustainability of the ecological dimension, it is necessary to improve the quality of the environment, diversify the ecosystem and develop the rehabilitation area.
2. Environmental issues related to household waste disposal are in need to be handled seriously. It is mainly because of public's behavior. Often times, people are disposing their garbage along the coastal areas.
3. In order to improve the sustainability of the development of a resilient coastal village (Resilient Coastal Village Development Program), it is necessary to expand the management of resources based on local wisdom of the local community.
4. In order to improve the sustainability of the Resilient Coastal Village Development Program, it is necessary to continue the commitment of the Resilient Coastal Village Development Program with a primary focus on improving the ecological dimension.

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