

## Coastal Ecosystem Restoration Based on "Good Governance": Case Study Gresik and Malang Regency, East Java Province

Rudianto<sup>1)</sup>, Edi susilo<sup>1)</sup>, Ade Yamindago<sup>1)</sup>

<sup>1)</sup> Faculty of Fisheries and Marine Science, Brawijaya University

E-mail : [haji\\_rudianto@yahoo.com](mailto:haji_rudianto@yahoo.com)

### ABSTRACT

This study is focused on the institutional aspects as an essential prerequisite to the integration efforts of the coastal ecosystem restoration in Gresik and Malang regency. The purpose of this study was to perform coastal restoration with a "good governance" focus as a means of coastal restoration.

The method to be used is to use Interpretive Structural Modeling (ISM) and Analytical Hierarchy Process (AHP). ISM is an interactive design methodology to develop structures that describe the relationship between elements. While AHP is a framework for effective decisions on complex problems.

The results of this study is to show the formulation of the seven (7) priority structure. While the master plan drawn up leading to the respective roles of the stakeholders at the village level, district level, district level and provincial and national levels. While the preparation of the action plan was drawn up with reference to the 9 (nine) step restoration management in an integrated manner.

**Keywords:** Integrated Coastal Ecosystem Restoration, the Master Plan, the Action Plan, ISM.

### INTRODUCTION

The coastal area is currently estimated at nearly 70% suffered severe damage. Mangrove ecosystems, coral reefs, estuaries and sea grass beds have been unable to function properly, so that the coastal

ecosystems cannot provide optimal service to the public. Causes of coastal damage is caused by natural and anthropogenic factors (Diposaptono, 2011). Damage caused by natural factors is earthquakes, tsunamis, hurricanes, floods, el-Nino, heating, predators, erosion. Damage caused by natural factors can occur naturally or as a result of human intervention to cause natural disasters. Natural disasters such as tsunami often cause many casualties. It caused damage in coastal areas due to sea waves generated by an impulsive disturbance that occurs in the ocean medium. Erosion problems can also be caused by natural processes, human activities, or a combination of both. The cause of the damage is caused by human behavior and it is heavily influenced by the ethics anthropocentrism. This anthropocentrism is a symbol of human greed that is not only individual but can be collective. Exploit human nature and the environment to benefit as much as possible without thinking of the impact that occurred. Effects due to these activities can damage natural resources, especially in this coastal ecosystem.

Rudianto (2014) states that in order to cope with coastal damage, it is necessary for integrated coastal restoration. Restoration efforts require prioritization handling proportionate. The first priority that needs to be addressed is the mangrove, the reefs, the third is the estuary and the fourth is the seagrass. Restoration of mangroves, coral reefs, estuaries and seagrass beds are to

receive widespread attention from the public due to the high socio-economic value and ecology of this ecosystem.

Restoration can raise the value of biological resources such as mangrove and it can prevent damage to the coast, maintaining biodiversity, fisheries production, and provide livelihood opportunities to local residents (Setiawan, 2006). Anwar and Gunawan (2006) showed that mangrove thickness of 200 m with a density of 30 trees/100 m<sup>2</sup> with a trunk diameter of 15 cm can reduce about 50% of the energy of tsunami waves. Based on data in 2002 that as many as 219 districts/town (68%) had allegedly coastal areas and 70% of coastal areas were damaged. If the beach is damaged continuously, then there will be pressure on the carrying capacity of the coast which is likely to interfere and it reduces the function of the beach.

The total area of the coastal district of Malang damaged is estimated 165 hectares. Condition of severely damaged mangrove area of 47.96%. While the conditions were slightly damaged mangrove area of 29.4 hectares or 8.54%. Coastal conditions were pretty good area of 150.1 ha. Malang regency coastal areas in the south is identified damage. Damage to mangrove forests causes severe abrasion and it is causing coastal damage. Malang district government through the department of Marine and Fisheries stated that the extent of damage Sendangbiru beach in the village Tambakrejo suffered considerable damage, if it is compared with the level of damage to the other shore. Efforts to address coastal damage in Malang regency done by planting mangroves of the year 2008 - 2012 covering an area of 20.8 hectares. It has been rehabilitated through 2012. Estuarine conditions in Malang regency are also very

concerned with the high attrition rate and high sedimentation process.

Office marine, fishery and livestock Gresik stated that coral reefs in Gresik area suffers from damaged with wide of 85.5 ha and it is estimated that almost half of them are already badly damaged.

Many of the reefs suffered from coral bleaching. Sea pollution level is high enough. This is because many vessels discard garbage such as oil and industrial waste into the sea. While the mangrove ecosystems were damaged, especially in the district of Bunga and sub-district of Ujung Pangkah. Mangrove damage occurs approximately 20.75% with moderate to severe category in Gresik regency.

Estuarine conditions in Gresik regency is shown heavily polluted area, where chemical and physical processes that occur are affected by the multi activities surrounding waters. One of the activities is a source of pollution of the pond. Value content of BOD<sub>5</sub>, DO and nitrate are very high which probably derived from the process of decomposition of organic material in the form of food remains, the rest of the metabolism of fertilizer. Besides the waste of households and industry is also affecting water quality in the estuary (Supriyadi, 2002)

Therefore, if the coastal restoration efforts will be made either in Malang regency and district Gresik, then some fundamental issues related to the integrated restoration efforts that need to be considered are: a) how to formulate the institutional model-based "Good Governance"; b) how to prepare master planning of coastal restoration for 5 (five) years; and c) how the preparation of an action plan. Based on these problems, then compiled the following research objectives: a) to formulate institutional model based on

"good governance" to apply the strategy of integrated management of ecosystem restoration; b) draw up a master plan (master plan) for 5 (five) years; and c) draw up an action plan (action plan) institutional model based on "good governance".

### METHODS

Scope of this research is focussed on preparing the model based on "good governance". It is applied to a strategy for the integrated management of the coastal ecosystem restoration that has been compiled in previous studies (Rudianto, 2014). Institutional model leads to an increase people participation, awareness, ownership, needs and hope. It is also to increase the capacity of the community participation, and the decision making process, as well as to increase the benefits for individuals and communities.

Orientation institutional model leads to increased participation, awareness, ownership. Besides, the institution needs to be directed also to the following matters: a) needs and expectations; b) the capacity of communities to participate; c) the decision-making process; d) benefits for individuals and communities to actively participation; e) how the institutional and legal regulations. Law enforcement to control the violations need to be done in a sustainable manner. Public awareness program for law-abiding

become important. Thereby the capacity of the community can be formed to encourage people to be more in line with the law and regulations. Techniques and data analysis to establish the institutional model based on good governance. It requires a lot of stakeholders to participate restoration. Broadly speaking, it can be formed three groups of stakeholders namely the government, private sector, and local residents. Therefore it takes several stages of exploration and analysis processes both qualitatively and quantitatively in building the institutional model. The process of analysis in this study using Interpretive Structured Modeling (ISM) and Analytical Hierarchy Process (AHP).

Methods of Interpretive Structural Modeling (ISM) is an interactive planning methodology that allows a group of people to work as a team to develop a structure that describes the relationship between elements (Bolanos, et al., 2005). Technically, ISM method is done by changing the hierarchy obscurity to become more visible. The model is well defined for better strategic planning. Unlike conventional methods, it requires the respondent to simply assess the importance of key issues, Interpretive Structured Modeling (ISM) to force policy makers to consider the relationship between the key issues (Ketkar, et al., 2012).

**Table 1.** Factors hindering the formation of Institutional Models.

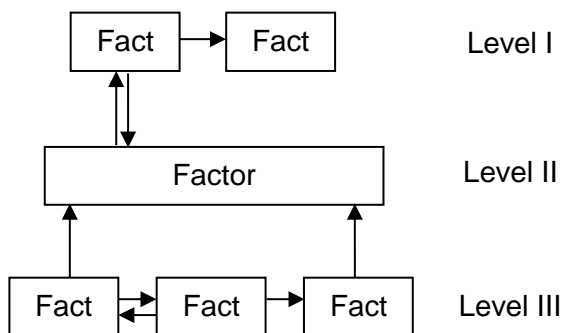
No	Obstacle factor	1	2	3	4	5	6	7
1	Overlapping policies							
2	Stages in the level of government bureaucracy							
3	Not conducive Rules							
4	Limitations human resources development							
5	Understanding the limitations of society							
6	Financial constraints							
7	Lack of infrastructure							

**Table 2.** Factors Supporting Establishment of Institutional models.

No	Supporting factors	1	2	3	4	5	6
1	Local law on institutional						
2	Parliament Supporting						
3	The existence of political will						
4	Shared commitment						
5	The attitude of mutual cooperation						
6	Public awareness to restore coastal area						

**ISM Model Shaping.**

The division level of ISM model sets up the hierarchical model ISM with level I up to the top level. The first combining results is included in Level I, and it combining both included in Level II. It obtains some level of hierarchy. The description of the model hierarchy ISM as follows:



**Figure 1.** Hierarchy Model ISM.

AHP is a framework to take decisions effectively on complex problems by simplifying and accelerating the decision-making process. AHP method is used to solve the problem into its parts and arranging parts or these variables in a hierarchical arrangement. It also gives a numerical value on the subjective judgment of the importance of each variable and synthesize these various considerations. It is used to set the variables which have the highest priority and act to affect the outcome of the situation. AHP is also combines the strength

of feeling and logic on various issues. Then, it was synthesized to various considerations are diverse, so the results are in line with forecasts. It is intuitively will produce a judgment that has been made (Saaty, 1993).

In this study, the method of analysis using AHP is carried out as a follow up of the hierarchy ISM formed. From the analysis of AHP, it obtained the weight of priorities and alternatives illustrate the synergy of government, private sector, and local communities. Step-by-step process by using AHP analysis in this study are as follows: (1) establish a hierarchy of problems based on the model used ISM as a hierarchy in the AHP; (2) setting priorities and alternative priority criteria for each element of an expert opinion or policy makers and transformed it into a pairwise comparison matrix form; (3) testing the consistency and weight matrix that illustrates the priority that it paired comparison test consistency. Then it was done calculation of weighted priorities and criteria for determining the factors prioritized along with alternatives.

**RESULT AND DISCUSSION**

To arrange an institutional strategy, it uses the IDM after found respondents about the priority goals and strategies of integrated coastal ecosystems in order to restore biodiversity to the integrated restoration approach, it was done with a strategy that uses methods Interpretive

Structural Modeling (ISM). The purpose of which has been prepared in previous studies (Rudianto, 2014) include: (1) to improve the management of the restoration of mangroves, coral reefs, estuaries and sea grass beds; (2) to increase the resilience of coastal areas to natural disasters and mitigate conflict in coastal areas; (3) to preserve coastal ecosystems based community participation; (4) to increase the sources of funds from government and non-governmental; (5) to enhance the institutional capacity and to improve the quality of human resources, and (6) to improve the competitiveness of coastal increase value-added products to facilitate MP3I.

To achieve the first goal of improving management of the restoration of mangroves, coral reefs, estuaries and sea grass beds, the strategy will be drawn up covering four strategies, namely: (a) improving approaches to managing coastal ecosystems by giving priority to the restoration; (b) preparing a master plan recovery; (c) the provincial government establish guidelines for the restoration of coastal ecosystems; (d) involve the participation of local communities in the management process. To achieve the second goal of improving the resilience of coastal zones to treat natural disasters and reduce conflicts in coastal areas, the strategies include: (a) the role of a local forum to plan, manage and control the activities of natural disaster and recovery; (b) Program to prevent abrasion, erosion and sedimentation in coastal areas; (c) to prevent mangrove deforestation activities other purposes; (d) the early warning system for natural disasters coast; (e) the participation of local communities; (f) The Government of coordination with the community and the private sector; (g)

allocate the budget of the government, local self-reliance and private (corporate social responsibility).

To achieve the third goal of preserving coastal ecosystems is based on community participation which include: (a). avoiding reclamation activities; (b) prohibiting the use of bombs and toxic materials such as cyanide to all forms of fishing; (c) formulating compensation costs for all stakeholders involved in coastal use; (d) restoring and rehabilitation and conservation of mangrove forests on a regular basis; (e) encouraging the participation of the community to preserve coastal ecosystems through public awareness; (f) determining the protected areas in accordance with the master plan of the coast. To achieve the fourth goal of increasing sources of funds from government and non-government namely: (a) exploring the sources of funds from various sources: government, public and private; (b) planning and preparing a funding strategy for the implementation of the restoration of coastal ecosystems; (c) preparing a strategic plan in the medium-term recovery plan. To achieve the fifth goal of improving institutional capacity and improving the quality of human resources covers: (a) making a non-governmental forum which is consisting of members from government, the public and private sectors to deal with to maintain coastal restoration; (b) increasing the inclusiveness, transparency, and accountability in the management of public resources at all levels of government; (c) formulating strategies to overcome institutional restoration of coastal ecosystems, and (d) providing guidelines for institutional improvement and optimization. To achieve the sixth goal covers: (a) improving the competitiveness of coastal areas by increasing the value-added products to facilitate MP3I; (b) improving the investment climate in the coastal areas

will be through debottlenecking, regulations, incentives and accelerated development of infrastructure needed by all stakeholders; (c). strengthening inter-island connectivity in terms of regional trade supply infrastructure, and restoration of coastal ecosystems; (d)

encouraging small and medium enterprises to increase the production of the coast; (d) improving productivity, innovation and creativity, driven by the science and technology.

**Table 3.** Matrix SIM Element Main Objectives.

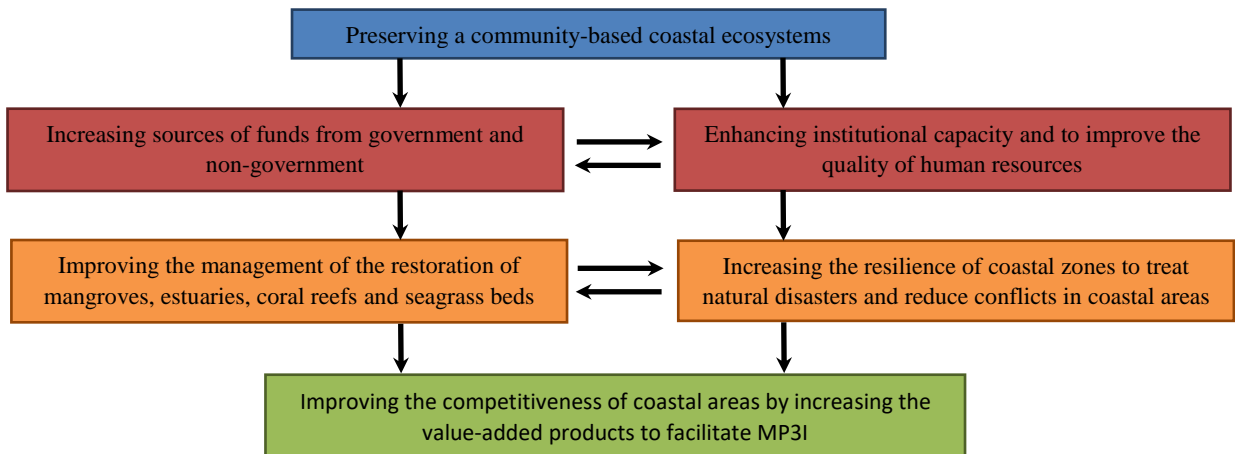
MAIN OBJECTIVES (I / J)	1	2	3	4	5	6
1. Improving the management of the restoration of mangroves, estuaries, coral reefs and sea grass beds.		X	A	X	A	V
2. Increasing the resilience of coastal zones to treat natural disasters and reduce conflicts in coastal areas.			A	X	A	V
3. Preserving a community-based coastal ecosystems.				V	V	V
4. Increasing sources of funds from government and non-government.					X	X
5. Enhancing institutional capacity and to improve the quality of human resources.						V
6. Improving the competitiveness of coastal areas by increasing the value-added products to facilitate MP3I.						

Based on Table 3 above, it arranged reach ability matrix and Driver Power, as shown in Table 4 below:

**Table 4.** Reachability Matrix on the Element Main Objectives.

THE MAIN PURPOSE	1	2	3	4	5	6	Driver Power
1. Improving the management of the restoration of mangroves, estuaries, coral reefs and seagrass beds	1	1	0	1	0	1	4
2. Increasing the resilience of coastal zones to treat natural disasters and reduce conflicts in coastal areas.	1	1	0	1	0	1	4
3. Preserving a community-based coastal ecosystems.	1	1	1	1	1	1	6
4. Increasing sources of funds from government and non-government.	1	1	0	1	1	1	5
5. Enhancing institutional capacity and to improve the quality of human resources	1	1	0	1	1	1	5
6. Improving the competitiveness of coastal areas by increasing the value-added products to facilitate MP3I	0	0	0	1	0	1	2

Based on the score Driver Power, formed the main goal attainment sequence scheme as seen below:

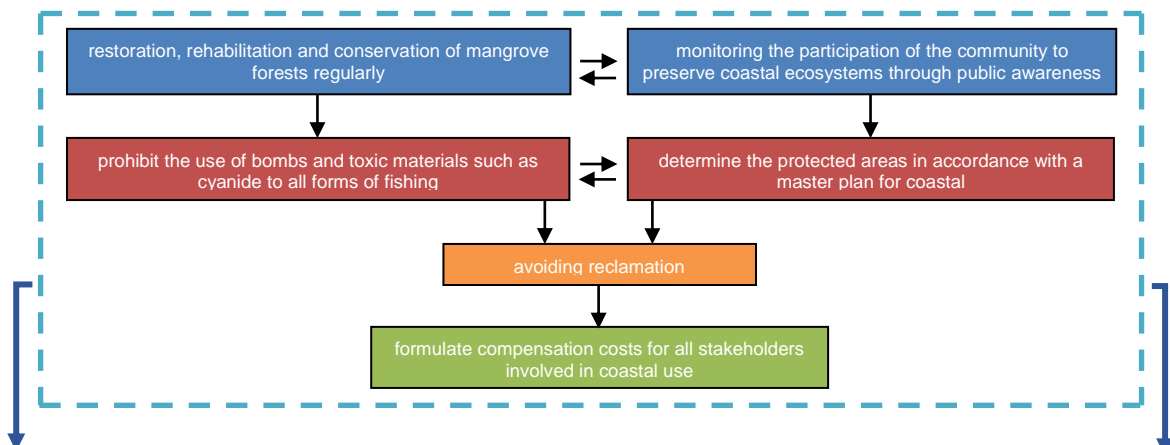


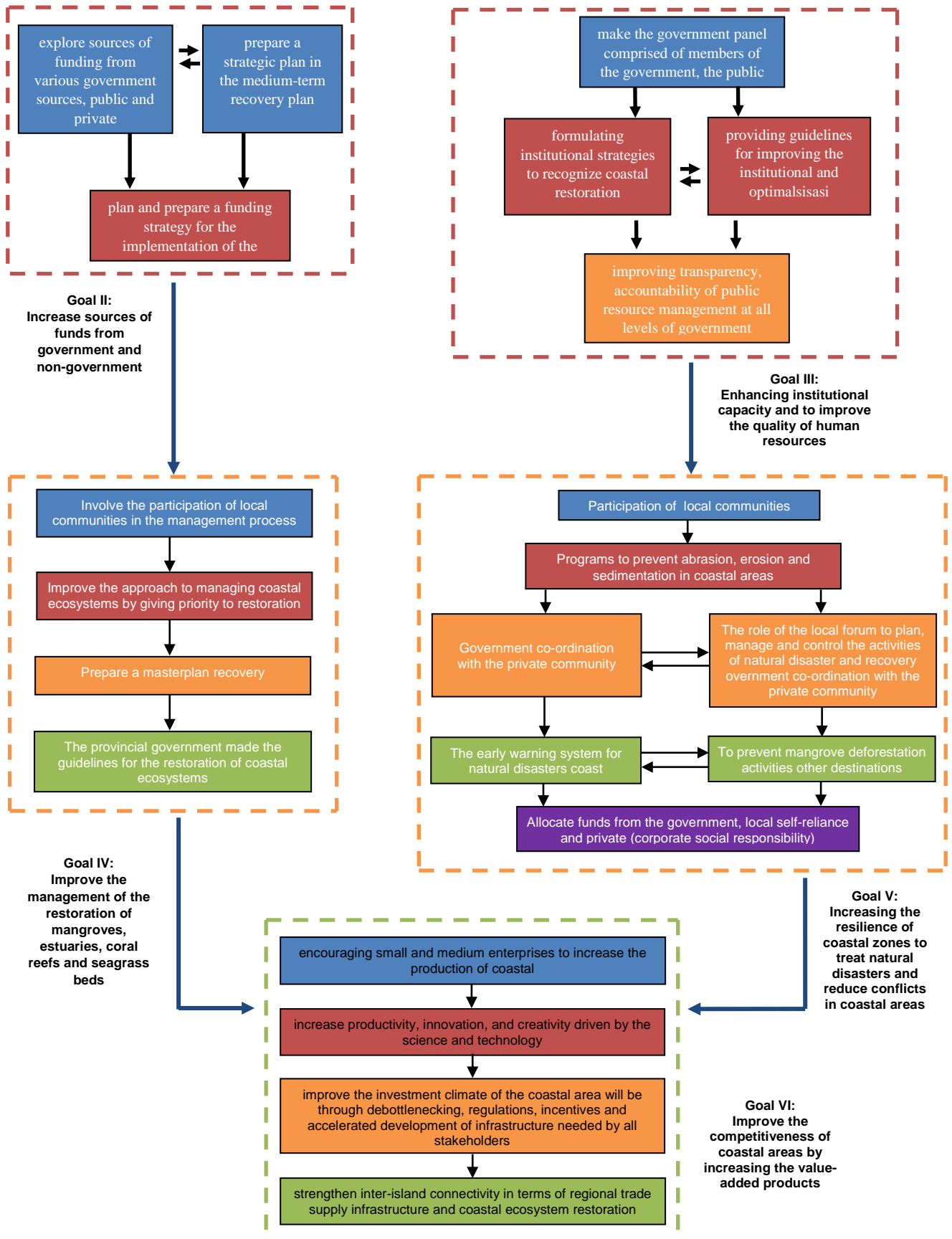
**Figure 2.** ISM Model on Main Objectives.

In Figure 2 above, it is mentioned strategy to preserve coastal ecosystems based on community participation. Therefore, it should begin by increasing sources of funds from government and non-government. In line with such strategy, it need to improve the institutional capacity and to improve the quality of human resources becomes very strategic. In order to increase the sources of funds from government and non-government need to improve the management of restoration of mangroves, coral reefs, estuaries and sea grass beds. Meanwhile, to improve the institutional capacity and human resources strategy is required to increase the resilience of coastal areas to natural disasters and to mitigate conflict coastal areas. To implement such strategies, it is necessary to increase regional competitiveness by increasing added value of coastal resources.

To describe the purpose of 2 to 6 goals with various strategies, including strategies that whichever of precedence, the necessary preparation: 1). SSIM matrix on the main goal; 2) then compiled Reach ability matrix of each element of strategy; 3) developing the model ISM to rank hierarchy of the strategy on the score Driver Power. Sixth kemasing main objectives and elaboration of these strategies, then summarized in the integration strategy Based on the the ISM models built on each of the main objectives and strategies, the model ISM in restoring coastal ecosystems in an integrated manner in order to restore biodiversity to MP3EI support integrated restoration approach is as follows:

**Integation Model ISM Restoring Coastal Ecosystems in the Context Restores Integrated Biodiversity Restoration With Integrated Approach Supporting MP3EI:**



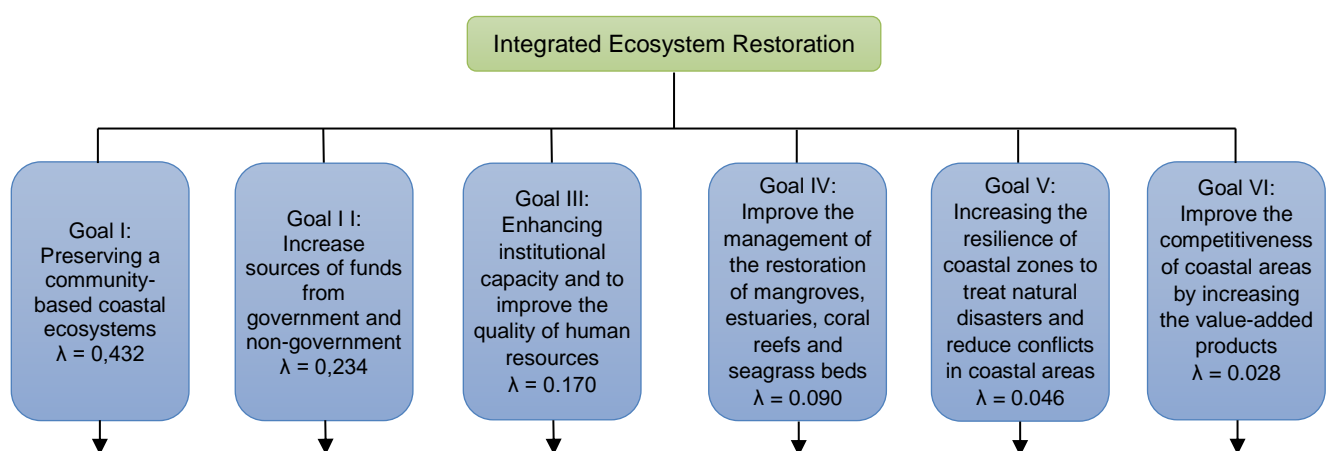


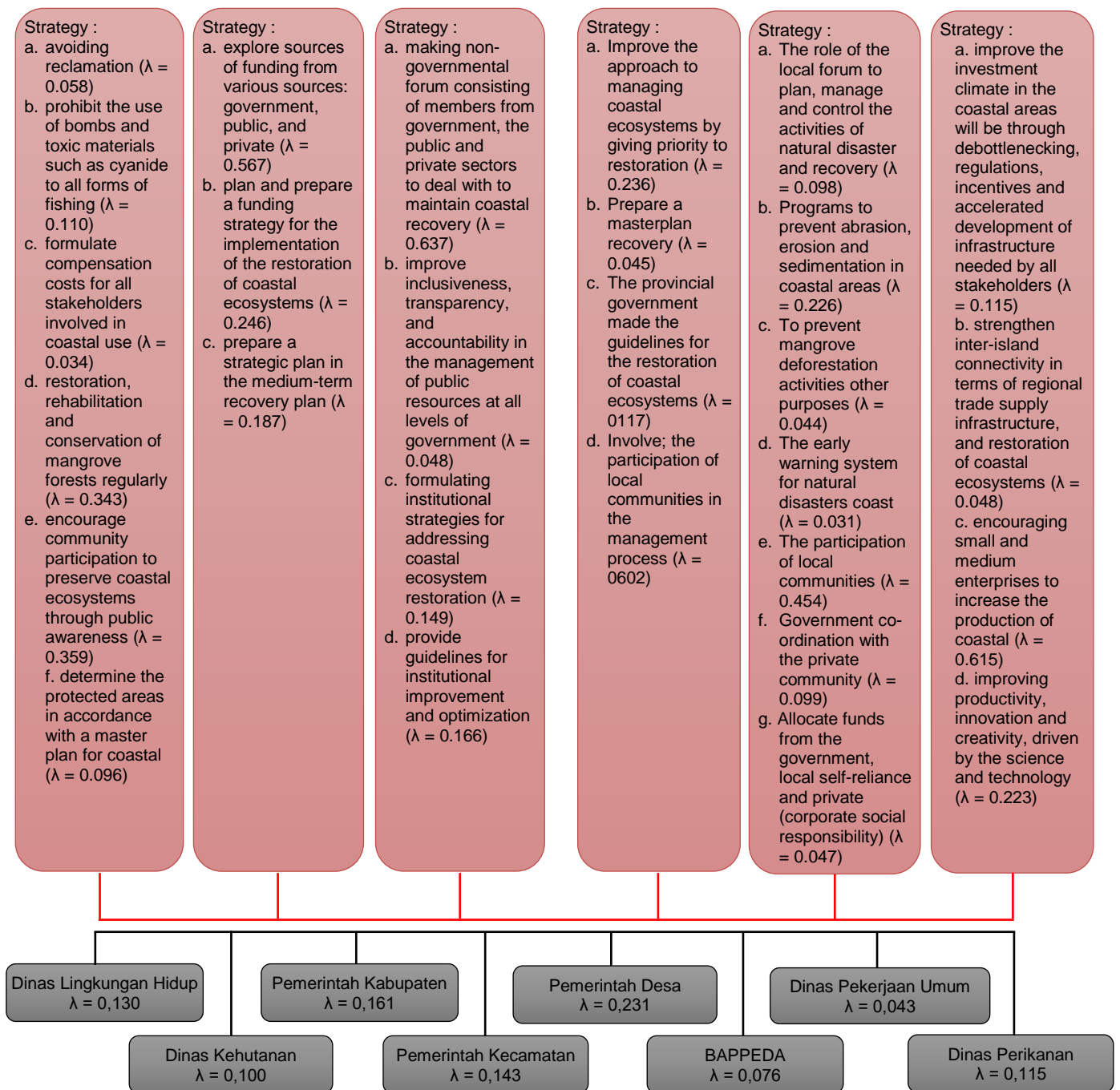


Based on the integration of ISM built models above and to realize the integrated coastal ecosystems' recoverable, it is indicated that the main focus should be prioritized on preserving coastal ecosystems based on community participation. The main focus of such integration is to explain the importance of community participation in various aspects of integrated ecosystem restoration. The second and third focus of the issue is sources funding and institutional aspects. Implementation of integrated restoring coastal ecosystems strategy requires management in a professional manner. Therefore, the budgeted funds can be absorbed optimally both in quantity and quality. The fourth and fifth focus is the management of the coastal ecosystem restoration and to increase the resilience of coastal areas. While the latter focus is improving the competitiveness of coastal areas.

To realize of good governance in an integrated ecosystem restoration, the government is not able to stand alone to carry out of all aspects of restoration activities. The government must involve the public and private sectors participation. Community involvement in the process of restoration of coastal ecosystems can be realized in the process of planning, implementing and monitoring the course of restoration. While the private sector can be involved in financing in the form of Corporate Social Responsibility as well as other forms of funding. In addition, the private sector can also be involved in the implementation process of restoration of coastal ecosystems in the form of experts assistance.

The importance of community participation and the private sector role should be systematically organized, because there are many people have interests in coastal areas to increase their income by building small shops to sell their trades. The role of local government involve to restore coastal area covers: the Forest Service, Department of Fisheries and Marine Resources, Environment Agency, the Department of Public Works, Planning, District Government, District Government, and the Government of the village. The number of agencies that have an interest in coastal areas causing cumbersome bureaucratic process. Therefore, it is necessary to draw up a strategy of institutional models in a systematic way and be able to carry out their duties professionally. Preparation of the institutional model is based on the goals and strategies that have been created in the model ISM. ISM models were developed further by using AHP. The following hierarchy of the institutional model of integrated coastal ecosystem restoration can be seen below:

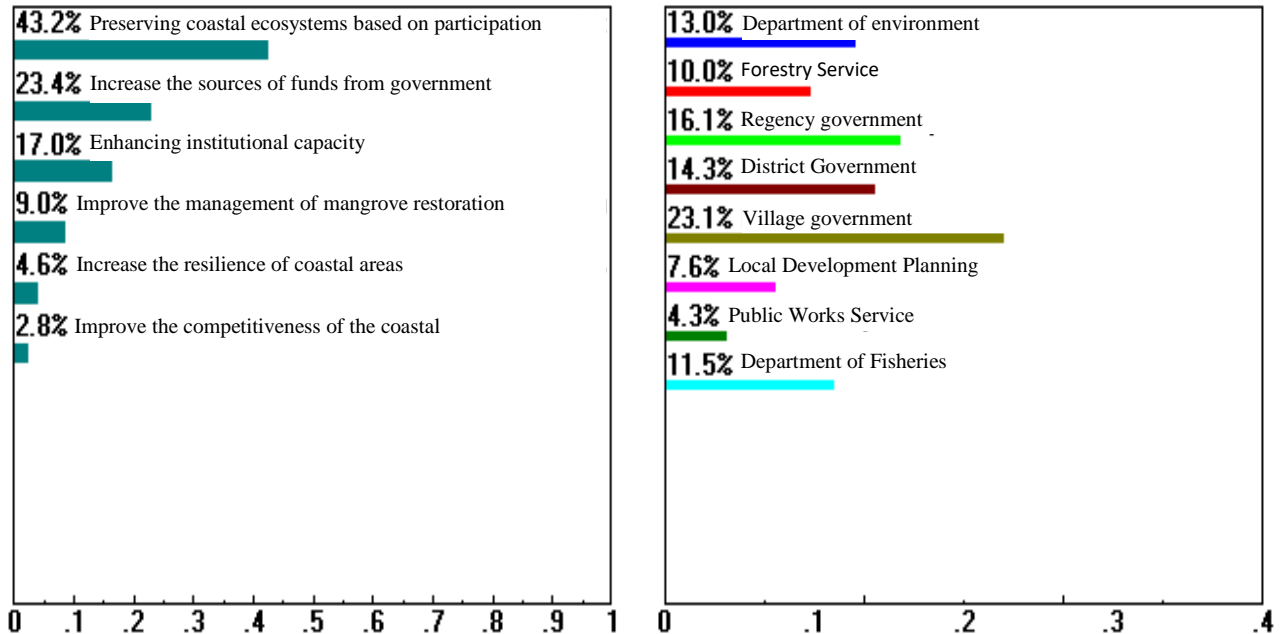




**Figure 3.** Institutional Hierarchy Model Integrated Coastal Ecosystem Restoration

Based on the results of the analysis of the institutional model of integrated coastal ecosystem restoration above on the basis of good governance, it will be explained that the Village Government agencies have the highest priority weight, ie 0.231. Weight of the highest priority in the implementation of the strategy shows that the institutional model in restoring integrated coastal ecosystems to restore biodiversity is supporting the integrated restoration approach MP3EI on the basis of good governance. The village government is a key actor of the whole layer of the strategy adopted. The village government is a government agency that is closest to the people. The closeness can be utilized in an effort to increase interest and public trust in order to

increase participation of coastal communities to organize their neighborhoods region. The three agencies that have the next greatest weight is the District Government, District Government, and the Environment Agency. The following chart comparison of dynamic sensitivity agencies priority in the institutional model:



**Figure 4.** Model of Good Governance in Integrated Coastal Ecosystem Restoration.

The village government is the key actor to restore coastal ecosystems. It means that the forum built up by regency government either Gresik or Malang regency is based on the village level. The forum build covers representative from local people, private and local government. The above figure can be explained that the objectives and strategies for restoring coastal ecosystems with highest score 43,2% called restoring coastal ecosystem based on the people participation. Whereas the village government has the highest value 23,1% compared with other agencies followed by the district government, district government, and the Environment Agency.

### CONCLUSION

1. Model-based institutional good governance oriented to the village government by taking into account the

formulation of 7 (seven) goals with the priority structure as follows: a) goal 1: Preserving coastal ecosystems gradual and sustainable community-based; b) Improving the sources of financing that comes from both the government and non-government; c) Enhancing the institutional capacity of both formal and non-formal as well as improving the quality of human resources; d) Improving management of mangrove ecosystems, coral reefs, estuary and sea grass beds; e) Goal 5: Improving the resilience of coastal areas against the threat of natural disasters and conflict mitigation in coastal areas; and f) Enhancing the competitiveness of coastal areas to improve value-added products facilitate MP3EI program. To six (6) Preparing guideline village government to draw up a master plan and action plan (action plan).

The village government is a priority of government institutions at the district level either Gresik and Malang as the spearhead of the coastal restoration. Institutional model village government level should result in restoration programs related to poverty reduction, sustainable development, capacity building, carbon emission reduction, disaster prepared-ness. Thus, the village government is become the coordinator of the representative forum of interaction between the public, private and governmental.

2. The master plan was drawn up with due regard to the achievement of the priority objectives structure with reference to the village profiles and characteristics. The role of stakeholders that includes the public, private and government is strengthening village institutions to look at internal factors such as human resources, infrastructure, funding, SOP and support from the local government. External factors related to understanding the village government related to the social, ecological, green economy, and institutional called Pokmaswas (a group of monitoring society).
3. To draw up an action plan as an institutional model based on "good governance" organized by having a span of five (5) years with reference to the proposed Community-Based Management of COREMAP (1997). The preparation of the action plan is modified with 9 (nine) steps stages which include: the stages of preparation, planning, preparation of society, public awareness, analysis of needs, skills training for Pokmaswas, planning restoration of coastal and marine integrated and sustainable as well as aspects of the financing.

## REFERENCES

- Anwar, C and Gunawan, H. 2008. Understanding Basic Mangrove. <http://www.dostoc.com> (3 December , 2015)
- Bulanos, R., Fontela, E., Nenclares, A, and Pastor, P. 2005. Using Interpretive Structural Modeling in Strategic Decision-Making Groups. *Journal of Management Decision*, Vol. 43 No. 6 pp 877 - 895 Emerald Group Publishing Limited.
- Diposaptono, S. 2011. Mitigation and Adaptation to Climate Change in the Management of Coastal Areas and Small Islands. Module Certification Training Material Preparation of the Zoning Plan for Coastal Areas and Small Islands in 2011. Bandung: Ministry of Maritime Affairs and Fisheries.
- Ketkat, SP, Shankar, R., and Banwet, DK 2012. Structural Modeling and Mapping of m-Banking Influencers in India. *Journal of Electronic Commerce Research*, VOL. 13 NO. 1 pp 70-87.
- Rudianto, Ismadi, Ade Yamindago. 2013. Integrated Management Strategy Supporting MP3EI Ecosystem Restoration: A Case Study of the Coastal Zone, Malang and Gresik, East Java Province. Brawijaya University. Not yet published.
- Saaty, Thomas L. 1993. Decision For Leaders, Analytical Hierarchy Process for Decision Making in Complex Situations. Management Series No. 134. Jakarta: PT. Pusataka Binaman Pressindo.
- Setyawan, A.D and K. Winarno. 2006. Direct Utilization of Mangrove Ecosystems in Central Java and Land Use in the Area; Damage and restoration efforts. *Biodiversity*. 7: 282-291.