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Institutional Improvement in Supporting the Carrying Capacity of the Kendari City Coastal Area, Indonesia

Abdillah Munawir [1], Edi Rusdiyanto[1], Prabawa Eka Soesanta[2], Siti Umamah Naili Muna[1]
[1]Fakultas Sains dan Teknologi, Universitas Terbuka, INDONESIA
[2]Sekolah Pascasarjana Universitas Terbuka, INDONESIA

E-mail: abdillahmunawir@ecampus.ut.ac.id

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ABSTRACT

This research is an escalating the environmental management of Kendari Bay coastal areas using an interpretatively structural modeling (ISM) technique. The fundamental circumstances of various problems in the coastal areas of Kendari Bay become complex due to the involvement of many interested parties (stakeholders) such as local government, communities, industries, merchants, hotel's owners, and non-governmental organizations (NGOs), and dynamic because the degradation rate of the coastal environment will change over time. This research aimed to seek the institutional roles in terms of concerned institutions, related government policies, and the needed programs in managing the coastal areas of Kendari Bay. Data collection was conducted from August to October 2018. Data were gathered through interviews, observation, and focus group discussions by using a technique of Interpretatively Structural Modelling (ISM). Results of this research exhibit that key elements of prioritized programs were information system development, research and development consolidation, clean the Kendari Bay movement and against pollution socialization, the establishment of community or custom-based organizations, and creating a coastal development agent of the bay. Furthermore, the results of analyzing the institutional key elements in broadening environmental management of Kendari Bay coastal areas were suggested to increase multi-sectors coordination among institutions such as Marine and Fishery Office, Regional Development Agency (*Bappeda*), Settlements and Public Housing Office, Environmental Office, Traditional Leaders, Watershed Management Agency, and Forestry Office. Those institutions in the analysis were hoped to be standard institutions in expanding the management of Kendari Bay coastal areas sustainably.

Key Words: institutional; the carrying capacity; coastal areas; Kendari City.

INTRODUCTION

Kendari Bay is very important both economically and ecologically. Dishidros (2001) states that there is a small island, Bungkutoko, in mouth part of the bay which makes the water circulation in the bay becoming relatively closed. In general, the water depth contour follows the coastal line pattern of the bay with depth variation between 0 to 23 meters. In the western part of the bay, the topography of the bay is flat and relatively shallow with less than 5 meters in depth. Ecologically, this bay possesses a beautiful mangrove ecosystem which supports the tourism activities around the bay. In addition, local communities' activities and public facilities are abundances in the bay such as ports, water transportations, industrial areas, hotels, tourist locations, fishing grounds for fishermen, rowing sports center, and other areas of activities. Hence, this bay is a natural resource and a shared environment (bay user communities) for a bunch of benefits which is bolstered by ecological and economical values. On the other hand, the increasing population and infrastructure establishment result in negative impacts on the sustainability of the waters around the bay. Consequently, over time, environmental degradation is still happening so that it will affect the decrease of the ecological function of the waters in the bay. Therefore, coastal area management of the bay grows into a serious problem that requires handlings fast, precisely, and professionally. According to Hana and Munasnghe (1995), and Ostrom (1992) there are two things which boost people to participate in the development activities namely (a) the existence of encouraging factors, and (b) the presence of a conducive climate or environment. Some encouraging factors are needs, motives, rewards, and availability of infrastructures. Ostrom (1992) further expresses that institution (organization) is a tool that enables the public to be able to be involved or not involved in the development.

Based on the problems and potencies of Kendari coastal areas, it is highly needed the management strategy, promoting and role of institutions of Kendari coastal areas in order to be sustainable. The institution, in this case, can be defined as a form or media or organization and as well as containing definitions about norms, rules, and procedures that organize relationships among human, and even institutional is abstract, complicated, and complex systems (Kartodiharjo., 1999; Munawir *et al* 2020). According to Schmid (1987); Kartodihardjo et al (2004), institutional is a set of provisions that arranges people, where they have defined available opportunities, implied forms of activities that are able to be carried out by certain parties to other parties, privileges which had been delivered, and compulsory responsibilities. This research aimed (1) to seek the institutional roles in terms of concerned institutions, related government policies, and the needed programs in managing the coastal areas of Kendari Bay; (2) to analyze the capacity of involved governmental institutions in overcoming the problems of the bay; (3) to find out the coordinating mechanism among institutions involved in administering the bay; (4) to design an alternative institutional framework management of the bay.

Travel patterns of people and goods in remote areas will influence the climate in that location. The location of the trip using various means of transportation will affect the distance and destination according to the travel time. This trip takes place according to weather conditions, temperature and conditions in the field (Syaiful S et.al, 2022; Syaiful S et.al, 2022; Syaiful S et.al, 2023).

RESEARCH METHODS

Material and Method.

The location and the time of the study

Data and information were gathered in August to October 2018 in coastal areas of Kendari Bay, Southeast Sulawesi Province, Indonesia. Data of this research were collected through interviews, field observation, and focus group discussion (FGD) from seven experts whose expertise were in the fields of the coastal environment. Those experts came from Marine and Fishery Office, Regional Planning Agent (*Bapeda*), Environment Office, Universities, Traditional Leaders, and Non-Governmental Organization in around Kendari Bay. Analysis technique used in this research was interpretatively structural modeling (ISM) to formulate alternative policies in the future. Steps in conducting the ISM is divided into two parts namely arranging a hierarchy and classifying sub-elements (Eriyatno, 2003).

Hierarchy Arrangement

The program which was being analyzed its structure gaps was divided into elements where each element then was disjointed into some sub-elements. After that, contextual relationships among sub-elements were set in a sub-ordinate terminology direction towards a paired comparison conducted by experts. If the number of experts was more than one, leveling was taken. Assessing the contextual relationship in paired comparison matrix used symbols, for example:

- V if $e_{ij} = 1$ and $e_{ji} = 0$; V = sub-element -i must be handled first than sub-element -j
- A if $e_{ij} = 0$ and $e_{ji} = 1$; A = sub-element -j must be handled first than sub-element -i
- X if $e_{ij} = 1$ and $e_{ji} = 1$; X = both elements had to be handled together
- O if $e_{ij} = 0$ and $e_{ji} = 0$; O = both elements were not handled priorities

The definition of eij values = 1 was a contextual relationship between sub-element -i and element -j, while values eji = 0 was not a relationship between the both elements. Results of these orders were arranged in a structural self-interaction matrix (SSIM). This matrix was made in a table of reachability matrix (RM) by replacing V, A, X, and O to become 1 and 0.

Sub-Element Classification

In general, the classification of sub-elements was divided into four sectors such as:

- Sector 1; weak driver-weak dependent variables (Autonomous). Sub-elements in this sector

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were not related to the system, and perhaps they had a little relationship, even though the relationship was probably strong. Sub-elements were categorized into this sector if the DP ≤ 0.5 X, and D ≤ 0.5 X, where X was a total of sub-elements.

- Sector 2; weak driver-strongly dependent variables (Dependent). Commonly, sub-elements categorized into this sector were not independents. Elements that were grouped in this sector if DP ≤ 0.5 X, and D > 0.5 X, where X was a total of sub-elements.
- Sector 3; strong driver- strongly dependent variables (Linkage). Sub-elements that were grouped in this sector should be reviewed carefully, due to the relationship among elements were not stable. Every action on a certain sub-element will be implicated to other sub-element and feedback effects will increase the impacts. Sub-elements that were categorized into this sector if DP > 0.5 X, and D > 0.5 X, where X was a total of sub-elements.
- Sector 4; strong driver-weak dependent variables (Independent). Elements which went into this sector was a remaining part of the system and was styled as independent variables. Sub-elements which categorized into this sector if DP > 0.5 X, and D ≤ 0.5 X, X was a total of sub-elements.

The matrix analysis of classifying sub-elements is figured below (Figure 1).

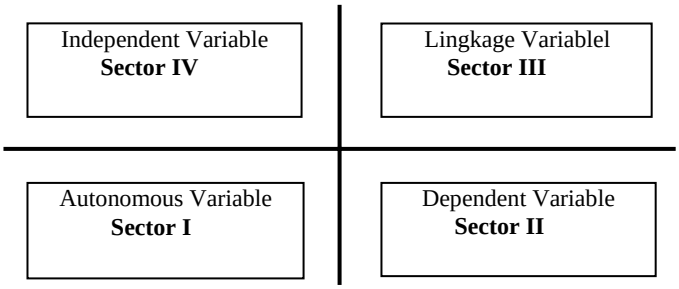

Figure 1. The effect levels and dependence among factors in waste control system of Kendari Bay.

After classifying the sub-elements, descriptive analysis of policies was able to be conducted that was suitable with the field existing conditions and the ISM analysis result by considering some aspects below:

Determining the state of a factor

- the state had to have a great opportunity to be happening (not a dream) in the certain time on the future;
- the state was not a level or measure of a factor (like big/medium/small or good/bad), however a situation description of a factor;
- every state had to be identified clearly;
- if the states came from more than one meaning, the states should be created oppositely;
- further, to identify the smallest opportunity state to happen or mutually incompatible.

Establishing the possible scenario

Steps in setting up a scenario on probably happening factors of the steps were as follows.

- the scenario that had a great opportunity on the future were framed firstly;
- the scenario was a combination of factors; hence it should contain all factors, however, each factor only accommodated one step and did not include mutually incompatible state;
- each scenario (starting from the most optimistic alternative until the most pessimistic alternative) was named;
- choose the most possible scenario was taken.

Scenario Implication

Scenario implication was the last activities that were consisted of:

- the selected scenario in the previous step was discussed its contribution to the study purposes;

- its implication then was discussed;
- last, policy recommendation was set up from arranged implications.

RESULTS AND DISCUSSION

Elements of Implementing the purposes of Coastal Zone Management

Results of analyzing the elements of program objectives that influenced the implementation of Kendari coastal areas management both directly and indirectly were divided into 17 sub-elements. Those sub-elements consisted of objectives in preserving pollution materials, shortening the track of pollution material, scaling up management system of pollution materials, dredging the bay's sediment, cleaning up un-wanted plants, broadening scope areas of environmental restoration, decreasing the erosion, lowering the sediment in the bay's water, establishing a research center, setting up a body of the bay's coastal development, developing community-based organization (CBO), constructing check dam, soil and vegetation conservation, Clean Bay Movement and the socialization anti-pollution, socialization knowledge, developing information system, and combining research and development. These sub-elements were arranged in a reachability matrix hierarchy structure as listed in Table 1.

Table 1. Final structural self interaction matrix (SSIM) in the element reachability matrix (RM)

	Sub element-j																	**Driver Power**	**Ranks**
Sub element-i	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
1	**1**	1	1	1	1	1	1	1	1	1	1	1	1	0	**0**	**0**	**0**	**13**	**3**
2	1	**1**	1	1	1	1	1	1	1	1	1	1	1	0	**0**	**0**	**0**	**13**	**3**
3	1	1	**1**	1	1	1	1	1	1	1	1	1	1	1	**1**	**0**	**1**	**16**	**2**
4	0	1	0	**1**	1	1	1	1	1	1	0	1	1	0	**0**	**0**	**0**	**10**	**6**
5	1	1	0	1	**1**	0	1	1	1	1	0	1	1	0	**0**	**0**	**0**	**10**	**6**
6	1	1	1	1	1	**1**	1	1	1	0	1	1	1	0	**0**	**0**	**0**	**12**	**4**
7	1	1	1	1	1	1	**1**	1	1	1	1	1	1	0	**0**	**0**	**0**	**13**	**3**
8	1	1	1	1	1	1	1	**1**	1	1	1	1	1	0	**0**	**0**	**0**	**13**	**3**
9	0	0	0	0	0	1	0	0	**1**	0	0	1	1	0	**0**	**0**	**0**	**4**	**7**
10	1	1	1	1	1	1	1	1	1	**1**	1	1	1	1	**1**	**1**	**1**	**17**	**1**
11	1	1	1	1	1	1	1	1	1	1	**1**	1	1	1	**1**	**1**	**1**	**17**	**1**
12	1	1	1	1	1	1	1	1	1	0	1	**1**	1	0	**0**	**0**	**0**	**12**	**4**
13	0	1	1	1	1	1	1	1	1	1	0	1	**1**	0	**0**	**0**	**0**	**11**	**5**
14	1	1	1	1	1	1	1	1	1	1	1	1	1	**1**	**1**	**1**	**1**	**17**	**1**
15	1	1	1	1	1	1	1	1	1	0	1	1	1	1	**1**	**1**	**1**	**16**	**12**
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**1**	**1**	**17**	**1**
17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**1**	**17**	**1**
Dependency	**14**	**16**	**14**	**16**	**16**	**16**	**16**	**16**	**17**	**13**	**13**	**17**	**17**	**7**	**7**	**6**	**7**		
Ranks	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**4**	**4**	**1**	**1**	**5**	**5**	**6**	**5**		

The results of those 17 sub-elements as shown at final reachability matrix in Table 1 indicated that there were five key sub-elements of the program goals which should be taken precedence namely developing information system, combining research and development, Clean Bay Movement and

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the socialization anti-pollution, developing community-based organization (CBO), setting up a body of the bay's coastal development. These key sub-elements were very important in developing Kendari Bay coastal area management. Furthermore, the results of the sub-element matrix and classification of calculating the goal matrix analysis of the bay area are presented in Figure 1.

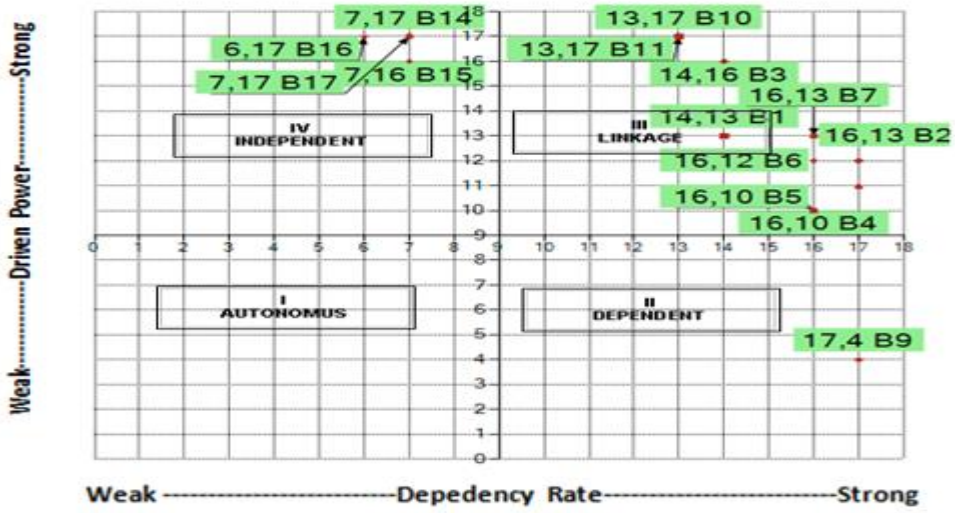

Figure 2. Matrix of Sub-Element and Clasification of Calculating Matrix Analysis

The results of analyzing the matrix exhibitted that nine sub-elements were included into sector II which were categorized as dependent variables that were able to be affected by other sub-elements. Those nine sub-elements were sub-elements such as increasing management system of pollution materials, setting up a body of the bay's coastal development, developing community-based organization (CBO), decreasing the erosion, preserving pollution materials, shortening the track of pollution material, broadening scope areas of environmental restoration, cleaning up un-wanted plants, and dredging the bay's sediment. Meanwhile, the determining factors of the system were four sub-elements namely Clean Bay Movement and the socialization anti-pollution, developing an information system, socialization knowledge, combining research and development, which were categorized into the Sector I that were identified as independent variables. These variables were able to specify all interactions among sub-elements and they could not be influenced by other factors. Setting the hierarchy of priority scales is illustrated in Figure 3.

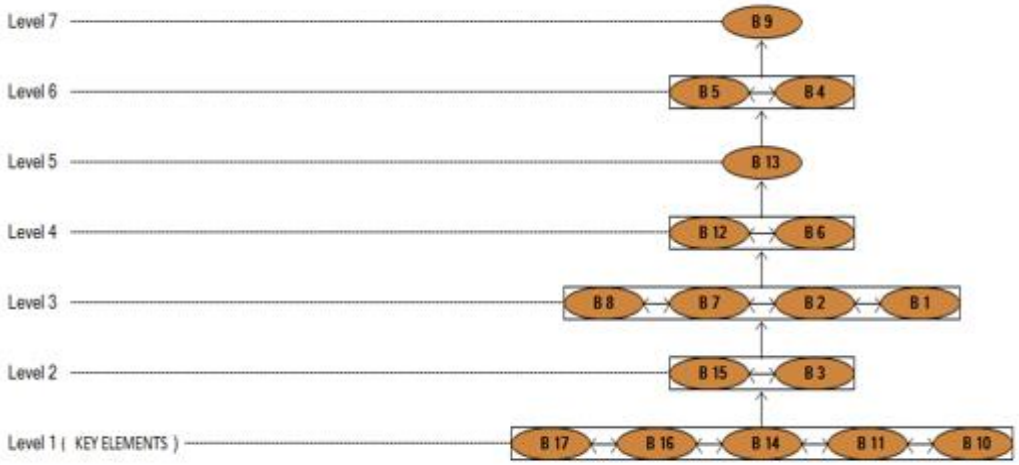

Figure 3. The Hierachy Structural Model Diagram of Kendari Bay Coastal Development Goal Sub-elements

Based on Figure 3, the hierarchy was constructed by seven levels. The first level as the key element consisted of five sub-elements such as developing an information system, combining research and development, clean bay movement and the socialization anti-pollution, developing community-based organization (CBO), setting up a body of the bay's coastal development. The second level was composed of two sub-elements namely increasing the management system of pollution materials and socializing knowledge of Kendari Bay coastal area management. The third level was constituted by four sub-elements such as securing pollution materials, shortening the track of pollution materials, decreasing erosion, and lowering the water-sediment of Kendari Bay. The fourth level was formed by two sub-elements namely broadening environmental restoration, and constructing a check dam in the coastal areas of Kendari Bay. The fifth level belonged to a sub-element namely conserving soil and vegetation, and the sixth level had two sub-elements such as cleaning un-wanted plants, and dredging sediments in the bay, as well as the seventh level was the establishment of a research center.

Based on the results of making up a hierarchy structure in jacking up the sustainability and preserving the unstable environment condition of coastal area, some efforts were suggested to be implemented such developing information system, combining research and development, movement of Clean Bay and socializing anti-pollution, developing community-based organization (CBO), and establishing a research center. This viewpoint provides an explanation that aspects such as social, economic, ecology, technology, infrastructure, and institution, must be considered in trying to secure the sustainability of a certain area (Rustiadi et al., 2003).

Institutional Elements in Managing Kendari Bay Coastal Areas

Setting the actors of institutional elements who were able to play important roles in expanding Kendari coastal areas was described to become 24 sub-elements. Results of the structural self-interaction matrix (SSIM) was filled based on the judgments of expert respondents. Hence, symbols such as V, A, X, and O were able to be replaced by symbol biner (0 and 1) with an existing provision which could reveal the values of reachability matrix (RM) of the final elements. The format of filling the matrix is displayed in Tabel 2.

Table 2. Final Structural self interaction matrix (SSIM) in the reachability matrix (RM) elements

	Sub element-j																		**Driver Power**	**Ranks**
Sub elemen-i	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1	**1**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**19**	**1**

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2	1	**1**	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	**19**	**1**
3	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**8**
4	0	0	1	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**8**
5	0	0	1	1	**1**	1	1	1	1	0	0	1	1	1	0	0	0	1	1	**15**	**5**
6	0	0	1	1	1	**1**	1	1	1	1	1	1	1	1	1	1	1	1	1	**17**	**3**
7	0	0	1	1	1	1	**1**	1	1	1	1	1	1	1	1	**1**	**1**	**1**	**1**	**17**	**3**
8	0	0	1	1	1	1	1	**1**	1	1	1	1	1	1	1	1	1	1	1	**17**	**3**
9	1	1	1	1	1	1	1	1	**1**	1	1	1	1	1	1	1	1	1	1	**19**	**1**
10	0	1	1	1	1	1	1	1	1	**1**	1	1	1	1	1	1	1	1	1	**18**	**2**
11	1	1	1	1	1	1	1	1	1	1	**1**	1	1	1	1	1	1	1	1	**19**	**1**
12	0	0	0	0	0	0	0	0	0	0	0	**1**	1	0	0	0	0	0	0	**1**	**8**
13	0	0	1	0	0	0	0	0	0	0	0	0	**1**	1	0	0	0	0	0	**3**	**7**
14	0	0	1	1	1	1	1	1	1	1	1	1	0	**1**	1	1	1	1	1	**16**	**4**
15	1	0	1	1	1	1	1	1	1	1	1	1	1	1	**1**	1	1	1	1	**18**	**2**
16	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	**1**	1	1	1	**17**	**3**
17	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	**0**	0	0	**3**	**7**
18	0	0	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	**1**	0	**9**	**6**
19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	**1**	**19**	**1**
Dependency	**6**	**6**	**16**	**16**	**14**	**14**	**14**	**14**	**14**	**12**	**12**	**15**	**13**	**14**		**13**	**15**	**14**	**13**		
Ranks	**6**	**6**	**1**	**1**	**3**	**3**	**3**	**3**	**3**	**5**	**5**	**2**	**4**	**3**		**4**	**3**	**3**	**4**		

Table 2 above manifested that the form of institutional becoming key elements in managing the coastal environment of Kendari Bay using interpretatively structural modeling was an institutional collaboration of multi-stakeholders from Marine and Fishery Office, Regional Development Agency (*Bappeda*), Settlements and Public Housing Office, Environmental Office, Traditional Leaders, Watershed Management Agency, and Forestry Office. Results of this ISM analysis were expected to be a standard institutional in managing the coastal areas of the bay. According to Nasir (2016), the institutional strengthening program should be coordinated by the local government. It can lead to creating community-based coastal communities. Those communities then would have mindsets in a conservative direction and maritime development sustainably (Yusuf dan Daris, 2018) and sustainable environmental management (Munawir et al 2019; Sodikin et al 2017). Accordingly, a broader scope of regulations is required to be able to govern all stakeholders involved in it. The intended regulations are local Acts issued by the local government through study results from the Marine and Fishery Office of a certain municipality or regency.

Results of sub-element matrix and classification of calculating the institutional matrix analysis of coastal area management are presented in Figure 4.

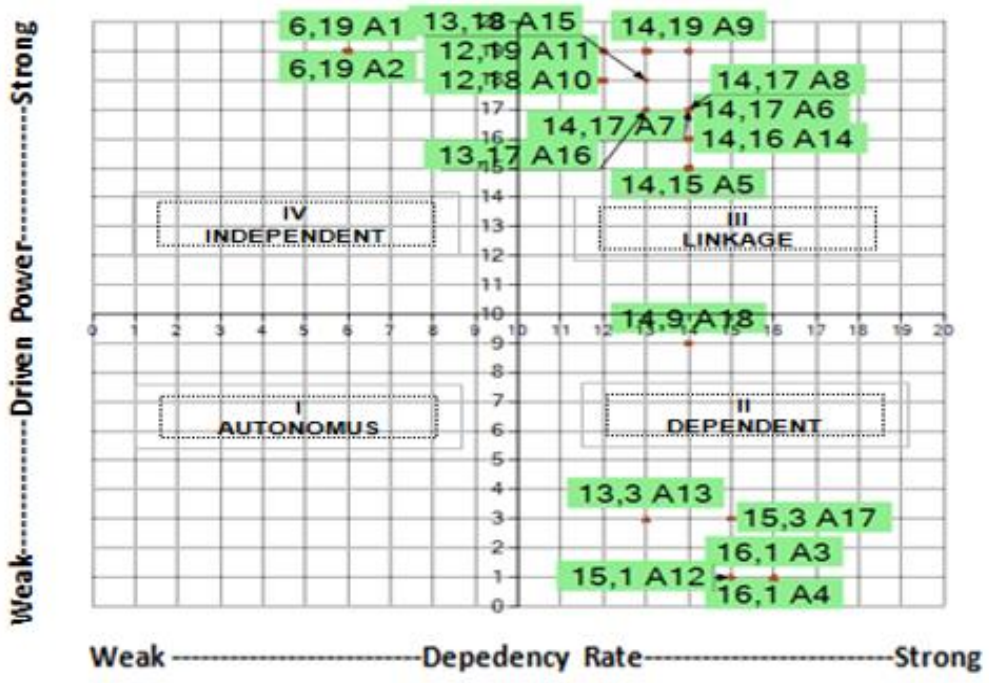

Figure 4. The sub-element matrix and classification of calculating matrix analysis

The Figure 4 indicated that the third sector, *linkage*, was very important due to its elements should be assessed carefully in order to be analyzed easily the benchmarks of success in developing the management of Kendari coastal areas. The sub-elements categorized into this sector were municipality government, community leaders, watershed management agency, Settlement and Housing Office, village government, Forestry and Environment Office, state/private universities, sub-district government, non-governmental organization, and Tourism Office. Paying attention to these sub-elements was crucial because they could contribute impacts on other sub-elements and their feedback effects would increase the impacts. Further, the next important sector was *Independent*. This sector is composed of two sub-elements namely Marine and Fishery Office and Regional Development Agency (*Bapeda*). These two sub-elements possessed strong driving powers to reach the sustainable development of Kendari coastal areas because they were independent variables which could not be influenced by other factors. Moreover, the sector *dependent* consisted of five sub-elements like Health Office, Industrial Office, Regional Revenue Office, State Electricity Enterprise, and roles of private sectors and entrepreneurs. These sub-elements of actors were independent variables that would be always affected by other sub-elements in the system for Kendari coastal area management. Determining the strategic management of Kendari Bay coastal areas is illustrated in a diagram of the hierarchy structural model in Figure 5.

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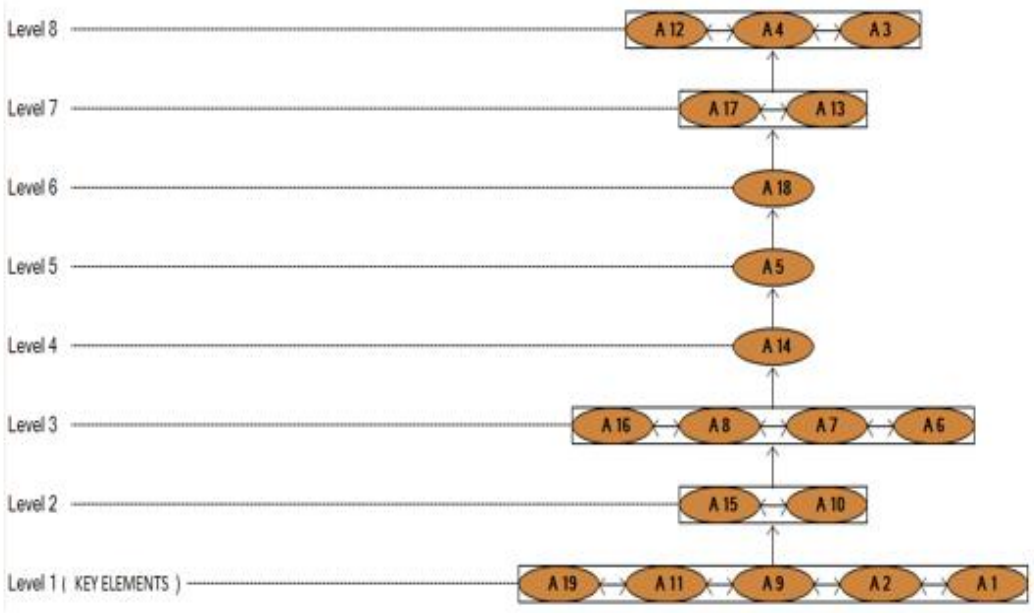

Figure 5. The hierachy structural model diagram of institutional sub-elements of coastal development of Kendari Bay.

Results of the hierarchy structural model diagram in Figure 5 pointed out that the involved institutional elements were the key elements in developing coastal areas of Kendari Bay. Those key elements were Marine and Fishery Office, Regional Planning Agency (*Bapeda*), Settlement and Housing Office, Environment Office, Traditional Leaders, Watershed Agency, and Forestry Office. The results also exhibitted that institutional and management rules were two important aspects of natural resources and environmental management. Institutional is identified by regulations and signs as a guideline used by members of certain community groups to arrange mutual relationships (Ostrom, 1990). Furthermore, Nasution (2002); Yusuf (2016) explains that institutional possesses a definition as a media and a norm. In Indonesian Big Dictionary (KBBI, 2015) styles that regulations are a guideline, principle, and provision, that are created to organize relationships. Other defenition states that regulations are tools containing a number of rules that issued to enforce orders in the social life. The regulations are created to control behaviors and relationships among group members. They can be either written or unwritten forms.

In the case of Kendari Bay, the necessarily prepared anticipation to overcome problems of coastal areas management was to establish law instruments and institutional frameworks in order to escalate integrating resource management of the bay through real coordination and to increase communities and private sector participation in maintaining the sustainability of the bay in the future.

CONCLUSION

The key elements of institutional in the development Kendari coastal areas management through interpretatively structural modeling was highly determined by roles of some institutions such as Marine and Fishery Office, Regional Planning Agency (*Bapeda*), Settlement and Housing Office, Environment Office, Traditional Leaders, Watershed Management Agency, and Forestry Office. (2) The key elements of program goals in managing the coastal areas at the bay in whole were by implementing the development information system, combining research and development, Bay Clean Movement and Anti-Pollution socialization, setting up community-based organizations, and setting up a body of the bay's coastal development. (3) Results of this modeling were expected to become a standard institution in developing the Kendari Bay coastal management that is able to improve the management of the bay which is not the only current condition, but also for a long-term period.

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