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Critical Factors and Institutional Role in Strengthening Capacity of National Parks: Analysis of Meru Betiri National Park, Indonesia Using Interpretative Structural Modeling

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Abstract

There are several factors suspected of ineffective rehabilitation and conservation of the Meru Betiri National Park. These important factors need to be identified to improve the management of the park. The purpose of this study was to identify and examine the relationship between the factors that influence the achievement of rehabilitation and conservation of the park. The method of this research used a systematic approach to be identified, analyzed, and explained the influential critical factors. Data and information collection was carried out through interviews with experts, management of Meru Betiri National Park, Jember Regency Government and then Focus Group Discussions with stakeholders and farmers. The information and data obtained were analyzed using Interpretative Structural Modeling (*ISM*)*. The results showed the three critical factors in achieving the purpose of the programs, such as the synergy between the management of the park and Jember district government; availability of appropriate technology; and the development of institutional capacity for local communities, then the three critical factors of institutional role are Meru Betiri National Park; and Development Planning Agency of Jember Regency; and Higher Education. The implication of this study is a policy intervention is needed to improve the management of Meru Betiri National Park in the future.*

Keywords: Meru Betiri, strengthening, rehabilitation, conservation

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Introduction

National park preserves the unimpaired natural and cultural resources, it has a very important function, such as the life support system, protect and maintain biodiversity, regulate water management, prevent flooding and erosion, prevent seawater intrusion, maintain soil fertility, and a place for recreation as well as education for the community (Harte, 2000). Meru Betiri National Park is a forest protected by the Indonesian government, this area is located between Jember Regency and Banyuwangi Regency. Through these very important functions, the government and the local community surround the park are required to maintain the preservation of Meru Betiri National Park.

From 1998 to now has been having various security problems. In 1998, there was illegal logging in the area (Darmadja et al., 2012). Based on best practices in managing national parks in several places in the world shows that preserve of national parks is carried out with good coordination between the authorities and the local community to provide socio-economic benefits for the surrounding community (Sharpley & Naidoo, 2010; Snyman, 2014; Anup, 2016; Acquah et al., 2017; Perrotton et al., 2017). Therefore, the park adopted a strategic policy by making the villages around Meru Betiri National Park a conservation and ecotourism village by involving local communities to maintain security and rehabilitate the area.

In 2003, the management policy of the Meru Betiri National Park was started as a regional rehabilitation partnership program. In the initial stage, the program involved and empowered 5,500 people living around the park to rehabilitate the area. The program aims to reduce the number of poor people in the area so that they do not become a trigger for security disturbances in the Meru Betiri area. The villagers around the park who participated in this program were empowered through a partnership program called the Center for Rural Forestry Expansion (CRFE). The CRFE generated the villagers by capital assistance, training, and other production facilities which funding by the management of Meru Betiri National Park.

The community empowerment program has been running for more than twelve years, but the economic development of the communities around Meru Betiri

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National Park has not changed significantly. The frequency of disruption to Meru Betiri forests in the form of illegal logging has the same from year to year (Rujito, 2016). Meanwhile, the growth of rehabilitation plants in Meru Betiri National Park growing slowly, even though it had been planted for more than thirteen years. These indicate that community empowerment and the effectiveness of the rehabilitation program were not in line with the targets. For this reason, the program needs to be improved through increasing the effectiveness of the collaboration which will have a positive impact on the security and conservation of natural resources and increasing the capacity of local communities in the area.

Several models of national park management in several places in the world can be used as a comparative study to improve national park management (Braasch et al., 2018). Based on some experiences in managing national parks, involving local communities to preserve national parks can be done through several alternative approaches, including adaptive management (Birgé et al., 2016), collaborative management (Ansell & Gash, 2008), and adaptive co-management (Fabricius & Currie, 2015).

General concepts management of national parks are based on ecological and social systems in the region (McGinnis & Ostrom, 2014; Mathevet et al., 2016) although ecological dynamics and social dynamics are difficult to predict (Dewulf et al., 2005; Brugnach et al., 2008; Allen & Gunderson, 2011).

There are several causes of the conflict of interest between the communities surrounding the national park and the national park management. For solving the problem, there are several models of collaboration between the stakeholders related to the national park (Braasch et al., 2018). Many problems in the program so that the program is ineffective based on research and preliminary observations by (Hall, 1999; Stringer et al., 2006; Idrissou et al., 2013).

One of the problems is the lack of strengthening the institutional capacity of the local communities in the villages due to the low awareness of the community to participate in empowerment programs. The community is not allowed to design an empowerment program, so that it happens a lack of initiative and participation of citizens in the program. Institutional aspect is one of the most important aspects of community empowerment. Others issues in the institutional aspects of local communities were lack of role and synergy among stakeholders (Rydin & Holman, 2004), lack of synergy between sectors, lack of synergy with government, lack of public access to capital (financial and production input), lack of marketing knowledge (Rydin & Pennington, 2000), lack of science and technology, the policymaking process, and lack of social capital (trust, togetherness, and networking) by (Nath et al., 2011).

Meanwhile, the network among small business in villages of the Meru Betiri National Park area is not going well. In rural areas, the important role of small businesses is providing additional income. The low networking inhibits the achievement of community empowerment so that so that business opportunities cannot be utilized optimally. As a result, the utilization of business opportunities is not optimal, declining value-added and low sales of production. This condition hinders the achievement of community empowerment. The purpose of this research was to evaluate the relationship of critical factors for the effectiveness of rehabilitation and securing conservation areas by the strengthening of local communities. The result of this research can be used as a basis for formulating policies for management to improve the management of Meru Betiri National Park.

Methods

The research method used a systematic approach to identify the key factors based on Interpretative Structural Modeling (ISM). This method is excellent for identifying relationships between specific element factors that cause problems in a system. This model is widely used by researchers to study the relationship between various kinds of elements causing problems in a system. The ISM method involves qualitative and interpretative data to solve complex problems based on the mapping of the structure of relationships between attributes (elements or factors) followed by transformation into a multi-level structure model (Lim et al., 2017).

The basic idea to identify the elements factors of the system is based on the practical experience of competent practitioners and experts who know how to spell out a complex system into several elements and to build sub-elements on which a multi-level structure model (Mathiyazhagan et al., 2013). The ISM method identifies the elements and explains the direction of the relationship between the sub-elements of a system by describing the relationship between the specific elements of the system and the hierarchical sequence that cause the problems of the system through dependencies and the driving power in other elements (Mangla et al., 2014).

Participants in this study were stakeholders related to the Meru Betiri National Park area, including the management of Meru Betiri National Park, the District Development Planning Agency of Jember Regency, the heads of local community groups, the heads of the villages in the Meru Betiri area, Department of Food Security and Animal Husbandry of Jember Regency, the Forestry and Plantation Service of Jember Regency, tourism agency and several regional university experts. Each stakeholder group is assigned as the representative expert to represent the group by interviews, focus group discussions and filling out the questionnaires which are relevant to the problems or issues and continue with the group's problem solving (Attri et al., 2013).

There are several steps to implementing the ISM method, such as: identifying the elements in the system that are relevant to the problem, developing contextual relationships between elements for modeling purposes, and preparing a single Structural Self-Interaction Matrix (SSIM) which is intended to represent the perception of respondent perceptions for the relationship between elements. The relationship can be explained by the symbols as follows: V= if factor I will help to achieve factor J or to influence factor J, A = if factor J will help to achieve factor I or to influence factor I, X = if factors J help to achieve or to

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influence each other, and O = if factors I and J do not correlate or do not affect each other.

Reachability Matrix (RM) is by converting the SSIM matrix symbols into the binary matrix. Convert SSIM matrix into the RM matrix using the following rules:

a. If in SSIM the relationship of element Ei to element Ej = V, Ei = 1, and Ej = 0
b. If in SSIM the relationship of element Ei to element Ej = A, i = 0, and Ej = 1
c. If in SSIM the relationship of the element Ei to the element Ej = X, Eij = 1, and Eji = 1
d. If in SSIM the relationship of the element Ei to the element Ej = O, Eij = 0, and Eji = 0

The next step is to classify system elements into a mapping consists of four levels, namely: autonomous, dependent, linkage and independent. The classification of the elements in the ISM structure is distinguished based on the level of partitions. At this step, the two devices are associated with the Ei elements of the system. A set of reachability (Ri) is a set of all elements obtained from the elements Ei, and the other obtained from the elements of Ai. Canonical matrices have done by grouping elements into the same level in a matrix development for preparing of diagrams. The chart illustrates the relationship between the elements directly and the level of the hierarchy. The preparation stage for policy strategies based on interpretive structural models (Lamatinulu & Dahlan, 2017), in the context of this research, is the management of Meru Betiri National Park.

Results and Discussion

Based on the results of in-depth interviews and discussions and FGDs with Meru Betiri National Park experts and managers as well as FGDs from stakeholders (farmers, facilitators, village heads, community leaders), there are the two main factors (critical factors) are (a) elements of the purpose system and (b) elements of the institutional role in the system.

Furthermore, contextual relationship assessment is performed on each sub element in each of the critical factors. The results of the study are in the form of structural information from the system (which includes rehabilitation, conservation and strengthening of local communities in the region) with an explanation of the hierarchical relationship between one sub element and other sub elements accompanied by the classification of sub elements based on the characteristics expressed in the level of driving power and the level of dependence on other sub elements.

Num	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
T1	A	X	X	A	A	A	A	A	A	A	A
T2		V	V	V	V	V	A	A	A	V	V
T3			A	A	A	A	A	A	A	A	A
T4				A	A	A	A	A	A	A	A
T5					X	V	A	A	A	X	X
T6						V	A	A	A	X	V
T7							A	A	A	A	A
T8								X	X	V	V
T9									X	V	V
T10										V	V
T11											X
T12											

Figure 1 Structural self-interaction matrix (SSIM) of purpose system.

Structural model of sub elements in critical factors of the purpose system The results of identifying the types and several sub-elements as follows: T_1 = The development of ecotourism in the Meru Betiri National Park area, T_2 = Development of potential regional resources for ecotourism and economy of local communities, T_3 = Conservation preserved of natural resources and the environment of Meru Betiri National Park, T_4 = Meru Betiri National Park rehabilitation targets achieved, T_5 = Provision of job opportunities for local communities, T_6 = Increased local community income, T_7 = The security of the Meru Betiri National Park area is well maintained, T_8 = Synergy between Meru Betiri National Park with District Development Planning Agency and Higher Education, T_9 = Strengthening the institutional capacity of the Meru Betiri National Park local community, T_{10}= Availability of supporting technology for potential regional development, T_{11} = Development of local community empowerment in the Meru Betiri National Park area, T_{12} = High productivity of crop farming, horticulture and livestock farming. then analyzed the level of interaction with ISM.

The first step is to study the contextual relationship in the form of a SSIM-VAXO matrix (Figure 1). The second phase carried out the transformation of the SSIM-VAXO into the reachability matrix (RM) of binary numbers (Figure 2). Further identification of 12 sub-elements that can be grouped based on the level of driver power and the level of dependency using the ISM method to determine the hierarchical structure model (Figure 3).

The sub-elements are classified into four sectors. The sector one is weak driver-weak dependent variables (autonomous), the relationship between these sectors is relatively small or not related. The sector two (weak driver-strongly dependent variables), the variable in this sector is very dependent on the input and actions of the system, especially on the linkage variables. The sector three is strong driver- strongly dependent variables (linkage), the relationship between variables in this sector is not stable and every action on the variable will affect the other variables. Sector Four is a powerful driver with dependent variables, the variables in this sector are called free variables whose sub elements are considered as key factors of the system.

Figure 3 showed that there are three key sub-elements of success in achieving rehabilitation and conservation goals, namely T8 (Synergy between Meru Betiri National Park with Development Planning Agency of Jember District and Higher Education); T9 (Strengthening the institutional capacity of the Meru Betiri National Park local community); and T10 (Availability of supporting technology for regional potential development). The sub-elements T8, T9, and T10 which have the highest driving force and the lowest dependency value. The importance of synergy between institutions (T8) as a key sub-element of success in achieving rehabilitation and conservation goals is consistent with the results of the research of (Venter et al., 2008) about the

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Num	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	Drv
T1	0	1	1	0	0	0	0	0	0	0	0	3
T2	1	1	1	1	1	1	0	0	0	1	1	9
T3	0	1	1	0	0	0	0	0	0	0	0	3
T4	0	1	1	0	0	0	0	0	0	0	0	3
T5	0	1	1	1	1	1	0	0	0	1	1	8
T6	0	1	1	1	1	1	0	0	0	1	1	8
T7	0	1	1	0	0	1	0	0	0	0	0	4
T8	1	1	1	1	1	1	1	1	1	1	1	12
T9	1	1	1	1	1	1	1	1	1	1	1	12
T10	1	1	1	1	1	1	1	1	1	1	1	12
T11	0	1	1	1	1	1	0	0	0	1	1	8
T12	0	1	1	1	1	1	0	0	0	1	1	8
Dep	4	12	12	8	8	9	3	3	3	8	8	

Figure 2 Reachability matrix elements of purpose system.

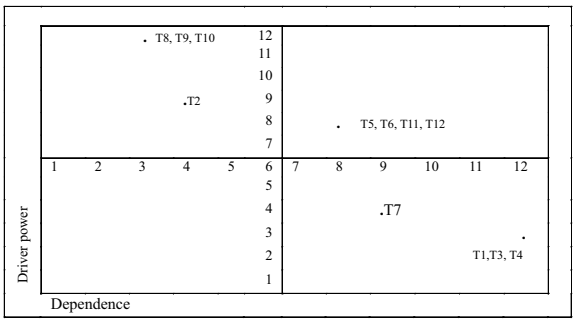

Figure 3 Strategic grouping of purpose system.

importance of synergy in handling national parks. Synergy will improve coordination, common perception, complementarity (there is no overlapping of activities), so that the efficiency and effectiveness of activities that focus on goals can be realized.

The key sub-element to success in achieving the system goals requires the existence of T9 (Strengthening the institutional capacity of local communities). This is due to the interaction between the community and the forest area that cannot be separated because the existence of the community around the forest is part of the forest itself. In order for local communities to contribute positively, a strong institutional capacity is needed (Moswete & Thapa, 2018). The reality on the ground now shows that in general, the institutional capacity of local communities in Meru Betiri National Park is still lacking.

The third key sub-element in the critical purpose factor is T10 (i.e. the availability of supporting technology for the development of potential areas). Based on the FGD conducted by the local community in the area, guided by a facilitator from the Meru Betiri National Park Center, the information technology needed by the community in the area are technology for processing agricultural products to increase the added value of products, and technology to improve access to information and communication in the area's community which has been rather isolated due to its remote location. Further identification of the need for technology for processing agricultural products in the Meru Betiri National Park area by experienced field practitioners and also by the heads of partner farmer groups shows that it needs tools and machines for processing fruit such as jackfruit, bananas, soursop, wood mushrooms, and medicinal plants. Other technological needs are information technology for developing smart village model areas to open villagers' access to capital (financial, land, production facilities), markets, science and technology, and to assist in the process of policymaking for local communities

Based on an analysis of the level of driver power and the level of dependency (Figure 3) showed that there is the lack of attention to the sub-elements will affect to conservation goal. Sub-elements T3 (conservation of Meru Betiri National Park conservation area), T1 (the development of ecotourism in the Meru Betiri National Park area), and T4 (the achievement of the Meru Betiri National Park Rehabilitation Targets) are in sector two. The variable in this sector is very dependent on the input and actions of the system.

In the final stage is to arrange a hierarchy of sub-elements based on the value of drive power and dependence on the purpose system (Figure 4). Nowadays coordination and perceptual similarities between institutions such as the Meru Betiri National Park and the offices in Jember District have not been as expected. Roles and synergy among stakeholders are felt to be still lacking, as well as synergy between sectors and between levels of government. This is because the related agencies are still under the control of the Jember and Banyuwangi District Governments, while the Meru Betiri National Park is under the control of the central government.

Structural model of sub elements in the critical factor of institutional role The results of the identification of the second critical factor (Institutional role elements in the system) obtained sub-elements as follows: L1 = Meru Betiri National Park, L2 = Regional Offices of Plant and Forestry, L3 = Regional Offices of Food Security and Animal Husbandry, L4 = Regional Offices of Industry and Trade, L5 = Regional Offices of Tourism, L6 = Jember Regency Planning and Development Agency, L7 = Regional Offices of Agriculture, L8 = Regional Offices of Community and Village Empowerment, L9 = Non-governmental organization, L10 = Local Community Institutions Rural Forestry Counseling Center, L11 = Higher Education, L12 = Independent Rehabilitation Partner Farmers Group.

Based on the results of the contextual relationship in the form of a SSIM-VAXO matrix (Figure 5), the reachability matrix (RM) of binary numbers (Figure 6) and the level of driver power and the level of dependency using the ISM method (Figure 7) to determine the hierarchical structure model (Figure 8). Based on Figure 5 and Figure 6 that in order to create an independent and empowered farmer group, there must be an institutional local community with a large or strong capacity (Figure 7). There are three institutions that are the key sub-elements that act as a motivator for other institutions to participate in the rehabilitation and strengthening of local communities and Meru Betiri National Park conservation, namely L1 (Meru Betiri National Park Office); L6 (Development Planning Agency of Jember Regency); L11 (Higher Education). These three institutions have the same relative driving force so they need to coordinate and cooperate with each other in order to be able to further encourage the participation of related agencies in order to participate in developing Meru Betiri National Park. The ultimate goal of this structural

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model is the realization of independence or empowerment of rehabilitation partner farmer groups. The hierarchy of sub-elements based on the value of drive power and dependence on the institutional role shown in Figure 8.

The results of this study state that the institutional strength of local communities is important to build social capital and learning for local communities in the region to become independent and contribute positively to the conservation of national parks. The results of this study are in accordance with the results of research conducted in several places in the world such as Zimbabwe (Ntuli & Muchapondwa, 2018) which states that the role of institutional and collaboration have a strong effect on the success of biodiversity on the conservation of national parks and in accordance with the results of a review of national park forest management for 40 years in several countries in the world all of which concluded that strong institutional capacity of local communities is needed to form social capital and also for learning for local communities so that they can become independent.

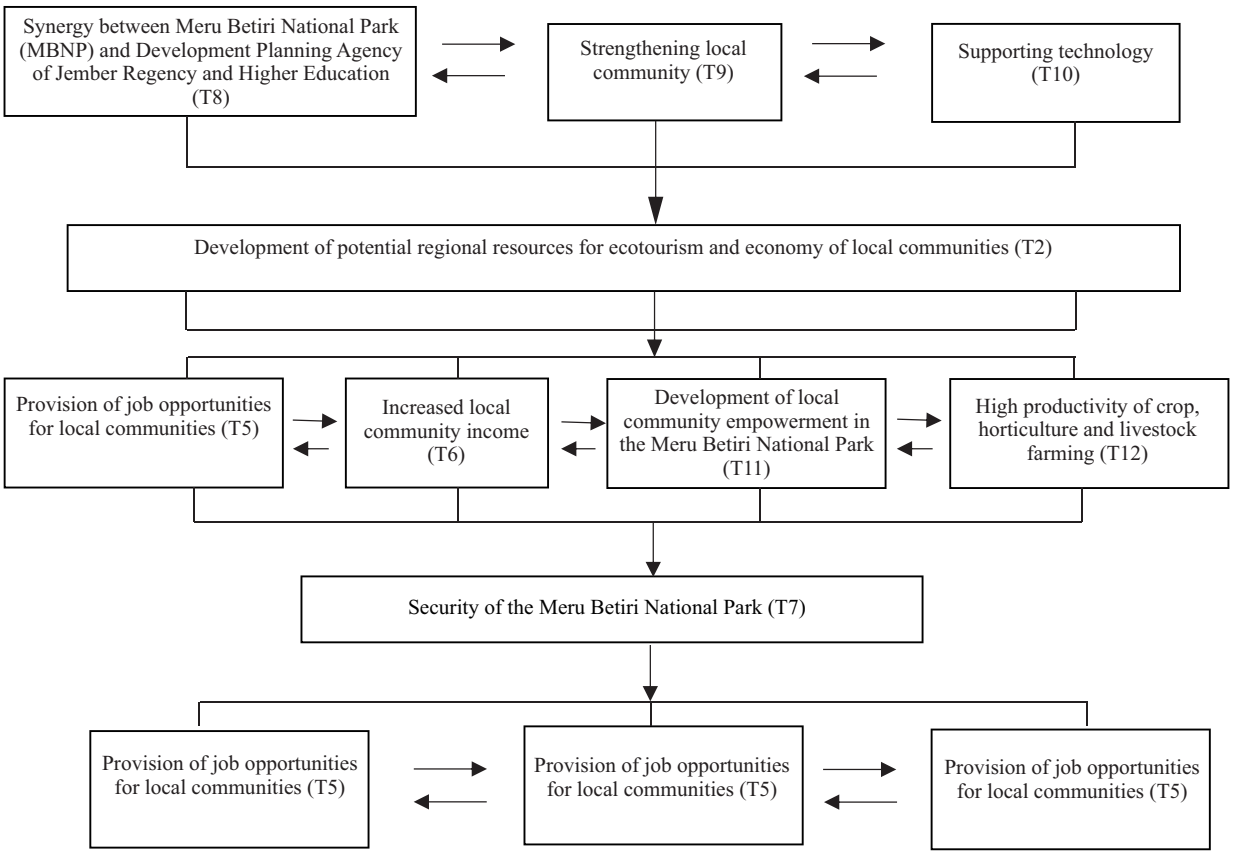

Figure 4 Hierarchical structural of sub-elements critical factors of purpose system.

Num	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12
L1	V	V	V	V	X	V	V	V	V	X	V
L2		X	X	X	A	X	A	A	V	O	V
L3			X	X	A	X	A	A	V	A	V
L4				X	A	X	X	O	V	A	V
L5					A	X	A	X	V	A	V
L6						V	V	V	V	X	V
L7							A	V	V	A	V
L8								A	V	A	V
L9									V	A	V
L10										A	V
L11											V
L12											

Figure 5 Structural self-interaction matrix (SSIM) of institutional role.

Num	L2	TL	L4	L5	L6	L7	L8	L9	L10	L11	L12	Drv
L1	1	1	1	1	1	1	1	1	1	1	1	12
L2	1	1	1	1	0	1	1	1	1	0	1	9
L3	1	1	1	1	0	1	1	1	1	0	1	9
L4	1	1	1	1	0	1	1	1	1	0	1	9
L5	1	1	1	1	0	1	1	1	1	0	1	9
L6	1	1	1	1	1	1	1	1	1	1	1	12
L7	1	1	1	1	0	1	1	1	1	0	1	9
L8	1	1	1	1	0	1	1	1	1	0	1	9
L9	1	1	1	1	0	1	1	1	1	1	0	9
L10	0	0	0	0	0	0	0	0	1	0	1	2
L11	1	1	1	1	1	1	1	1	1	1	1	12
L12	0	0	0	0	0	0	0	0	0	0	1	1
Dep	10	10	10	10	3	10	10	10	11	3	12	

Figure 6 Reachability matrix elements of of institutional role.

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Therefore, a strong community institution can be concluded as having an important role in helping to conserve national parks. In the structural model of the sub-elements the critical factor in the institutional role related to technical aspects (there are 7 services) is in level 3, which means these services have quite a strong impetus but also have a large enough dependency. For the good of the future, these agencies should coordinate with each other and work together to form a synergy with the coordination of Development Planning Agency of Jember Regency.

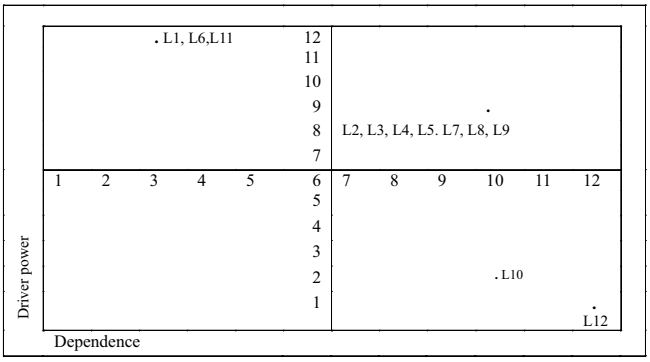

Figure 7 Strategic grouping of institutional role.

Conclusion

There are two important factors that affect the rehabilitation, conservation and strengthening of the institutional capacity of local communities in the Meru Betiri National Park are the purpose of the system and the role of institutions in the system. The key sub-elements on the purpose of the system such as synergy between related institutions, strong institutional capacity of local communities, and availability of technology for development area. The achieving the purpose of rehabilitation and conservation is largely determined by the development of local institutional capacity and the three main institutions that have an important role are Meru Betiri National Park, Development Planning Agency of Jember Regency, and Higher Education.

Recommendation

Based on a review of the academic literature and information from the conclusions of this study, the following are recommended: (1) Strengthening the synergy and coordination between Meru Betiri National Park, the Jember Regency Development Planning Agency and Higher Education, (2) Provision of facilities and intensive assistance to increase the institutional capacity of local communities, and (3) Appropriate technology to increase the added value of agricultural products that are abundant in the region but are easily damaged. Also, access to capital in the form of financial loans, production facilities, market provision, business networks and information technology is provided for residents in the Meru Betiri National Park area.

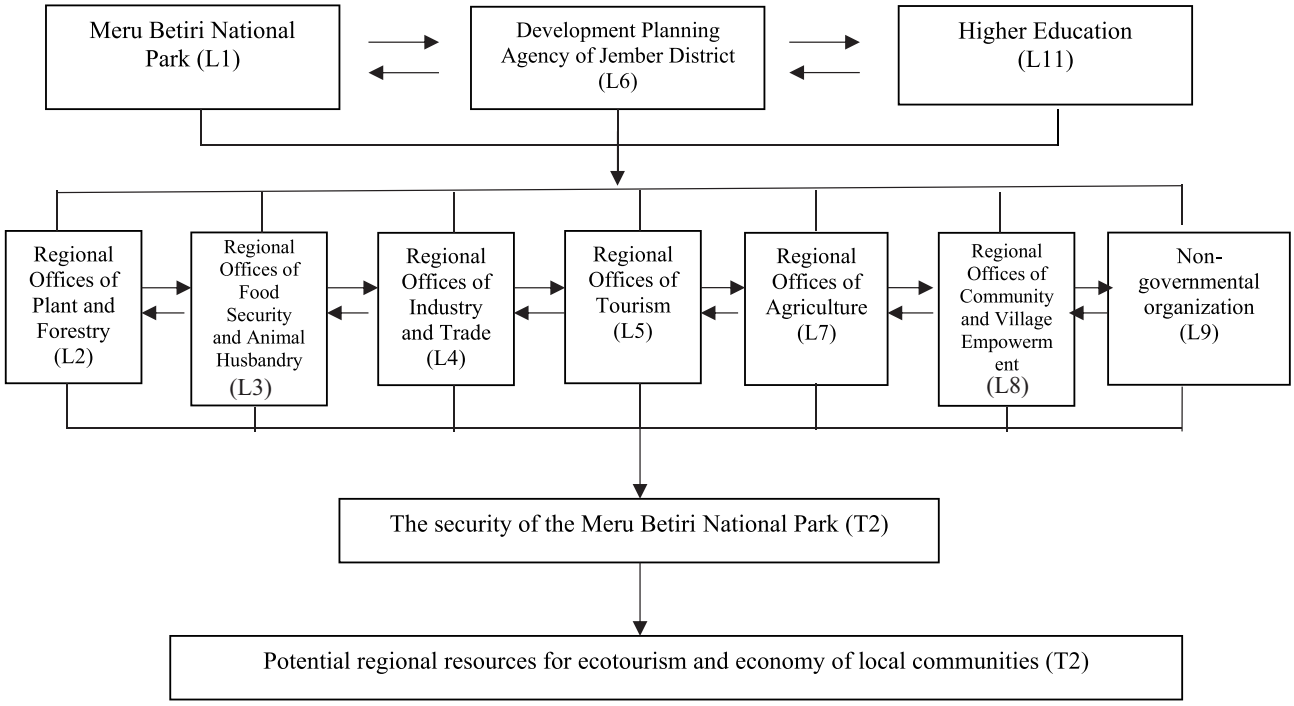

Figure 8 Hierarchical structural of sub-elements critical factors of institutional role.

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