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Institutional models of Bunaken National Park (BNP) management to ensure sustainability of ecological and economic functions

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Abstract

Bunaken Marine Park is one of the world's most beautiful marine tourism which has a unique coral reefs, turtles and diversity of pelagic fish. Currently Bunaken Marine Park has become an excellent tourist attraction for diving. Since the number of visitors and community activities around the park are continues to increase; there have been severe damages to coral reefs as well as polluting the environment around the marine park. Therefore, the sustainability of economic and social benefits is threatened. To avoid damage to coral reefs and pollutions, it is necessary the institute manager which can ensure the sustainability of he sustainability of the tourism attraction. Interpretative Method Structure Modeling (ISM) was chosen to design the institutional model appropriate to the conditions surrounding the object, which is able to manage Bunaken Marine Park as a sustainable tourist attraction.

Keywords: Ecotourisme , Tourist attraction, Environment pollution, Sustainable tourism, AHP method

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1. Introduction

Bunaken is one of the world's most beautiful marine parks, located in North Sulawesi Province. This park has become the famous tourist destination of ecotourism in North Sulawesi. One of the uniqueness of this park is the beauty of coral reefs with a variety of fish species. Government through the Ministry of Forestry has set Bunaken as National Park, namely the Bunaken National Park, which has three main functions: the economic function to meet the needs of the local community; the ecological function (as conservation); and social function as a tourist destination.

Geographical area of Bunaken Marine Park is about 89.065 Ha, located in South Minahasa Regency, North Minahasa Regency and District of Manado City, with the distance of 15.5 km from Manado city taken by boat motors up to 1 hour and 45 minutes. Total area of coral reefs is about 531 acres with a length of 2.5 km and a depth of 5 meters. Beauty and biodiversity of Bunaken Marine Park have become the most interesting attraction for tourists. Tourism developments continue to increase from year to year and the estimated number of tourists reaches to 35.000-40.000 visitors each year (Supit, AAG, 2007) with a ratio of 70% domestic tourists and the rest 30% foreign tourists. The main tourist activity at Bunaken is diving with an estimated number of 9000 dives each year.

Tourist activities in Bunaken have encouraged the development of other economic activities, such as the development of specialty services, resort, hotel and restaurant as well as increasing of transportation service providers in the form of motor boats for the transportation from Manado to Bunaken. Development of the Bunaken Marine Park as a tourist destination in North Sulawesi has changed the surrounding area to an economic center. There are 40 thousand people, mostly with elementary education relying on this marine park. Besides being a place for tourism development, it is a place for the fishermen to catch fish.

The expanding of the community and tourism activities has made economic and social functions to become more dominant than ecological functions as a conservation area. Utilization of Bunaken Marine Park as a tourist and economic center goes almost beyond the environmental carrying capacity, because the environmental carrying capacity is only able to accept 9000-10000 dives (BTNB, 2007). This condition causes damage to coral reefs and lots of rare species fish such as "ancient fish" or "king marine fish" and "napoleon fish". Damage of coral reefs from fishing and tourism activities was made by increasing the bad category damages amounting to 20%-25%, and the medium category damages being equal to 49% (Supit, 2007).

At the same time the activity of the local community has also produced solid wastes (garbage), liquid waste, as well as water contamination due to residual oil combustion mainly by motor boats. It is estimated that if these conditions continue, the ecological function of this marine park as a conservation area will continue to decline, due to the destruction of coral reefs and the loss of rare species of fish and other biota. As a result, the beauty of the marine park for tourist attractions will be lost and the Bunaken National Park will no longer be an attractive tourism spot. This means that the reduction of ecological functions will result in threats to the sustainability of economic functions.

While there are several agencies involved in the management of Bunaken National Park, from the central government to the provincial and district/city level, this causes overlapping authority and results in inefficiency and ineffectiveness. To ensure the sustainability of economic and ecological functions of the Bunaken National Park, it is necessary to build an appropriate management model by considering the conditions of the local communities, and at the same time with the involvement of existing stakeholders.

ISM method (Interpretative Structural Modelling) developed by Saxena (1992) has been widely used in the analysis and development of institutional models. This method can also be used to develop some kind of structure, including its influence, as well as identify the most dominant aspect of the key elements of success of a program.

To develop a model of institutional management of Bunaken National Park in accordance with objective condition and determine the strategy of what to do in ensuring the sustainability of ecological and economic functions of the Bunaken National Park, the ISM method is selected.

The objectives of this study are (a) to develop a model of institutional management of Bunaken National Park to ensure the sustainability of the economic, social and ecological functions, and (b) to choose the main strategies that can be a key element of success in ensuring the sustainability of Bunaken National Park.

2. Literature review

2.1. Ecotourism and national park

Ecotourism conceptually is a concept of sustainable tourism development in order to support efforts to conserve natural and cultural environment and increase community participation in management, in order to gain economic benefits to the local communities. In terms of management, ecotourism can be defined as an organization responsible for tourism activities in the "natural" or "made under the natural rules" areas, to support efforts to conserve the environment and improve the welfare of the local communities.

According to Fandeli and Muklison (2000), ecotourism is a form of tourism that is responsible for the preservation of pristine areas (natural areas) together with economic benefits and maintaining the cultural integrity of local communities. According to Major (2006) ecotourism (ecological tourism) is travel activities that do not damage or contaminate the nature in order to admire and enjoy the beauty of nature, animals or plants in their natural environment as well as educational facilities. Ecotourism is a concept which contains the six elements of conservation, education, ethics, sustainable development, impact and local benefit (McIntosh et al., 1995).

The definition of ecotourism refers to (1) environmentally-friendly tourist activities, (2) involvement of local community, (3) supporting the education and learning, (4) minimum negative impact, and (5) increased regional economic income (Sekartjakrarini and Legoh, 2004). Based on the concept of ecotourism there are some activities that can be used as the basis for the claim that an activity can be categorized as ecotourism (Justiano, 1998):

1. Activities are carried out by a small tour group.
2. Employing Local people in tourism activities.
3. Promoted environmental education exists.
4. Paying an entrance fee to see the natural beauty.
5. Prohibiting the tourists to take out the waste, and promoting environmental cleanliness.
6. Prohibiting the tourists to destroy crops and kill animals.
7. Not using the vehicles to travel.
8. Forbid eating the meat of wild animals.

Ecotourism should be construed as a concept of tourism development and operation based on the natural environment (the local culture) with the operational principles and implementation that focuses on:

1. Protection of resources to maintain the continuity of the ecological environment (ecological sustainability) and preservation of local culture.
2. Operational management activities with “minimal” / “as small as possible” environmental impact (enviro-management).
3. Participation and empowerment of local communities as part of efforts to resuscitate, enabling, and improving people's capacity towards prosperity and quality of better life, by relying on the business activities of the society itself and the increasing expertise of the professionals.
4. Development and presentation of the tourist attractions in the form of program interpretation (learning and recreation).

National parks were originally established for the purpose of buffering productive areas to maintain their ecological balance in order to keep them awake. Determination of the park is usually done on marginal lands that are not or have not been reached by intensive development. According to MacKinnon et al. (1992) the basis for establishing an area as a national park are: (1) characteristic or unique ecosystems, (2) Having diversity of species or “specific species value”, (3) Having landscapes with geophysical characteristics or “aesthetic value”, (4) Having the function of hydrological protection (soil, water, local climate), (5) Having means for outdoor recreation and tourism activities, and 6) Having places of high cultural heritage (temples, ancient heritage and so forth).

The national park has strategic functions to preserve the environment and culture. National parks are effective for (1) preservation of biotic to keep the balance of the ecosystem, (2) maintenance of ecological diversity, (3) maintenance of genetic resources, (4) maintenance of cultural heritage objects, (5) protection of the beauty of natural scenery, (6) provision of educational facilities and research, (7) provision of recreational facilities and tourism, (8) support the construction and development of rural areas, (9) maintenance of the watershed production, and (10) control of erosion and sedimentation (miller, 1978 in abbas, 2005).

2.2. ISM method

One of the modeling techniques developed for strategic policy planning is Interpretative Structural Modeling (ISM). ISM is a process of assessment group (group learning process) in which the structural models are

produced to capture the complex subject of a system, through a carefully designed pattern using a graphic as well as sentences (Saxena, 1992; Eriyatno, 2002). ISM method can also be used by planners to analyze complex problems that can not be done with operational research methods and descriptive statistics. ISM is relevant to the interpretation of an object or a representative of the whole system through the application of theory in a systematic and iterative graphics. The stages carried out for ISM include:

1. Identifying elements that can be obtained through research, brainstorming, etc. related to eco-tourism park management policy.
2. Building a contextual relationship between elements based on the purpose of modelling.
3. Creating a Single Interaction Matrix (Structural Self-Interaction Matrix/SSIM). This matrix element represents the element of preparation for the intended respondents. Four symbols are used to represent the type of relationship that exists between the two elements of the system being considered:
 - V ... relationship of the elements E_i to E_j , not vice versa;
 - A ... relationship of elements E_j to E_i , not vice versa;
 - X ... interrelated relationship between E_i and E_j (to the contrary);
 - O ... shows that E_i and E_j are not related.
4. Making Reachability Matrix (RM) by changing the SSIM symbols into a binary matrix.
5. Grouping sub elements into four sectors; Autonomous, Dependent, Linkage and Independent, based on values of Driver Power (DP), and Dependence (D) on Reachability Matrix.
6. Creating a hierarchy based on values of Key Element (EK) and Level on Reachability.

3. Methodology

The method used in this study is the method of institutional analysis using the ISM developed by Saxsena (1992). Of 9 elements developed by Saxena, we took only two elements, namely the necessary strategic programs and agencies involved. In general three steps were taken: (1) the determination of elements and sub elements, (2) expert assessment and (3) analysis of SSIM (Structural Self Interaction Matrix), RM (Reachability Matrix), DP (Driver Power), and D (Dependence).

4. Results and discussion

In accordance with the purpose of the study, of 9 developed by Saxena (1992), only two elements were selected. Each element is then divided into sub-elements. in order to ensure the sustainability of economic and ecological functions, there are 9 sub-elements for strategic program element that were examined including: (1) making a clear and firm regulation, (2) developing alternative areas, (3) law enforcement, (4) increasing community involvement in aspects of control, (5) business area development outside of the

Bunaken National Park, (6) determination of zoning system, (7) increasing community skills through the creative industry, (8) restrictions on time of visits, and (9) setting the number of visitors. For the element based on the “agencies involved” there are 15 sub-elements including: (1) the State Ministry of Forestry, (2) the State Ministry of Environment, (3) the Provincial Government, (4) Regency / City Government, (5) Central National Park, (6) National Parks Board, (7) Local Department of Forest (8) Department of Fisheries and Marine Resources, (9) Local Department of Education and Culture, (10) Local Department of Tourism, (11) Local Higher Education (12) local communities around the area, (13) environmental and marine NGOs (14) business sector and tourism services, (15) the general public.

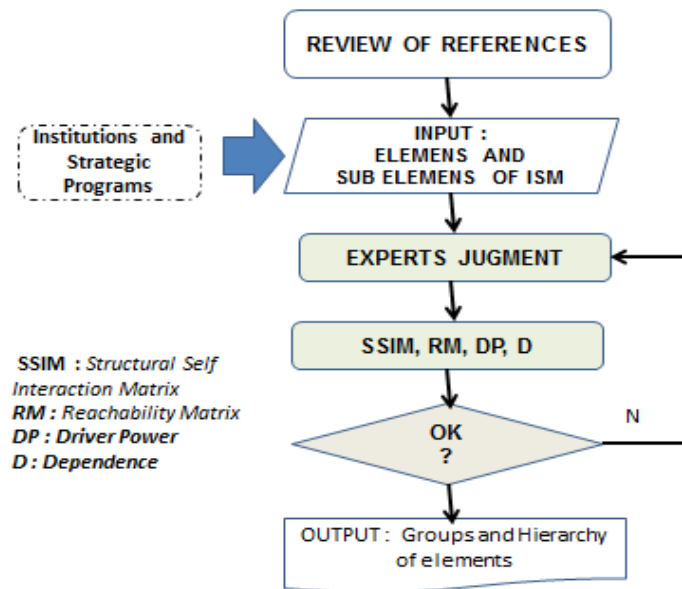


Figure 1. Steps of ISM analysis

4.1. Strategic programs are needed

Based on interviews with experts by using the concept of the matrix VAXO SSIM (Structural Self Interaction matrix) the Table 1 is obtained.

On the Matrix RM we can see the sub-element as the main drivers of the others by looking at the Driver Power (DP), Dependence (D). The values listed in Dependence show the position of the quadrant: Autonomous (1), Dependent (II), Linkage (III) and Independent (IV). For the level values a position is indicated on the hierarchy of sub-elements. Sub-element which has the smallest value is ranked first, which means there is enormous influence on other elements. The values in the Driver Power shows the sequence of roles (y) a sub-element at a position corresponding to the value of Dependence (x), and EK (key element) is a sequence of sub-elements and is the key factor in determining program objectives to be achieved.

Based on the RM matrix, the sub-elements are then grouped into 4 as shown in Figure 2.

Table 1. Reachability matrix elements of strategic programs

Sub-Elements of Strategic programs	K1	K2	K3	K4	K5	K6	K7	K8	K9	DP	EK
K1	1	0	1	1	1	1	0	0	0	5	4
K2	1	1	1	0	1	1	1	1	0	7	2
K3	0	0	1	1	1	1	1	1	0	6	3
K4	0	1	0	1	0	0	1	0	0	3	6
K5	0	1	0	1	1	0	1	0	1	5	4
K6	1	1	0	1	1	1	1	1	0	7	2
K7	1	0	1	1	1	0	1	1	0	6	3
K8	1	0	0	1	1	0	0	1	0	4	5
K9	1	1	1	1	0	1	1	1	1	8	1
Dependence	6	5	5	8	7	5	7	6	2		
LEVEL	3	2	2	5	4	2	2	3	1		

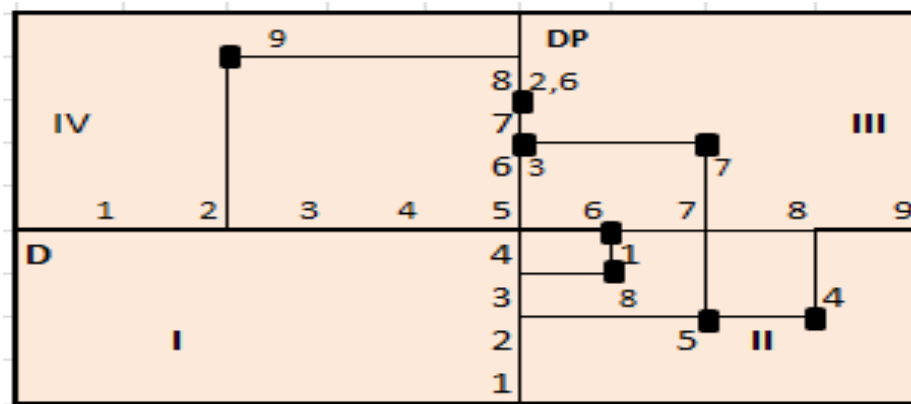


Figure 2. Strategic grouping of sub-element program

Based on the Figure2, the sub element 9 (setting the number of visitors) are in sector IV (Independent), which means the visitor program setup has a very strong influence on other sub elements. This means that other programs will depend on the setting number of visitors. The sub-element 2 (central business district development outside the Bunaken National Park), 6 (making zoning system) and 3 (law enforcement) are right on the DP line, which means that these programs are very important in ensuring the sustainability of economic and ecological functions. A community empowerment program to lessen the pressure on the park can be achieved by skill-building improvement through the development of creative industry, but this program is very sensitive to other programs. This means that such program will not work if the other programs on sector IV perform inappropriately. Hierarchical structure of each element is shown in Figure 3.

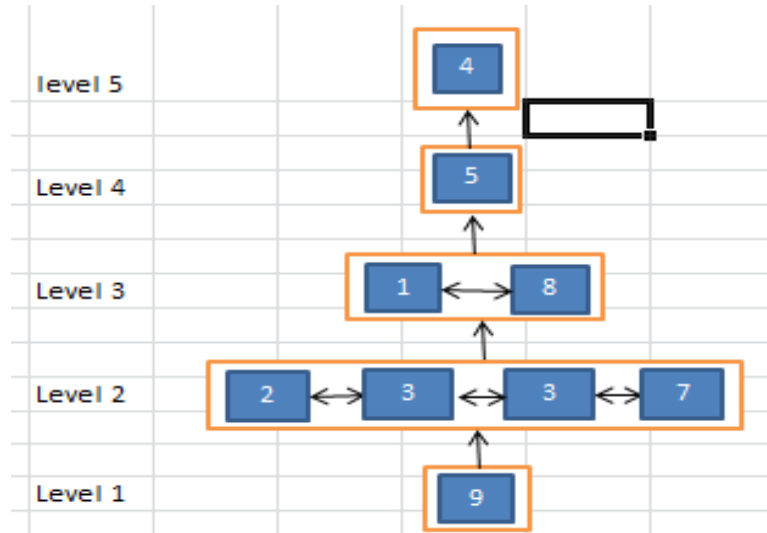


Figure 3. Hierarchical structure of the necessary elements of a strategic program

Figure 3 provides information that shows visitor setting to National Bunaen Park (9) is the main program and drives the programs on the following hierarchy (level 2, 3, 4, and 5). This image was reinforced the earlier explanation.

4.2. Elements involved institutions

Based on the results of expert assessment, the matrix of RM obtained as shown in Table 2. The matrix RM above shows that Bunaken National Parks Board (DNTB) can be considered as the institution that is a determinant of sustainability of economic and ecological functions of the area. The position of this institution are based on the existence in sector IV (Independent) with other sub elements, including 6 "National Parks Board", 11 "local college/local higher education", 3 "provincial government", 8 "local department of Fisheries and Marine", 2 "Ministry of Environment", and 9 "Local Department of Education and Culture". This means that all of these institutions have a very strong influence on other agencies in ensuring the sustainability of economic and ecological functions of National Bunaken Park, as shown Figure 4.

Figure 4 also shows that there are some institutions that are highly sensitive in ensuring the sustainability of economic and ecological functions of National Bunaken Sea Park, which are located in sector III (Linkage), namely: Local Department of Tourism (10), State Ministry of Forestry (1), Regency/City Government (4), and tourism services sector (business actor travel agencies, hotels, and restaurants). National park (5), people around the area (12), environmental NGOs (13) and the general public (15) are on one group in sector II (dependent), meaning that these institutions are depending on the institutions that are located in sector IV (Independent) as described above. Hierarchical structure of the elements of these institutions is as follows (Figure 5).

Table 2. Matrix RM of elements of agemcis involved

Sub-Element Kendala ke-i	M1	M 2	M3	M4	M5	M6	M7	M8	M9	M 10	M 11	M 12	M 13	M 14	M 15	DP	EK
M1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	12	3
M2	1	1	0	1	1	0	1	0	0	1	0	1	1	1	1	10	5
M3	1	1	1	1	1	0	1	1	0	1	0	1	1	1	1	12	3
M4	1	0	0	1	1	0	1	0	0	1	0	1	1	1	1	9	6
M5	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	5	9
M6	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	1
M7	0	0	0	0	1	0	1	0	0	1	0	1	1	1	1	7	7
M8	1	1	0	1	1	0	1	1	0	1	0	1	1	1	1	11	4
M9	0	1	1	1	1	0	1	1	1	1	0	1	1	0	0	10	5
M10	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	7	8
M11	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	13	2
M12	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	5	10
M13	1	0	0	1	1	0	0	0	0	0	0	0	1	0	1	5	9
M14	1	0	1	0	1	1	0	0	1	0	1	0	1	1	1	9	6
M15	0	0	1	1	0	0	0	0	1	1	1	1	0	0	1	7	10
DEPENDENCE	9	6	6	9	13	3	9	6	6	11	6	13	14	11	14		
LEVEL	3	2	2	3	5	1	3	2	2	4	2	5	6	4	6		

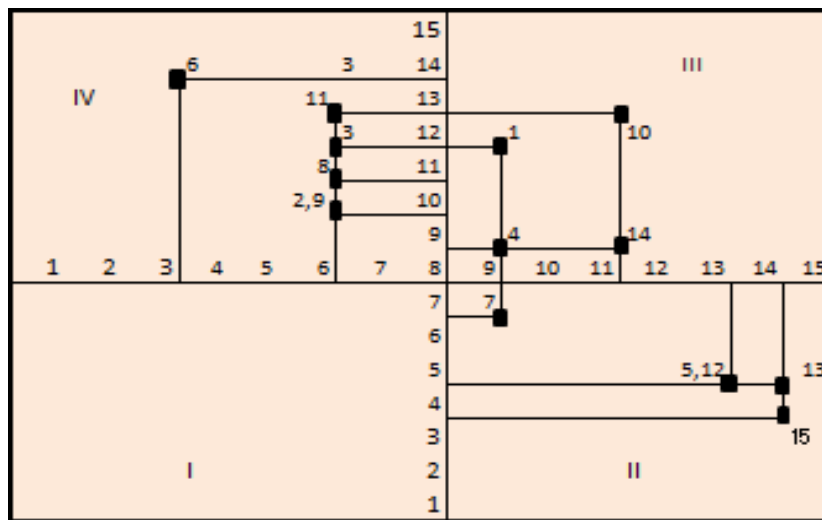


Figure 4. Grouping sub elements of the involved agencies

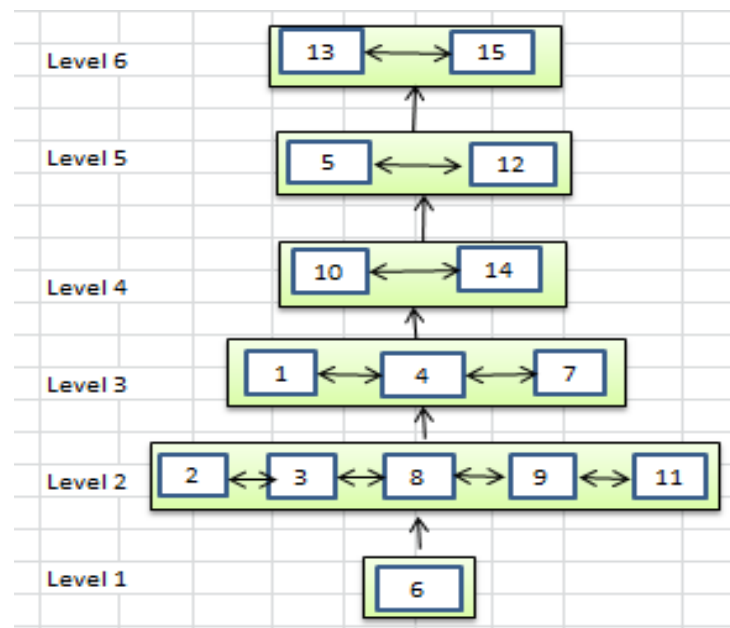


Figure 5. Hierarchical structure of elements of the involved agencies

Based on this structure, Board of Bunaken National Park (DTNB), number 6, occupies the highest level (1) that means it can driver power to the institutions located at the next levels (levels 2, 3, 4, 5, and 6). DTNB is a body set up by the Governor of North Sulawesi province in 2007. This institute comprises local government (provincial and district and city) where the park, businessmen, community leaders, local high education centers, and NGOs are located. The main task is to manage the park (including the provision and management of operating costs) from both the government and ticket sales. But its function has not been running optimally, even there is still overlap with the central government, especially State Ministry of Forestry and State ministry of Environment. The results of this study confirm that DTNB is the most appropriate institution to manage the park either in support of sustainable economic and ecological functions. It is therefore necessary to revitalize the function of this DTNB so it can perform its functions optimally.

5. Conclusions and suggestions

To ensure the sustainability of the park there are four main strategic programs that must be addressed: (1) make appropriate arrangements for the visitors, (2) development of alternative areas (3) determination of the zoning system, and (4) law enforcement. Since the most appropriate institution to manage national Bunaken Park for ensuring the sustainability of economic and ecological functions is Board of Bunaken National Park (DTNB), this council needs revitalization in terms of both function and membership.

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