RESEARCH PAPER

The effectiveness of ecotourism management of multidimensional scaling (MDS) in Mount Rinjani National Park

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Abstract

Mount Rinjani National Park (TNGR) is a natural conservation area that has the potential of biological natural resources and the uniqueness of the landscape as well as the socio-cultural diversity of the community. This potential as the main attraction in the management of ecotourism. This study aims to map the effectiveness of the eco-tourism management cycle of TNGR in achieving its management objectives. Multidimensional scaling (MDS) is one of the methods used to assess the effectiveness index of Ecotourism management cycle of TNGR using Rapid Appraisal Sustainability Index for TNGR Ecotourism based on mapping data on two or three dimensional space in the form of perceptual mapping through data collection using questionnaire with purposive sampling technique to key informant that is stakeholders in management of ecotourism of TNGR. MDS ordination results on the dimensions of the ecotourism management cycle of TNGR show the dimensions of the contextual background, dimensions of planning, and dimensions of output are included in the quite effective category while the dimensions of the needs (input), process dimensions of process, and dimensions of outcome impact are included in less effective category. Based on the average index of 6 (six) dimensions, the effectiveness of ecotourism management of TNGR is included in the quite effective category. This category illustrates the overall goal of TNGR ecotourism management that has been achieved, but it still needs to increase the index value in the six dimensions of the eco-tourism management cycle of TNGR to achieve higher levels of performance management effectiveness.

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Introduction

Mount Rinjani National Park (TNGR) is one of the conservation areas of Natural Conservation Area (KPA). TNGR has a unique and diverse biodiversity potential. Diversity concerns the diversity of ecosystems (habitats), types (species) and genetics (varieties/races*) (Fandeli, 2012, Baiquni, 2007). Ecological, social and economic biodiversity is essential for the balance of nature, and as a supporter for the welfare of society and development (Alikodra, 2012).

The management of the conservation area of TNGR cannot be separated from the dynamics that comes from the interaction process between the community and the national park area to meet their daily needs (Ichsan AC *et al.*, 2017). These include environmental conflicts. The environmental dispute that occurs has a complex dimension and involves various interests between sectors and development actors. Environmental conflicts are not only a struggle for access to natural resources, but in modern civilization can be water pollution or atmospheric pollution (Baiquni and Susilawardani, 2002).

Therefore, new conservation concepts (innovative, creative, and selective conservation) must be adopted in science repositioning, and conservation technologies that can be used to develop prospective businesses that can synergize between ecological, economic and socio-cultural interests (Fandeli, 2012). One of the strategies for sustainable forest management is the utilization of TNGR conservation areas with the concept of green tours through the management and development of ecotourism by involving the active participation of local communities and interested stakeholders. TNGR with uniqueness of landscape and biodiversity and socio-cultural diversity is very potential for ecotourism management and development.

The higher biodiversity and local culture around the area, the more opportunity as an ecotourism attraction it becomes (Latupapua, 2015). Ecotourism development in TNGR forest conservation area is one of the conservation strategy of the area in improving community welfare because ecotourism aims to conserve nature, increase community income, improve the quality of education and support local community participation (Das *et al.*, 2015).

The weaknesses of ecotourism management in TNGR forest conservation areas is the frequent occurrence of conflicts of interest among stakeholders closely related to management issues (Manullang, 1999). Many national park managers are under pressure in which side should increase the number of visitors and me *et al.* l the needs of visitors in the form of adequate infrastructure but on the other hand must still pay attention and guarantee the sustainability of the area (Luo *et al.*, 2016). Therefore, knowing and understanding the cycle of TNGR ecotourism management is very important, so there must be an evaluation of the performance effectiveness of TNGR ecotourism management. Evaluation of the effectiveness of its performance can be measured by the 6 (six) aspects of the conservation area management cycle which includes *context* (background), *planning, input, processes* (implementation), *output* (results), and *outcomes* (impact) (Hocking *et al.*, 2006).

There is no single approach in different regions or types of organizations for the effectiveness of performance management assessment, but a multidimensional approach is needed to measure the effectiveness of management or organizational performance (Kreitner and Kinicki, 1992 in Soetopo, 2010). Each aspect, field or managerial part which has been done is a cycle that repeats and affects each other. Therefore, the assessment of the effectiveness of ecotourism management in TNGR uses Multidimensional Scaling approach (MDS) is needed. Rate-based multidimensional scaling becomes an alternative way to assess the performance of the TNGR ecotourism management based on data presentation through an image in the space of two or three dimensions showing the relationship between the number of objects based on variables measured or otherwise known as a map of the perception (perceptual mapping) Fauzi and Anna (2005).

This can help managers to know the achievement of management objectives without going through an in-depth measurement process, and encourage managers to always adapt in providing valuable and useful insights into future management plans. Managers and stakeholders can know what factors needed to be improved in the future. The approach with the method can show the level to which ecotourism management efforts in TNGR have achieved the objectives and provide positive results on the aspects of the area's resources that impact on improving the management performance and socio-economic culture of the community. Implementation of management effectiveness assessment also provides follow-up impact in the form of improving communication and cooperation between managers with other related parties (Hermawan *at al.,* 2014; Ichsan AC *et al.*, 2017).

Materials and methods

Research Location

This research was conducted in Mount Rinjani National Park (TNGR). Administratively include three (3) districts of North Lombok, Central Lombok, and East Lombok. The research is located in 2 (two) villages, Senaru Village, Bayan District, North Lombok Regency, which is included in SPTN Region I Lombok Utara and Sembalun Lawang Village, Sembalun Sub-District, East Lombok Regency included in SPTN Region II East Lombok (Balai TNGR, 2015). Both villages are the official entrance of the climbing route to Mount Rinjani. The selection of the two villages as they are both long climbing routes, and most widely used as ecotourism climbing paths are representative enough to represent the overall management of ecotourism of TNGR.

Research Method

The research used qualitative and quantitative methods. Qualitative method is aimed to see the tendency of various phenomena, while the quantitative method is used to measure the tendency of various phenomena (Creswell, 2014). Types of data in the form of primary data obtained directly through in-depth interviews with questionnaires to selected respondents (*key informants)* with *purposive sampling* technique that is the technique of determining the sample with certain considerations (Arikunto, 2010) that is the competent parties, and is considered able to provide an overview and information (Sugiyono, 2012) including staff and employees of the TNGR Hall, provincial and district government offices of TNGR, local communities and eco-tourism services actors and stakeholders in TNGR ecotourism located in two villages, Senaru Village and Sembalun Lawang Village.

Secondary data is data obtained from government agencies, or related literature, in the form of reports or other written sources relating to ecotourism management, socio-cultural community, and TNGR management area.

Research on the effectiveness of the eco-tourism management cycle of TNGR uses a standard framework approach developed by Hocking *et al.* (2006) in assessing the effectiveness of regional management including dimensions of *context* (background), planning, input, *processes* (execution), *outputs* (results), and *outcomes* (impact). The techniques used in determining and classifying dimensions and attributes to assess the effectiveness of the ecotourism management cycle of TNGR is *Grounded Theory Approach* Charmaz, 2006; Bryant & Charmaz, 2007).

Determination criteria and indicators in the form of attributes and sub attributes used the standard *Global Sustainable Tourism Council* (GSTC, 2013), Indonesian National Standard (SNI) for the management of natural tourism (BSN, 2014) and *The International Ecotourism Society* (TIES, 2015). The results of the analysis are used to assess the effectiveness of TNGR ecotourism management by using *multidimensional scaling* method (MDS) (Kavanag, 2001, Fauzi and Anna, 2005 Santosa A B, 2014) Rapid Appraisal Sustainability Index for TNGR Ecotourism is a modification of *Rapfish* (Rapid Appraisal for Fisheries). RapEkowisata TNGR is a *Rapfish* with modifications to the attributes that

match the conditions and characteristics of ecotourism management of TNGR. The selected attribute reflects the level of effectiveness of ecotourism management in each dimension, and is adapted to the availability of information that can be obtained from the character of the studied resource (Pitcher and Preikshot, 2001).
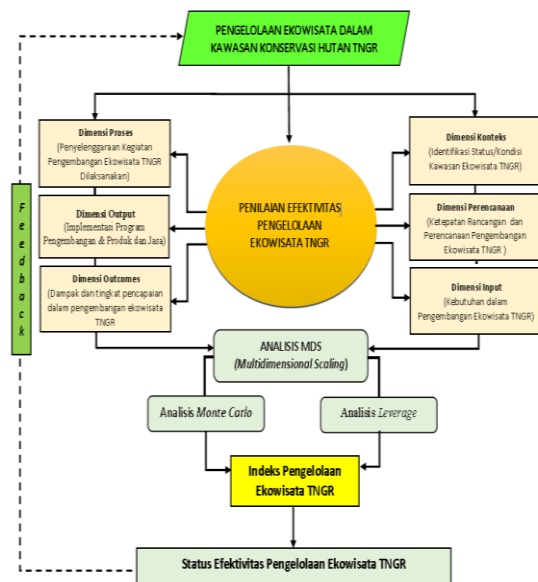

Fig 1. Conceptual Framework Research.

Results

Effectiveness Index of TNGR Ecotourism Management

The effectiveness of TNGR ecotourism management cycle index value is divided into four (4) categories (Fauzi and Anna, 2005), namely:

1. Poor Category (Ineffective) : score (0 , from 00 to 24.99),

2. Deficient Category (Less Effective) : score (25.00 to 49.99),

3. Fair Category (Sufficient) : score (50.00 to 74.99),

4. Very good category (Highly Effective) : score (75.00 - 100.00).

MDS ordination results of each dimension of the ecotourism management cycle of TNGR using Rapid Appraisal Sustainability Index for TNGR Ecotourism on the value of ecotourism management index of TNGR is presented in tables, images and kite diagrams as follows:

Table 1. Index Value of Effectiveness of TNGR Ecotourism Management .

TNGR Ecotourism Management Dimension	Index Value of Effectiveness of TNGR Ecotourism Management (MDS)	Effectiveness
Dimension of *Context* (Background)	50.38	Sufficient
Dimension of *Planning* (Planning)	54.04	Sufficient
Dimension of *Input* (Needs)	47.43	Less effective
Dimension of *Process* (Implementation)	46.15	Less effective
Dimension of *Output* (Result)	54.07	Sufficient
Dimension of *Outcome* (Effect)	48.65	Less effective
Average Index of Effectiveness	50.12	Sufficient

Source: Analysis of primary Data, 2018.

Highest index value is obtained in the dimension of planning, dimension of output and dimension of context with each index value of 54.07, 54.04, and 50.38. Meanwhile the lowest index value is obtained from the dimension of Input equal to 47.43. Status of the index value of the ecotourism management of TNGR is depicted on the two-dimensional map and the kite diagram as follows:
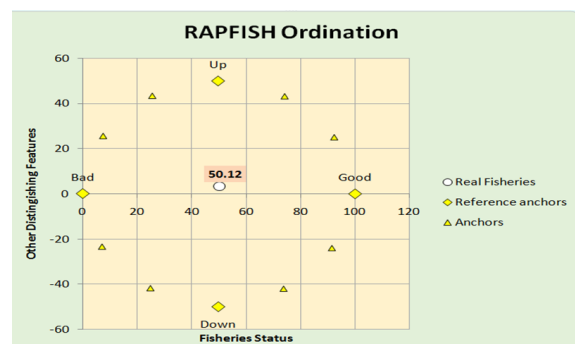

Fig 2. The Index Value of the Effectiveness of TNGR Ecotourism management Status.
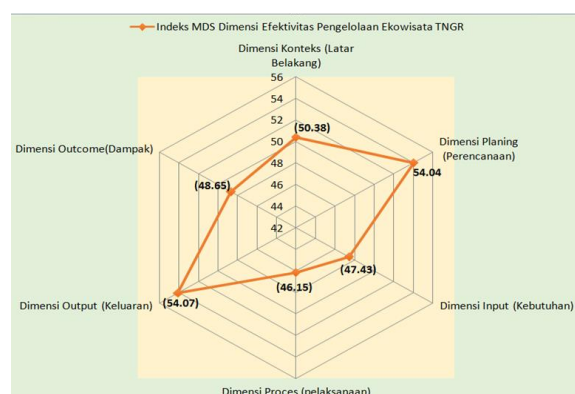

Fig 3. Kite Diagram of TNGR Ecotourism management effectiveness.

Monte Carlo Analysis

The Monte Carlo analysis results are used to evaluate the impact of random error (in statistical analysis) performed on each dimension (Kavanagh dan Pitcher, 2004). The result of comparison of Monte Carlo analysis with MDS at 95% confidence level shows there is difference of value <1 that is equal to (0,31). The comparison of MDS and monte carlo index values to the effectiveness of the ecotourism management cycle of TNGR is presented in the table as follows:

Table 2. Index Value Comparison of MDS and Monte Carlo.

Dimension of TNGR Ecotourism Management	Index Value MDS and Monte Carlo			Note
	MDS	Monte Carlo	Difference	
Dimension of *Context* (Background)	50.38	49.77	0.61< 1	As per the Real Condition of the Field
Dimension of *Planning* (Planning)	54.04	53.64	0.4< 1	As per the Real Condition of the Field
Dimension of *Input* (Needs)	47.43	47.41	0.02< 1	As per the Real Condition of the Field
Dimension of *Process* (Implementation)	46.15	46.02	0.13< 1	As per the Real Condition of the Field
Dimension of *Output* (Result)	54.07	53.69	0.38< 1	As per the Real Condition of the Field
Dimension of *Outcome* (Effect)	48.65	48.31	0.34< 1	As per the Real Condition of the Field
Average Index of Effectiveness	50.12	49.81	0.31< 1	As per the Real Condition of the Field

Accuracy Test (Goodness of Fit) MDS

TNGR Rap Ecotourism analysis results obtained coefficient of determination ($R2$) between 93.00% - 95.00% or greater than 80% or close to 100% which means that sustainability index estimation model is good and sufficient to be used (Kavanagh 2001).

The stress value between 0.13 - 0.16 is smaller than 25% so that the MDS analysis model obtained has a goodness of fit to assess the effectiveness index of TNGR Ecotourism Management (Fisheries, 1999). The value of stress and determination coefficient of Rap Ekowista TNGR analysis results are presented in Table as follows.

Table 3. Accuracy Test (*Goodness Of Fit*) MDS.

Dimension of TNGR Ecotourism Management	S *Stress*	R^2	Iteration	Note
Dimension of *Context* (Background)	0.14	0.94	2	Good and Adequate
Dimension of *Planning* (Planning)	0.15	0.94	2	Good and Adequate
Dimension of *Input* (Needs)	0.16	0.94	2	Good and Adequate
Dimension of *Process* (Implementation)	0.13	0.95	2	Good and Adequate
Dimension of *Output* (Result)	0.15	0.94	2	Good and Adequate
Dimension of *Outcome* (Effect)	0.16	0.93	2	Good and Adequate
Rata-Rata (*Goodness Of Fit*)	0.15	0.94	2	Good and Adequate

Discussion

The average index value at 6 (six) dimensions of effectiveness of TNGR ecotourism management is 50.12. The average value of the index illustrates that the management of ecotourism TNGR has been run well (quite effectively) with a range of values ranging from 50.00-74.99. The effectiveness of TNGR ecotourism management shows the level of understanding of managers and stakeholders toward TNGR eco-management objectives in general has been achieved, but in order to obtain highly effective index category (≥ 75.00), it is necessary to improve the effectiveness of better management performance in the six (6) management dimensions in achieving the goal of ecotourism management of TNGR. The index value category is strongly influenced by factors leverage in 3 (three) dimensions of 6 (six) dimensions of ecotourism management cycle of TNGR that have sensitive effect to increase or decrease status of effectiveness of ecotourism management of TNGR which is stated with the highest Root Means Square (RMS) value up to the half of each dimension of the effectiveness of ecotourism management on laverage analysis ie dimension of planning, dimension of *output,* and the dimension of context. Each index value is 54.07, 54.04 and 50.38. It is necessary to increase the index value on the 3 (three) dimensions to the highly effective category of index value (≥ 75, 00) so it

will also affect the value of ecotourism management performance index in other dimensions in achieving a higher level of effectiveness of ecotourism management of TNGR.

The result of *laverage analysis* Fig 5 dimension of Planning, dimension of Output and dimension of context translated into 6 (six) attribute of assessments respectively. Attributes on Dimension of planning are: 1) Ecotourism Management Plan; 2) The purpose of ecotourism management; 3) Protection System Planning on Sensitive Environments; 4) Design of Ecotourism Area; 5) Planning for waste prevention and handling and vandalism; 6) Planning of interpretation and education activities. There are 3 (three) attributes that become the lever factors that have an effect on the sensitivity to the increase or decreasing the effectiveness status of TNGR ecotourism management namely: 1) The objective of ecotourism management with RMS score 4,41; 2) Planning a sensitive environmental protection system with a RMS score of 4.35; 3) Planning of waste prevention and handling and vandalism with RMS score 3,32.
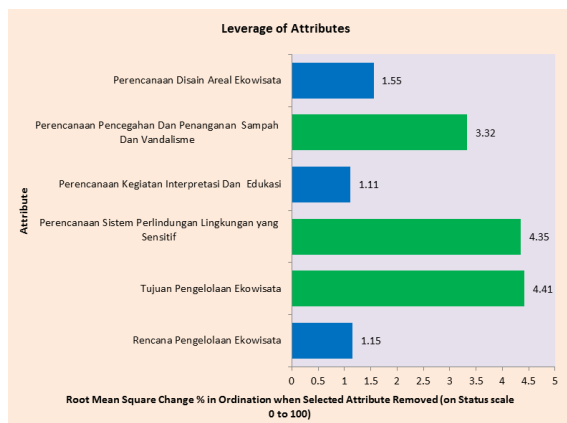

Fig. 4. Leverage Value of Attribute Dimension Planning (Planning) Based on Root Mean Square Value (RMS).

Attributes on the output dimension (output) are: 1) Quality And Quantity Natural Owned; 2) Employment Creation; 3) Maintenance of Tourist Safety and Security; 4) Availability of Visitor facility; 5) The Development of Tourist Attractions; 6) Ecotourism Management Document.

There are 3 (three) attributes that become the factor of lever which influential sensitive to increase or decrease status of effectivity of ecotourism management of TNGR, namely: 1) Employment Creation with RMS score 4,78; 2) Availability of Visitor Pasilitas with RMS score 4,74; and 3) The development of Tourist Attractions with RMS score of 3.71.
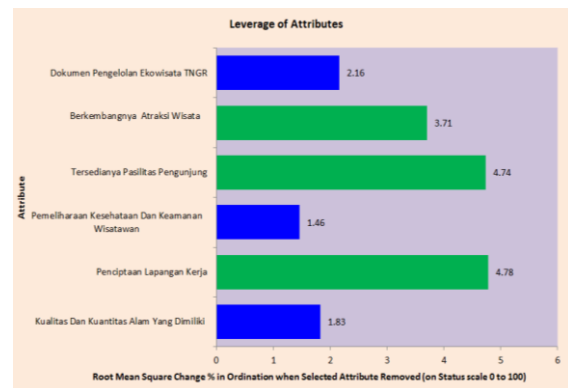

Fig. 5. Leverage Value Attribute Output Dimension (Output) Based on Root Mean Square (RMS) Value.

Attributes in the background dimension (context) are: 1) Legal basis; 2) Regulation and law enforcement; 3) important values of ecotourism areas; 4) The boundaries of ecotourism management areas; 5) Threats in ecotourism areas; 6) National and international context of ecotourism area; there are 4 (four) attributes that become the factor of lever which influential sensitive to increase or decrease status of effectivity of ecotourism management of TNGR, namely: 1) Boundaries of Ecotourism Management Area with RMS score 4,29; 2) Important Value of Ecotourism Area with RMS score 3,25; 3) Regional threats with RMS score of 2.68; 4) Regulation and Law Enforcement with RMS score 2.33.
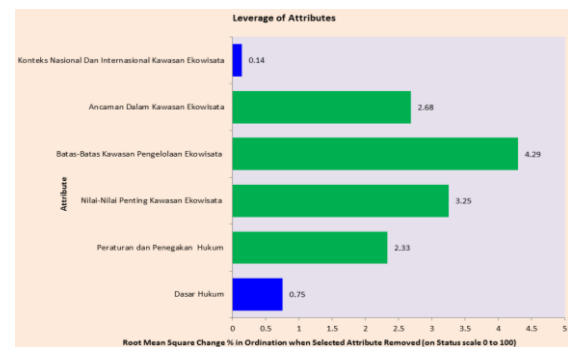

Fig. 6. Leverage Value Attribute Context Dimension (Background) Based on Root Means Square (RMS) Value.

The 10 (ten) lever factors of the 3 (three) dimensions must be controlled or well noted because it is very sensitive to the increase or decrease in the value of the management index in determining the status of effectiveness of TNGR ecotourism management performance. Failure in controling the factors of levers on both dimensions will affect the performance condition of ecotourism management TNGR of which will also affect the sustainability of the area and the level of welfare of the community around TNGR. The effectiveness of planning in the management of ecotourism TNGR means will produce a strategy in achieving profits and products that have competitiveness at the level of the company or the actors of tourism (Damanik dan Weber, 2006). In addition, one of the determining factors of the effectiveness of the management of one area is the output Hocking *at. al,* (2006).

In the Long Term Management Plan of TNGR Central 2015-2024 listed eco-tourism management or called nature tourism is the goal of TNGR area management. Similarly, conducted by the NTB Provincial Government in the Master Plan of Sustainable Tourism Lombok Island 2015-2019, and planning made by the Ministry of Tourism to include the island of Lombok as one of the national tourism priority destinations 2014-2019. Although ecotourism planning is made by several parties, it has the same goal of conserving nature and culture and as a means of gaining economic benefits over the region and improving the economy of the community.

The absence of ecotourism management planning systems that prevent the introduction of invasive species in the TNGR area will have a negative impact on the ecosystem. Based on the information from the TNGR Hall staff regarding the invasive species within the TNGR ecotourism areas such as the development of rat populations at trucking stations used to rest and overnight by tourists, even the rat species have been found in lakes and mountain peaks before never existed, but also the change of behavior of animals such as monkeys in the area of TNGR. The emergence of rats up to Segara Anak lake has the potential to spread diseases from wild animals to humans or vice versa (zoonosis), so in the future it is necessary to have ecotourism planning system that prevents the introduction of invasive species within the TNGR.

The impact of ecotourism activities in terms of biodiversity is to raise the problem of inhibition of plant regeneration due to being trampled, or even cut down by visitors along the climbing route to serve as sticks and materials for cooking (Rai, 2010) at the peak of the climb, still often happened edelweiss taker by tourists, the number of people also become a barrier for passing wildlife on the left and right side of the track. The lack of monitoring of negative impacts and protection of ecosystems, as well as sensitive species within the TNGR area due to the lack of resources, limitations of TNGR budgets, and low awareness of tourists and communities both as porters and guides in preserving the region.

The increasing number of visitors in TNGR not only gives positive impacts but also negative impacts that can disrupt the preservation of the ecosystem of the region. Negative impacts of ecotourism activities that have been the problem of waste and vandalism. The condition is caused because of the low awareness of visitors to nature in maintaining the sustainability of the area and closely related to the behavior and habits, in this case educational approach is very important in doing so in need of cooperation and attention by all stakeholders consistently.

The impact of ecotourism activities in TNGR is physical and biophysical damage within the area. This condition is the result of the high number of visitors who do not pay attention to the carrying capacity and capacity of the region. Carrying capacity and ecotourism capacity of TNGR can receive tourists as many as 1,452 people per day for all ecotourism activities, or 172,917 people per year. In 2014 the number of tourists visiting the ecotourism of TNGR of 44,112 people had exceeded the carrying capacity for camping activities of 42,525 people per year or 357 people per day (Sadikin, 2017). The high number of visitors in TNGR ecotourism contributes to the amount of garbage and vandalism within the region.

The absence of limitations on the number of visits in accordance with the carrying capacity and capacity of the region although later in the future will be applied online booking system which is one of the visitor management strategy. Analysis of the carrying capacity of the area is very useful to determine the limits of tolerance and the optimal capacity (flexibility) to travel for tourist satisfaction is met in a sustainable (Muhammad dan Baiquni, 2014).

The condition of the ecotourism area of TNGR is full of piles of garbage located at the resort posts along the climbing lane, camping ground area, lake, and the hot spring. Types of garbage such as plastic waste, bottles, bottles, wet wipes, remnants of vegetable waste and food as well as the number of vandalism in almost all buildings/infrastructure provided by TNGR Hall. There is a huge number of vandalism on the rocks around the lake just to write names. The behavior gives a huge impact on the decline of the quality of the habitat of the region also to visitor satisfaction. Therefore the TNGR Hall should strive and cooperate with all stakeholders by empowering the community and educating the visitors to minimize the negative impact. 2017 Hall of TNGR has made a master plan of waste management in cooperation with the University of Mataram as a team of experts. This waste management plan is a master plan for waste management in climbing activities to be carried out over a 20-year period. This waste management plan is prepared to address the main problems of waste that are the negative impacts of TNGR ecotourism activities.

In addition, TNGR will try waste management in the form of waste deposit application which is still under review and governor's regulation draft process. In the master plan of waste management is discussed the role of stakeholders, financing, visitor restriction mechanism, confinement of garbage in the form of prohibition of some types of garbage to enter the TNGR area such as wet wipes, streoform, B3 and candy wrappers, in addition to the arrangements related to waste sorting and waste, , waste management institutions, inspection procedures

(pack in and pack out), division of space in each post such as in the camping area, kitchen and toilet area, garbage dagging in the area, waste management and garbage transport to TPS/TPA. It is also about the mechanism of rewarding and sanctioning.

TNGR ecotourism management can create jobs, so that many local people work as tour operators either as porters, guides, TO/owners of home stay/ transportation, parking attendants, food vendors or food vendors. The BTNGR 2017 data shows the number of TOs increased from 22 in 2000 to 59 in 2017, the number of guide/porters increased from 290 people in 2000 to 1059 in 2017, as well as the number of inns increased from 20 in 2000 to increase to 82 in 2017.

Ecotourism has a huge role in terms of generating economic benefits because ecotourism contributes to the creation of jobs in remote areas that are economically not profitable for both government and society Linberg (1999). The existence of ecotourism activities (tourism) can benefit local communities by opening jobs, business opportunities, and funding that are reabsorbed in the form of regional development projects (Scheyvens, 2000, Retnowati, 2004 dalam Dhalyana at al., 2013) as well as providing greater opportunities to control the use of natural resources in certain areas as one of the assets of ecotourism activities (Ashley & Roe, 1997).

TNGR ecotourism activities should be supported by the availability of infrastructure in the form of facilities and infrastructure to support these activities. Infrastructure is the building or basic facilities needed to support ecotourism activities and is provided for the needs of providing comfort to tourists visiting TNGR such as bulletin boards, signage boards, toilets, parking lots, shopping, roads, transportation, accommodation and so on. Infrastructure (facilities and infrastructure) ecotourism needs to be built and adapted to the characteristics of the object or area of conservation and socio-cultural conditions of local communities. Therefore the planning of physical building and pelu infrastructure based on the

understanding of the potential of the local area and the characteristics of visitors *(existing user)* Nugroho, 2011. The same thing according to (Suwantoro, 1997) that for the readiness of tourist objects that will be visited by tourists in the tourist destination, the tourism infrastructure needs to be built with the appropriate location and condition of the relevant tourist attraction.

Quite effective planning in the management of ecotourism TNGR means it will produce a strategy in achieving profits and products that have competitiveness (competitiveness) at the level of the company or the actors of tourism (Damanik dan Weber, 2006). In addition, the effective management of ecotourism TNGC based on the results of MDS odination is also influenced by the output dimension (output). Indicators of effectiveness of the management of one area is determined by the output (output) Hocking *at. al,* (2006). in the form of 3 (three) factors leverage yatiu creation of job opportunities, availability of visitors and visitors have begun the development of tourist attractions conducted within and outside the area ekowista TNGR.

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Lack of availablity and inadequacy of infrastructure in the form of facilities and infrastructure for visitors in support of ecotourism management TNGR is very influential on the satisfaction of visitors so that the necessary provision and management of sarpras to support excellent service. The procurement of TNGR ecotourism facilities and infrastructure has been derived from DIPA Balai TNGR budget.

The facilities and infrastructure include information room and regional entrance ticket, guide board of climbing and warning, shelter, overnight area to set up a tent, mount plaque of Mount Rinjani, and many others but it is very unfortunate condition of the facilities and the impressed impressed terawat and the number of vandalism in the form of graffiti for example on the wall and pole of the building.

Conclusion

The MDS ordination results on the six dimensions of the ecotourism management cycle of TNGR using Rapid Appraisal Sustainability Index for Ecotourism tool TNGR shows the average value of the 6th (6) dimension of effectiveness of ecotourism management of TNGR in the category is quite effective with the index value of 50.12. This category illustrates the goal of TNGR ecotourism management achieved, however it is still necessary to improve performance to achieve higher levels of effectiveness of the management of ecotourism of TNGR. The highest index values are obtained on planning dimensions, output dimensions, and background dimensions (Kontexs) of 54.07, 54.04 and 50.38, respectively. The lowest index value is obtained in the needs (input) dimensions of 47.43.

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