STUDY ON COMPARISON BETWEEN HANDLING POVINCIAL ROAD PRIORITY IN LOMBOK ISLAND USING PROVINCIAL ROAD MANAGEMENT SYSTEM (PRMS) WEST IN NUSA TENGGARA IN 2017 AND ANALYTICAL HIERARCHY PROCES (AHP)

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ABSTRACT

West Nusa Tenggara Province is one of provinces in Indonesia having rapid development progress. It might be contributed by some potencies that involved the beautiful landscape and become the international tourism destination; having agricultural, plantation and fishing areas and the provinces was identified as the national food barn. Hence, the development of this region was very important. The development of a region needs adequate infrastructure including road. Limited available budget require the Provincial Government to set priority activities for road preservation. This research was aimed to compare the priority activities set by the Provincial Government of 'West Nusa Tenggara for road preservation based on PRMS method and that based on the analytical hierarchy process (AHP). The primary data was collected by distributing questionnaire to road beneficiaries group, construction professionals, project owner, community leaders, consultant and scientist (academics). The secondary data was collected from planning and budgeting document of the Provincial Government related with priority activities for road preservation. The research reported that based on the AHP method, the rank order of road preservation priority activities was periodic maintenance and rehabilitation, road improvement, road reconstruction and routine maintenance. The rank order of road preservation priority activities based on the work volume determined in 2017 was routine maintenance, periodic maintenance and rehabilitation, road improvement (enhancement) and road reconstruction. Moreover, the rank order of priority activities based on budget allocation was periodic maintenance and rehabilitation, road improvement, routine maintenance and road reconstruction. It was concluded that the priority activities for road preservation had relatively same rank order between that of AHP method and that of PRMS method used by the Provincial Government of West Nusa Tenggara. The priority activities set by the provincial

government based on the budget allocation had closer rank order with AHP than that based on the work volume.

Key words: Road handling, priority activities, AHP Method, PRMS Method.

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1. INTRODUCTION

West Nusa Tenggara Province is one of provinces in Indonesia having rapid development progress. It might be contributed by some potencies that involved the beautiful landscape enabled the area become the international tourism destination; having agricultural, plantation and fishing areas and the provinces was identified as the national food barn. Hence, the development of this region was very important.

The development of a region needs adequate infrastructure. To develop the potencies of the province need adequate road either the length or quality of the road. The quality infrastructure might increase accessibility of the tourism destination, smoothness of transportation and commodities distribution resulting low cost of transportation. Hence, improving quality of road was very importance to increase the region development.

Road is one of public goods that should provide benefit for community. It has consequences for the government including provincial government to assure the availability of quality road. The development, management and maintenance of the road become government's responsibility. According to the Indonesian Law No. 38/2004(Anonymous, 2004), the development of road is become the provincial government authority. There was significant change of mechanism in planning and programming of road infrastructure currently. As far as now, the central government had allocated specific budget for road development and maintenance based on the central government's assessment. Currently, the Province government through Civil Office should determine, make priority, develop planning and budgeting for the infrastructure development through local budget (APBD) and "match" the provincial budget. The central government is only responsible for the artery road, while the other become province and district government responsibilities.

The provincial government has challenge in prioritizing infrastructure development and maintenance activities due to limited budget. The alternatives activities were routine maintenance, periodic maintenance and rehabilitation, road improvement (enhancement) and road reconstruction. The Provincial Government used PMRS survey to determine priority activities. The Provincial Government had set road development and preservative priority in the Provincial Midterm Development Plan (RPJMD) 2015-2019 document based on the PRMS method. Meanwhile, there is other method in setting priorities, Analytical Hierarchy Process (AHP) that accommodate multiple criteria's that enable the priority decision could be determined more accurate and comprehensively (Anonymous, 2014). To evaluate the quality of priority activities determined by the provincial government, it was necessary to compare the priority based on the PMRS method and that based on the AHP. This study focused on comparing the road preservative priorities in Lombok Island set by the Provincial Government and that resulted by AHP method. How is the conformity of road preservative priority activities set by the Provincial Government of West Nusa Tenggara based on PRMS

method with those resulted by Analytical Hierarchy process (AHP) to be addressed in this study.

The general objective was to compare the road preservative priority activities set by the Provincial Government of West Nusa Tenggara and the priority activities resulted by Analytical Hierarchy Process (AHP).

The specific objectives of the study were:

- Identify the road preservative priority activities in Lombok Island set by the Provincial Government of NTB in 2017 by using PRMS.
- Identify the road preservative priority Activities based on Analytical Hierarchy Process (AHP) method.
- Analyze the conformity of road preservative priority activities set by the provincial government in 2017 and those based on Analytical Hierarchy Process (AHP) method..

2. LITERATURE REVIEW

Mulyono et al, (2014) study about evaluation of national road handling programs in south sumatra province based on iri value, road width and V / C Ratio "using the Importance Performance Analysis (IPA) and modified-CSI method to solve existing problems. This research is different from the research of Agus and Riani (2014) in determining the problem solving method, while the research variables studied have similarities. These variables are the road conditions represented by the IRI and V / C Ratio values and the road function variable represented by the Road Width.

Wahyudiana (2009) studied about "determining the priority of district road maintenance based on the availability of fund allocation (Case Study of Regency Roads in Tulungagung District) has similarities with the research. This study is in terms of the AHP method and the determination of the consideration of the use of road maintenance funds. The present study also had differences with Wahyudiana's research (2009) in terms of the research object, where the current study used provincial roads as research objects while Wahyudiana (2009) research used district road as the object of research

According to the Republic of Indonesia Law No 22/1999 where the definition of road is all parts of the road, including complementary buildings that are intended for public traffic, which is under the surface of the ground, above ground level, below the water surface, and above the water surface, except railroad and cable road. The road has a role to encourage the development of all units of the development area, in an effort to reach the level of development between regions (Anonymous, 1999)

According to Indonesia Law No. 38/2004 concerning Roads, can be defined as land transportation infrastructure covering all parts of the road, including its auxiliary buildings and buildings which are intended for traffic, which is at ground level, above ground level, below ground and / or water, and above the water surface , except railroad tracks, lorry roads and cable roads. (Anonymous, 2004)

It also stated that based on its role, Law No. 38/2004 divides the primary road network system in four categories, namely primary arterial roads, primary collector roads, primary local roads and primary environmental roads. Government Ordinance No. 34/2006 explained that primary arterial roads are roads that connect powerfully between centres of national

activities or between centres of national activities and regional activity centres. The primary collector road connects efficiently between the centre of national activities and the centre of local activities, between regional activities central, or between regional activity central and local activity central. (Anonymous, 2006)
Saaty (2005) introduced the Analytical Hierarchy Process(AHP). The AHP describes a structured approach in making decisions as a general choice (overall preference) among a number of alternatives that are considered capable of meeting a series of objectives (objectives)

3. METHODOLOGY

This research used two kinds of data which are the primary data and the secondary his research was an analytical observational research that aimed to evaluate the conformity between the road preservative activities prioritized by the Provincial Government of West Nusa Tenggara through Provincial Road Management System (PRMS) and that based on the Analytical Hierarchy Process (AHP). There were 4 alternatives activities being prioritized that included routine maintenance, periodic maintenance and rehabilitation, road improvement (enhancement) and road reconstruction. The study was located in Lombok Island on the Provincial road segment of West Nusa Tenggara (NTB).

The variable included the prioritizing method as independent variable and the road preservation priority activities resulted as dependent variable. The independent variable had 2 attributes that involved Provincial Road Management System (PRMS) and Analytical Hierarchy Process (AHP) Method. The priority activities set by the provincial government was measured based on the work volume (in kilometers) and budget allocated (rupiah) for each activity. The AHP method used multiple criterias that included road condition, traffic volume, land utility and cost aspect. Participants especially beneficiaries and those in charge with road preservative activities that included construction professionals, project owner, community leaders, consultant and scientist (academics) were given questionnaire as respondent. The sample size was calculated using Equation 1

$$\boldsymbol{n = \frac{N}{1+Ne^2}}. \qquad (1)$$

Where:

N = population size

n = sample size

Secondary data collection was done to identity handling road priority activities setting by the Provincial Government. The data included: road condition, traffics volume, and budget for road maintenance, policy and land use management. The data was collected from provincial government document related with road preservative management especially The Road Management Division (Highways Division) of District Office of Public Works and Spatial Planning and Development of West Nusa Tenggara Province in year period of 2017 (Anonymous,2016). Then, the primary data collection was analyzed by using AHP method. The data was collected by interviewing sampled parties related with road priority setting management

In this research, the hierarchy setting for Analytical Hierarchy Process (AHP) method was used which the perpetual process as shown in Figure 1.

Study on Comparison Between Handling Povincial Road Priority in Lombok Island Using Provincial Road Management System (PRMS) in West Nusa Tenggara in 2017 and Analytical Hierarchy Process (AHP)

The method of technical analysis for Road Planning in Lombok Island based on Ministry Regulation No.77/KPTS/Db/1990 Director General of Highways was presented on Figure 2.(Anonymous, 1990)

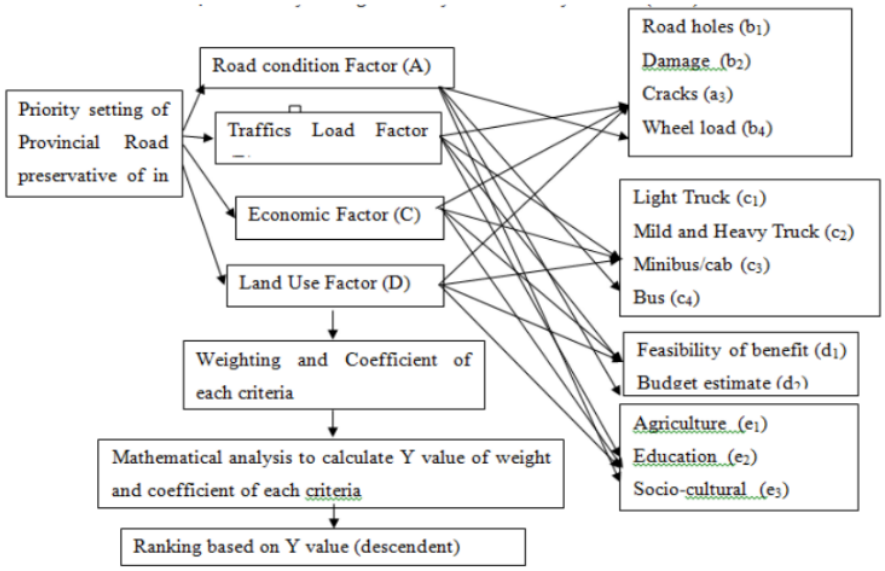
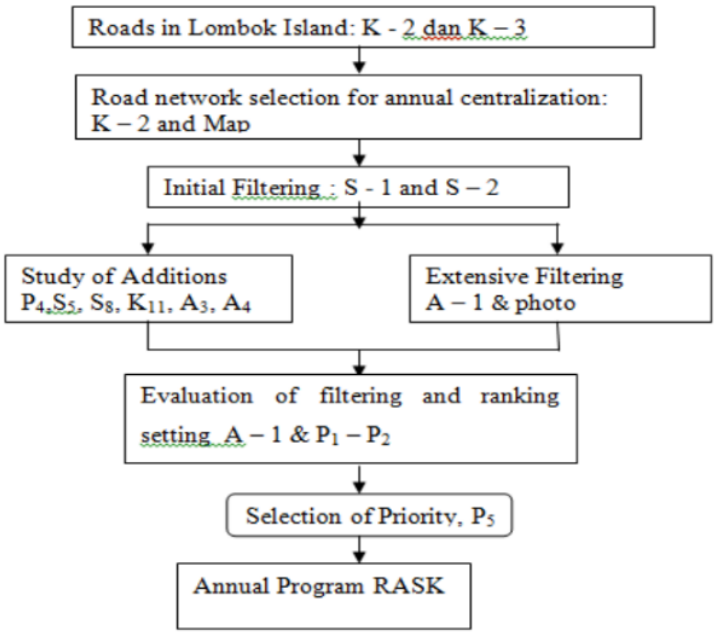


Figure 1 Hierarchy setting of handling road priority



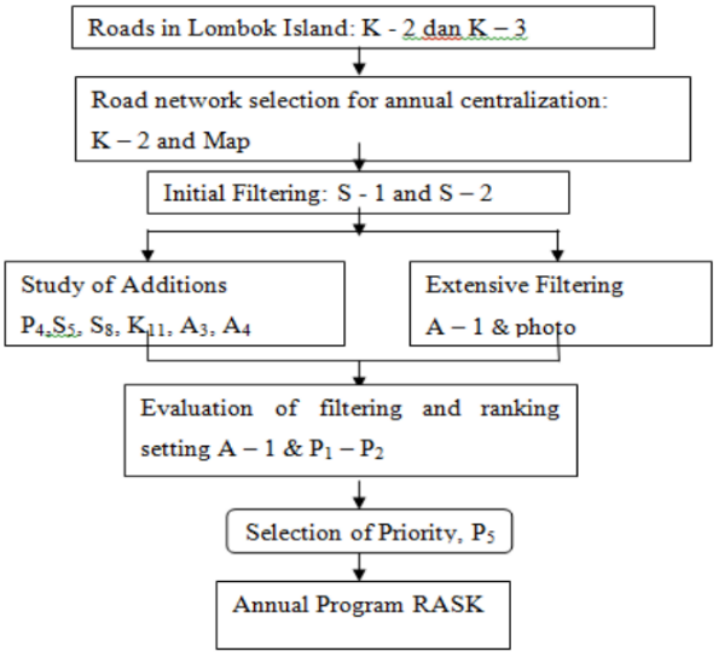


Figure 2 Technical Analysis of Road Preservative Plan in Lombok Island

3.1. Data Analysis

The data was analyzed by using Process Hierarchy Analysis (AHP) that was processed with Microsoft Excel software. The procedure of analysis involved the following steps:

Weighting each criteria with paired comparison and scoring. The score take range between 1 to 9 with 5 degrees, i.e.: very important, more important, as important, less important and not important as presented on Table 1.

Table 1 Assessment of the importance and score

No	Degree of Importance	Score
1	Very Important	9
2	More important	7
3	As important as	5
4	Less important	3
5	Not important	1

Identify the score of Priority Vector (PV) from each compared criteria.

Determine the maximum λ score. Identify CI (Consistency Index) to produce CR (Consistency Ratio).

Scoring utility of each criteria with paired comparison. In this scoring method, the chosen normality score was activity constraint with the following equation (Eq.2):

$$\text{The normality score} = \frac{score}{\sum score} \ldots \quad (2)$$

The last step was interpreting the result of the analysis to identify the main criteria as a basis to set road preservative priority activities in Lombok Island according to the condition.

The flowchart of priority setting used by the Provincial Government as shown in Figure 3 below, (Anonymous, 2016).

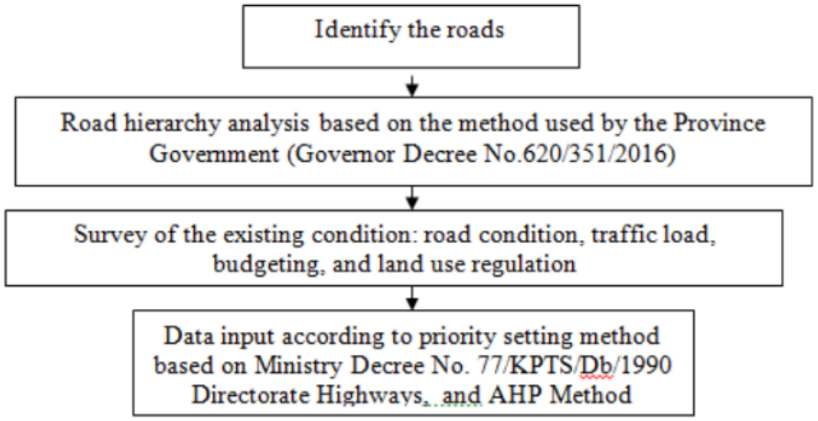


Figure 3 Analysis of Road Condition in Lombok Island

On the other hand, in this study it was implemented AHP method to determine road priority compared with method based on Ministry Decree No. 77/KPTS/Db/1990 Directorate General of Highways as shown in Figure 4.

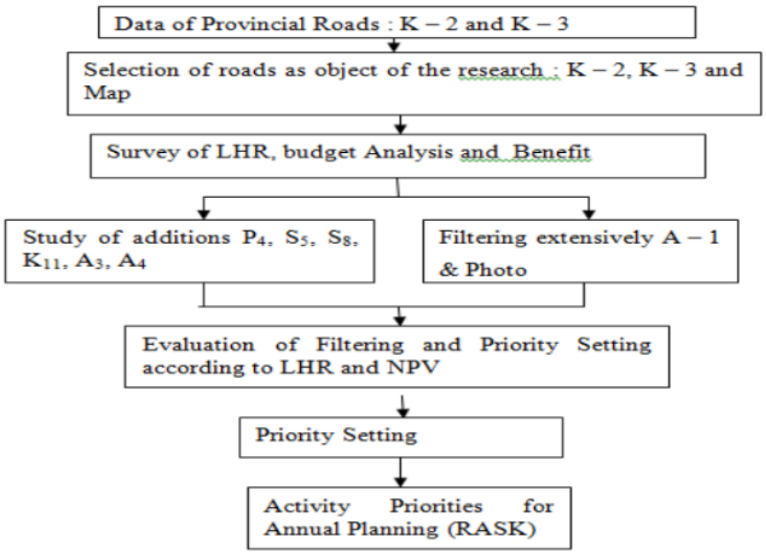


Figure 4 Priority setting method According to Ministry Decree No. 77/KPTS/Db/1990 Director General of Highways

4. RESULTS AND DISCUSSION

The road damage was identified based on the existence of hole and cracks that had been converted into the value of road damage index (RDI). The RDI would be used to assess the volume of road damage for each road. Among 74 road segments, the volume of road damage as follow:

- 43 segments (59,7%) were in good condition
- 2 segments (2,8%) had totally light damage
- 7 segments (9,7%) had totally medium level of damage
- 1 segments (1,4%) had totally severe level of damage
- 4 segments (5,6%) had severe level of damage on ≤ 50% partly
- 15 segments (20,8%) had damage in various level.

Based on the RDI, the Provincial Government of West Nusa Tenggara determined 14 roads as priority for preservative program that was set by the Director General of Highways Decree No. 77/KPTS/Db/1990 and The Governor decree No. 620/351/2016. The road had 169,08 km in total spread out in Lombok Island.

The Provincial Government of West Nusa Tenggara had allocated budget around IDR. 224,847,800,000,00 in 2017 for road preservative and development. The budget was used to finance priority activities related with the road preservative. The budget allocated and the volume of work (kilometers) represented the level of priority activities. The priority activities and the budgeting were presented on the Table 3.

Table 3 The Budget and Length of Road as Priority Activities Set by the Provincial Government of West Nusa Tenggara

Activity	Volume (Km)	% Volume	Budget Rp. (Thousand)	% Budget
Routine Maintenance	533.16	69.27	10,000,000	4.45
Periodic Maintenance and rehabilitation	134.5	17.48	107,394,800	47.76
Road Improvement	100	12.99	104,053,000	46.28
Road Reconstruction	2	.26	3,400,000	1.51
Total	769.66	100	224,847,800	100

According to the volume of work, the table shows that the order of priority activities was routine maintenance, periodic maintenance and rehabilitation, road improvement and road reconstruction. While the priority activities according to budget allocated was periodic maintenance and rehabilitation, road improvement, routine maintenance and road reconstruction consecutively.

Table 4 Priority Activities for Road Preservatives Resulted by AHP Method

No	Activities	Score (%)	Rank
1	Routine Maintenance	24,0	3
2	Periodic Maintenance and Rehabilitation	25,6	1
3	Road Improvement (Enhancement)	25,6	1
4	Road Reconstruction	24,8	2

The analytical hierarchy process (AHP) was used to determine priority activities based on the multi criteria's. the criteria included budget, time of implementation, quality of work, work plan, work safety, structure, work performance, climate factor and capability of contractor. the AHP resulted priority activities for the road preservatives as follow:

Table 4 shows the priority activities for road preservatives resulted by the analytical hierarchies process. the order of priority activities was periodic maintenance and rehabilitation, road improvement (enhancement), road reconstruction and routine maintenance consecutively. the analysis also resulted consistence ratio (CR) as 0,10 % (CR< 10 %). the cr was less than 10% that indicated the degree of consistence was fulfilled and the AHP result was optimum

Table 5 Comparison between the Order of Priority Activity resulted by AHP Method and That of Provincial Government

Activities	Rank by AHP	Rank Based on Work Volume (Km)	Rank Based on Allocated Budget
Periodic maintenance and rehabilitation	1	2	1
Road Improvement (enhancement)	1	3	2
Road Reconstruction	2	4	4
Routine Maintenance	3	1	3

To measure the quality of priority activities set by the provincial government of West Nusa Tenggara, it was necessary to compare between the priority activities with that resulted by AHP method. The rank order of activities by Provincial Government was adjusted due to the work volume (kilometers) and budget allocated for the activities.

Table 5 shows that the rank order of priority activities based on the three measurements was relatively similar. However, the rank order based on budget allocation was closer with the AHP result than that based on the work volume. The AHP method placed periodic maintenance and rehabilitation and road improvement as the rank 1 (same rank), while budget allocation placed the both activities as rank 1 and 2. The difference place only for road reconstruction that was placed on rank 4 based on the budget allocation. The different rank was more visible on the rank order resulted by work volume. Moreover, it can be concluded that the priority activities for road preservative set by the provincial government of West Nusa Tenggara province in 2017 was relatively similar with that resulted by analytical hierarchy process method

5. CONCLUSIONS

The order of priority activities for the road preservation in Lombok Island set by The Provincial Government of West Nusa Tenggara based on the work volume was routine maintenance, periodic maintenance and rehabilitation, road improvement (enhancement) and road reconstruction.

The order of priority activities according to the budget allocation was periodic maintenance and rehabilitation, road improvement, routine maintenance and road reconstruction. While the priority activities according to AHP method was periodic

maintenance and rehabilitation, road improvement, road reconstruction and routine maintenance.

The comparison between the priority activities set by the provincial government and that based on the AHP method resulting relatively similar rank order. However, the priority activity based on the budget allocation had closer rank order with that based on the AHP method.

REFERENCES

[1] Wahyudiana, Determination of District Road Maintenance Priorities Based on Availability of Fund Allocation (Case Study of Regency Roads in Tulungagung Regency), Thesis of Master in Civil Engineering, Postgraduate Program, Sebelas Maret University, 2009.

[2] Mulyono, et. al, "Evaluation of Handling National Road Program in South Sumatera Province based on IRI value, road width, and V/c ratio using Importance Performance Analysis dan modified-CSI., Thesis of Magister in Transportation, Engineering Faculty, Gajah Mada University, 2014

[3] Thomas L Saaty, Theory and applications of the analytic network process: decision making with benefits, opportunities, costs, and risks, RWS publications, Pittsburgh,USA, 2005

[4] Anonymous, Directorate General of Highways, Ministerial Decree No. 77/KPTS/Db/190 about Technical Instruction for Road Planning and Programming in District Level. Ministry of Public Work of the Republic of Indonesia. Jakarta. 1995.

[5] Anonymous, Directorate General of Highways. Manual for Road Capacity of Indonesia. Ministry of Civil Work of the Republic of Indonesia. Jakarta. 1997.

[6] Anonymous , Directorate General of Highways. Design of Road Classification and Function in Rural Areas. Ministry of Public Work, Settlement and Infrastructure of the Republic of Indonesia. Jakarta. 2003.

[7] Anonymous , Government of Indonesia. The Government Decree No. 47/1997. National Spatial Planning for Territories. Jakarta. 1997.

[8] Anonymous , Government of Indonesia. Government Regulation No.38/2004 about Highways, Jakarta. 2004.

[9] Anonymous , President of the Republic of Indonesia. The Indonesian Law No.22/2009 about Road. Jakarta. 2009.

[10] Anonymous , Provincial Government of West Nusa Tenggara. Provincial Territory Spatial Plan for 1999-2014, Mataram.,1999.

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