Determining the priority of new road development according to the West Sumatera provincial government perception

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Abstract. The West Sumatra provincial government has prioritized the development of ten provincial road in order to improve community welfare. With budget constraints, an analysis is needed to determine development priorities for the road, so that the budget can be used appropriately. This study aims to determine the criteria, the sequence of criteria and the priority sequence of roads for the development of new roads in West Sumatera province. The criteria were obtained from a preliminary study. While the sequence of criteria were obtained by using the Priority Criterion method, and the priority sequence of road were obtained by using the Prioritization Matrix method. From this study, there were twelve criteria that influence the development of new roads in West Sumatera Province, with the main criteria "Roads built will support access to local production and trade", and the final criteria "Roads built will facilitate access to social/cultural communities". From the twelve criteria, it was concluded that the main priority road was the Pasar Baru - AlahanPanjang road. The results of this study can be a reference for decision-makers in determining the priority of road development in the PUPR Department of West Sumatera Province.

1. Introduction

The development of new roads is a road handling activity that starts from the condition of the unavailability of the road body until it reaches the road conditions that can function/operate. Road development has a very important meaning, given the function of the road in facilitating the flow of people and goods from one place to another. With the development of roads will also facilitate the flow of goods from production sources to marketing centers.

The basic considerations that must be used as a basis for road development activities include [1]:

- Stimulate with socio-economic and cultural activities.
- Development criteria are not based solely on economic feasibility, but rather emphasized on the consideration of many factors including,(1) Aspiration of a developing community;(2) Community dynamics;(3) Regional development;(4) Equitable development results;(5) Environmental aspects;(6) Social, cultural and defense security;(7) Investment aspects.
- Development of a long-term scale.
- Short term with functional scale.
- Priority of connecting corridors across regions.

With the aim of achieving public welfare, the provincial government has planned the construction of several road contained in the Provincial Road Master Plan Documents for 2016-2026 West Sumatera Province. The development of road is very important because it can boost the life of the economy which will lead to increased community welfare.
This study aims to determine the criteria, the sequence of criteria and the priority sequence of roads in the new road development project in West Sumatera Province, so that the existing budget can be used appropriately so that the mission to improve community welfare can be achieved. The results of this study can later be used as a consideration for decision makers in the PUPR Department of West Sumatera Province to determine the priority of road development projects.

2. Priority Method
Limitations of time, energy, and funds make it impossible to do many things at the same time so that it needs to be prioritized [2]. Many methods can be used in determining priorities. And in this study focused on using a combination of Priority Criteron methods and Prioritization Matrix methods.

The Priority Criteron method is usually based on the priority ratings that have been determined for maintenance items which can be based on historical data or expert judgment. This method collects proposals from maintenance personnel and items are prioritized based on predetermined priorities [3]. The Priority Criteron method only highlights the priority of maintenance work without explaining the actions that must be taken to solve the problem [4]. Research on the reasons for maintenance and maintenance priority preferences of building elements in Malaysia uses the Priority Criteron method in processing the data. Respondents were asked to prioritize the reasons for building maintenance and prioritize the preference of building elements by using a 4-point rating scale which ranged from 1 to 4, from 1 = strongly agree to 4 = strongly disagree [5].

A matrix is a sequence of numbers, symbols, or expressions of rectangles arranged in rows and columns. In priority settings, visually represent factors or criteria used for priority rankings [6]. Prioritization Matrix is a simple tool that provides a way to sort a series of diverse items into a sequence of interests. This matrix provides a means to prioritize projects based on specified criteria so that we can clearly see which sequence of projects must be done first [7].

3. Research Methodology
In the preliminary study phase, the previous literature was examined regarding the criteria in determining road development priorities. At this stage, interviews were also conducted with several PUPR Department staff to find out what criteria are commonly used in determining road development priorities.

In this study, primary data and secondary data are needed. To obtain primary data, interviews and questionnaires were filled directly with respondents, whom are related to the field of new road development in the West Sumatera Provincial PUPR Department as provincial road organizers. Respondents consisted of 1 Head of Division, 1 Section Head, 9 Project Leader, and 3 expert staff in the field of development of the PUPR Department. In filling out the questionnaire, respondents were directed to rank 12 criteria that had been determined based on their importance. The scoring system of the questionnaire questions is a 4-point assessment that is the value of 1 for absolute high priority criteria, 2 for high priority criteria, 3 for medium priority criteria, and 4 for low priority criteria. The data is then processed using the Priority Criteron method to get the sequence of criteria that will be used in the next analysis. After that, the results of data processing are combined with secondary data in the form of data regarding the condition of the road obtained from the PUPR Department and data analysis is performed using Prioritization Matrix to get the priority sequence of roads. To ensure the reliability of data, reliability testing is carried out before analyzing the data. With the test results show the Cronbach Alpha value is 0.709 which is above the acceptable minimum threshold of 0.5 as suggested [8].

4. Results
From preliminary studies conducted, by tracing the previous research and interviews on several expert staff at the Department of PUPR obtained 12 criteria required in this study that can be seen in Table 1.
Table 1. Criteria obtained from preliminary studies.

| Number | Criteria                                                                 |
|--------|--------------------------------------------------------------------------|
| 1      | Roads built has a road body                                             |
| 2      | Roads built are in a relatively large / densely populated area          |
| 3      | Roads built will support access to local production and trade           |
| 4      | Roads built require relatively large costs / budgets                    |
| 5      | Roads built are access to public facilities                            |
| 6      | Roads built are access to isolated areas                                |
| 7      | Roads built are access to the natural tourism area                      |
| 8      | Roads built will facilitate access to education                         |
| 9      | Roads built will facilitate social/ cultural access of the community    |
| 10     | Roads built will be an alternative road to avoid congestion             |
| 11     | Roads built will be an alternative ways of mitigating disasters         |
| 12     | Roads built will shorten the distance between two or more districts / cities |

In the primary data analysis stage, the Priority Criterion method is used to get the criteria sequence from 12 existing criteria where the results can be seen in Table 2.

Table 2. Data analysis using priority criterion method.

| Sequence | Criteria                                                                 | Mean   |
|----------|--------------------------------------------------------------------------|--------|
| C1       | Roads built will support access to local production and trade.           | 1.571  |
| C2       | Roads built will be an alternative ways of mitigating disasters.         | 1.643  |
| C3       | Roads built are access to public facilities.                             | 1.714  |
| C4       | Roads built are access to isolated areas.                                | 1.786  |
| C5       | Roads built will shorten the distance between two or more districts / cities | 1.857  |
| C6       | Roads built are access to the natural tourism area.                      | 1.929  |
| C7       | Roads built will facilitate access to education.                         | 2.143  |
| C8       | Roads built are in a relatively large/ densely populated area.           | 2.286  |
| C9       | Roads built will be an alternative road to avoid congestion.             | 2.357  |
| C10      | Roads built require relatively large costs / budgets.                    | 2.643  |
| C11      | Roads built has a road body.                                             | 2.714  |
| C12      | Roads built will facilitate social/ cultural access of the community.    | 2.857  |

Based on the results of the data, it can be seen that "Roads built will support access to local production and trade" (mean score 1.571) is the most important criteria, followed by "Roads built will be an alternative ways of mitigating disasters" (mean score 1.643), and "Roads built are access to public facilities" (mean score 1.714), and so on.

In the secondary data analysis stage, the Prioritization Matrix method is used to get the priority sequence of roads. In evaluating each criteria, weighting is given according to the mean value of each criteria as shown in Figure 1 below.
Furthermore, an assessment of ten road sections is based on 12 criteria that have been obtained previously. The road assessment system is a value of 0 if the criteria are suitable/owned by the intended road and value 1 if the criteria are not suitable/not owned by the intended road. The criteria value is generated from the multiplication between the weights and the assessment. From the results of data analysis using the Prioritization Matrix method, the results of the assessment are obtained as in Table 3.

Table 3. Assessment recapitulation of criteria based roads.

| Road Name                  | C1  | C2  | C3  | C4  | C5  | C6  | C7  | C8  | C9  | C10 | C11 | C12 | Total Score |
|----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|
| Pasar Baru – Alahan Panjang| 0.00| 0.00| 1.71| 1.79| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| **3.50**    |
| Teluk Bayur – Nipah – Purus| 0.00| 0.00| 0.00| 1.79| 1.86| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| **3.64**    |
| Lubuk Sikaping – Talu      | 0.00| 0.00| 1.71| 0.00| 0.00| 0.00| 0.00| 0.00| 2.29| 0.00| 0.00| 0.00| **4.00**    |
| Alahan Panjang – Kiliran Jao| 0.00| 0.00| 0.00| 1.79| 0.00| 0.00| 0.00| 0.00| 2.29| 0.00| 0.00| 0.00| **4.07**    |
| Teluk Kabung – Mandeh – Tarusan | 0.00| 0.00| 0.00| 1.79| 1.86| 0.00| 0.00| 2.29| 0.00| 0.00| 0.00| 0.00| **5.93**    |
| Bungo Tanjung – Teluk Tapang | 0.00| 0.00| 0.00| 0.00| 1.86| 1.93| 0.00| 0.00| 2.36| 0.00| 0.00| 0.00| **6.14**    |
| Pangkalan Kt. Baru – Sialang – Gelugur | 0.00| 0.00| 1.71| 1.79| 0.00| 1.93| 0.00| 2.29| 0.00| 0.00| 0.00| 0.00| **7.71**    |
| Purus – Bandara Internasional Minang Kabau | 0.00| 1.64| 0.00| 1.79| 1.86| 0.00| 0.00| 0.00| 0.00| 0.00| 2.71| 0.00| **8.00**    |
| Abai Sangir – Sei. Darefa    | 0.00| 0.00| 1.71| 0.00| 0.00| 1.93| 0.00| 2.29| 0.00| 0.00| 0.00| 2.86| **8.79**    |

From Table 3, it can be seen that the main priority roads are Pasar Baru - Alahan Panjang road (Total Value 3.50), followed by Teluk Bayur - Nipah - Purus road (Total Value 3.64), and Lubuk Sikaping - Talu road (Total Value 4.00).
5. Conclusion
This research was conducted to obtain the criteria and sequence of criteria used in determining the priority of new road development, also to get a priority sequence of roads in new road development work in the area of West Sumatera Province. Which would later become a reference for decision makers in the PUPR Departement to decide which road will be prioritized for development work.

From this study, it was concluded that the criteria used were 12 criteria, among others, the criteria "Roads built have road bodies", criteria "Roads built are in relatively large/densely populated areas", criteria "Roads built will support production access local and trade", etc.

From this study, it was also concluded the sequence of criteria that influence the priority of road development from the most important are the criteria "Roads built will support access to local production and trade", follows by "Roads built will be an alternative ways of mitigating disasters", and "Roads built are access to public facilities".

While the priority sequence of the road segments obtained from the analysis of the 12 criteria from the most important are the Pasar Baru - Alahan Panjang road, follows by Teluk Bayur - Nipah - Purus road, and Lubuk Sikaping - Talu road.

The increasing number of data regarding the condition of the provincial road section owned will be very helpful to get accurate data results. Then it will be very necessary to have a joint evaluation with the local government regarding road conditions in the area so that the provincial government as the road organizer can determine the priority of road development in an appropriate manner.

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