APPLICATION OF PAVEMENT CONDITION INDEX (PCI) ASSESSMENT METHOD FOR RURAL ROAD MAINTENANCE IN KUCHING-SAMARAHAN AREA

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APPLICATION OF PAVEMENT CONDITION INDEX (PCI) ASSESSMENT METHOD FOR RURAL ROAD MAINTENANCE IN KUCHING-SAMARAHAN AREA

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A thesis submitted in fulfillment of the requirements for the degree of

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DECLARATION

"I hereby declare that this dissertation entitled 'Application of Pavement Condition Index (PCI) Assessment Method for Rural Road Maintenance in Kuching-Samarahan Area' is the result of my own research except as cited in the references. This dissertation has not been accepted for any degree and is not concurrently submitted in candidature of any other degree"

Signature

Author: SHAWN MCKENZIE

Date: 12.09.2012
~To My Beloved Wife, Family and Jesus~
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ABSTRACT

Road is very important infrastructure as mean of access for the community that lives in rural area. Rural roads need to be regularly maintained to ensure achieving serviceable lifespan and continuously to be in good, optimum condition. The aim of this study is to conduct the Pavement Condition Index (PCI) assessment method to selected rural roads within Kuching-Samarahan area. Pavement defects can be assessed using Visual Assessment Method or Mechanized Method. Visual inspections are normally used to record all conspicuous defects of pavement, shoulders, ditches, culverts, slopes and road furniture. Mechanized method is more repeatable, reproducible and, generally, can be collected more efficiently. The Pavement Condition Index is a numerical index between 0 and 100 and is used to indicate the condition of a road pavement. PCI assessment method incorporates the severity and density ratings for each distress types and converts the data to a single distress score based on a declining condition scale from 100 to 0. The Pavement Condition Index is computed using the relation \( PCI = 100 - CDV \) for each sample unit inspected. This condition index is useful to give a good indication of the pavement condition of a network. Case studies were carried out at selected rural roads within Kuching-Samarahan region namely Jalan Kampung Danu-Bengoh and Jalan Kampung Karu-Semandang road. The results show that road at Jalan Kampung Danu-Bengoh rated as 'Poor' condition with Pavement Condition Index of 29 and while the road at Jalan Karu-Simandang is rated as 'Good' condition with Pavement Condition Index of 70.
ABSTRAK

Jalan raya merupakan infrastruktur yang sangat penting untuk masyarakat yang tinggal di kawasan luar bandar. Jalan perlu sentiasa diselenggarakan untuk memastikan ia sentiasa berada dalam keadaan yang baik. Tujuan kajian ini adalah untuk menjalankan kaedah penilaian 'Pavement Condition Index' (PCI) ke atas jalan luar bandar yang terpilih dalam kawasan Kuching-Samarahan. Kecacatan jalan boleh dinilai dengan menggunakan kaedah penilai 'Visual Assessment Method' atau 'Mechanized Method'. Pemeriksaan 'Visual' biasanya digunakan untuk mencatatkan semua kerosakan jalan yang mudah dilihat, bahu, parit, pembetung, cerun dan perabot jalan. Kaedah 'Mechanized' pula adalah lebih berulang dan secara amnya boleh mengumpul data yang lebih jitu. PCI adalah merupakan indek berangka antara 0 dan 100 dan digunakan untuk menunjukkan keadaan permukaan jalan. Kaedah taksiran PCI menggabungkan penilaian tahap kerosakan dan kekerapan bagi setiap jenis kerosakan jalan dan menukarkan data kepada skor tunggal yang berdasarkan pada skala keadaan menurun dari 100 ke 0. PCI dikerakan menggunakan persamaan berikut, PCI = 100 - CDV untuk setiap unit sampel yang dinilai. Kajian kes telah dijalankan di jalan-jalan luar bandar yang terpilih dalam kawasan Kuching-Samarahan iaitu Jalan Kampung Danu-Bengoh dan Jalan Kampung Karu-Semandang jalan. Keputusan menunjukkan bahawa keadaan jalan raya di Jalan Kampung Danu-Bengoh diberi nilai "Poor" dengan Indeks PCI 29 dan manakala keadaan jalan raya di Jalan Karu-Simandang diberi nilai "Good" dengan Indeks PCI 70.
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CHAPTER 1

INTRODUCTION

1.1 Introduction

Rural roads are a very important facility as means of access for communities folks that live in the rural areas and need to be continuously maintained in order to ensure its serviceability and good condition. In many ways, the rural road has benefited the rural societies in terms of stimulating the agricultural production growth, creating jobs opportunities, establishing communication, acquiring education, obtaining health benefits and others. In brief, rural roads comprise a special category of roads with regards to the type of materials used and construction techniques, as compared with roads that formed the highway network. Thus, the construction and maintenance problems involved in keeping the rural road network at a satisfactory level of serviceability are of a different level and method. This is in addition to the problems arising from the usually inadequate allocations available for the
maintenance and the larger geographical spread of such a network. Rural roads if not maintained would rapidly become impassable to motorised traffic until a point that they are no longer trafficable. Poor road condition can bring forth negative social impact to rural communities and could severely affects the livelihood and socio-economic in the rural areas.

Accordingly, the Government over the years has shown concern over this issue and therefore has placed the responsibility of monitoring the road condition and maintaining the existing road into the hands of local authority. Hence, the supervision and maintenance of these roads fall under the jurisdiction of local authority distributed according to the size of their district or region. Nonetheless, the routine and periodic maintenance works being conducted yearly has cost the government substantial amount of money.

1.2 Problem Statement

Wahida (2010) mentioned that Government at Network Level has the complication to prioritize budget allocation for road maintenance to every regions and districts from the vague assessment report received from local authority. This scenario according to JKR (1994) is common in Malaysia. Roads condition at rural level are being inspected through visual assessment method which only indicatively gives 'good' or 'poor' reporting statement. If the pavement condition of the road is not correctly evaluated, then the allocation given maybe over budgeted and large sums of money may be wasted. At the same time, approaches of maintenance may require changes if the budget allocated is insufficient due to the road condition is not correctly evaluated. Thus, this has made it difficult for government to
prioritize the fund allocation on the specific road that needs immediate rectification. To ease the complications, suggestion to propose alternative assessment methods is needed to complemet the current visual assessment method. A better alternative assessment methods can assists the evaluator in making better judgement and precise evaluation on the road condition.

1.3 Aim and Objectives

The aim of this study is to conduct the Pavement Condition Index (PCI) assessment method on selected rural roads within Kuching-Samarahan area.

The objectives of this study are as follows:

I. To study the current assessment methods used for rural road maintenance program in Malaysia

II. To proposed alternative method for rural road assessment method to complement to the current assessment method

III. To identify and evaluate the use of Pavement Condition Index on Pavement Distress Types in Malaysia

IV. To carry out field studies of application of PCI assessment method on rural roads and to conduct analysis on the data gathered.
1.4 **Scope of Study**

The study was conducted within Kuching-Samarahan area and was limited to two rural roads namely Jalan Kampung Danu-Bengoh and Jalan Kampung Karu-Simandang. Literature review includes reviewing the current assessment methods and Pavement Condition Index (PCI) assessment method from journal, books, conference paper, domestic guidelines and online-journals and article.

1.5 **Thesis Structure**

![Flowchart of Thesis Structure](image)

*Figure 1.1- Flowchart of Thesis Structure*
The flowchart explains that the initial discussion begins with discussing with the supervisor on the aim and objectives of this research. Then literature review is being conducted by reading materials such as reference books, journals, internet web search, published articles and also reference of other thesis. From the literature review, the attention is narrowed and focus on to current assessment method and PCI assessment method. Field study is conducted at selected road within Kuching-Samarahan Area using the PCI assessment method. All the data gathered are then analysed and computed. From the results, a conclusion is derived.
2.1 Introduction

Rural roads play an important role in supporting the livelihood of the population in the rural areas. If they are not maintained then the number of people who benefit reduces rapidly over time and the economic and the social benefits of proper access are lost. The implication of lack of maintenance is severe. Poor road maintenance of rural roads can lead to loss of access which may results the rural community isolated from the urban community, agricultural productivity will be low, economic growth will be slow, standards of health care may deteriorate because clinics are hard to reach, school enrolment will be low and absenteeism are high. In brief, the livelihood in the rural areas is affected if the existing rural access is not properly and thoroughly maintained.