# THE STUDY OF BLOCK PAVEMENT PERFORMANCE

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# SYNOPSIS

Infrastructure is vital for development, hence roads have to be planned and constructed with appropriate surfacing material to ensure overall economy of the project. At present, new and improved surfacing materials are used in road construction. An example of such material is concrete block pavement.

For some applications, this modular pavement system is selected in preference to conventional pavement due to its cost-effectiveness, aesthetic quality, ease of construction and maintenance, and operational advantages. This pavement has some unique properties that significantly influence its deformation characteristics thus making it more adaptable and tolerable than bituminous pavement.

Although increasingly used, this pavement has not being incorporated as an alternative pavement type in Highway Development and Management application (HDM) due to the lack of information on appropriate life cycle performance model. This dissertation looks at a set of proposed performance models, which have not been fully tested for validity and reliability. For comparison, some work in Bangladesh has provided a broad generalised performance on similar type of pavement derived from the calibration of HDM-III roughness model for unpaved roads. Elaborate programming of the proposed modelling relationships was done to model the roughness of the pavement. The output was then compared with the model in HDM-III. Appropriate analyses were conducted on the variables and parameters in order to check their pattern and the influences on roughness progression.

This study has led to the conclusion that block pavement is a viable alternative to the conventional type of pavement due to its advantages in terms of cost and performance. Validation of the proposed performance modelling was inconclusive due to the lack of reliable data. However, preliminary assessment showed that these models are promising but need some modification before they can be reliably used in modelling the performance of block pavements in future versions of HDM-4.

# CONTENTS

# CHAPTER ONE:
# GENERAL INTRODUCTION

## 1.1 Introduction

The provision of a road is part of an economic development strategy of a country. A major problem for highway engineering is to keep existing road network open for traffic. Disruption to the transportation system would have significant impact on the economic activities and distribution of goods. Hence, it would frustrate economic development and integration of the nation.

Inappropriate road investment and poor maintenance strategy of existing roads has resulted in rapid deterioration of the network. Pavement distresses would affect the serviceability of the road system (Pell, 1978). Low level of service increases the cost to the road users in the form of the higher vehicle operation and maintenance needs. However, with the use of the World Bank's Highway Design and Maintenance Standards Model (HDM) and other similar systems the choice of making poor decisions could be avoided (Gichaga, et. al., 1988). These applications can assist in evaluating alternative road projects and maintenance programs to look for economic road investment schemes and policy options.

The HDM system has construction, maintenance, road deterioration and road-user cost relationships that have been extensively researched over a wide range of conditions. The interactions between these modules are shown in **Figure 1.1**. The construction module consists of a selection of pavement and geometric standards. The previous version of HDM (HDM-III) incorporated a limited selection of pavement types. With the continuous development of pavement systems, other surfacing materials are now becoming more common. One such pavement system is block paving.

This dissertation is devoted to the study of the performance of block pavements. It involves looking at the viability of this surfacing material, as an alternative to conventional type of pavement. With this study, some insight would be obtained about the performance and therefore assisting the development of an acceptable conceptual models of behaviour. These performance models could then be part of the road deterioration and maintenance

submodel of future versions of HDM.

Block paving is a term adopted to describe the small discrete surfacing element used for pavement surface. Normally made of concrete or ceramic materials, block paving has become an important alternative of surfacing material and is increasingly being used in recent years. There are variety of shapes, colours and sizes available which make them attractive to use. Almost all cities and major towns in the world are adopting this type of pavement for pedestrian precinct and around shopping areas. Some urban and industrially located roads are being relaid with heavy-duty concrete blocks to take on the loads and stresses of traffic. In some countries where natural source of aggregate is scarce, bricks surfacing have been used as a substitute for the conventional type of pavement.

Development of concrete technology and improvement in manufacturing techniques has allowed the production of high strength and durable concrete elements. Manufacturers have taken this advantage to produce concrete block paving for heavy-duty performance as experienced under traffic loading. With such properties combined with the ease of construction and maintenance, the use of concrete block pavement has become acceptable for rural and urban traffic environment.