AN ASSESSMENT OF THE IMPACT OF ROAD NETWORK CHANGES ON LAND USE PATTERN IN KURUNEGALA DISTRICT

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DECLARATION

I declare that this research project report represent my own work except where due acknowledgement is made and that it has not being previously included in a thesis, dissertation or report submitted to the University of Sri Jayawardenapura or to any other institution for a degree, diploma or other qualification. I wish to also declare that the total number of words in the body of this report (excluding the Tables, Graphs References and Appendix) is 8486.

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An assessment of the impact of road network changes on land use pattern in kurunegala district

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ABSTRACT

This study examines the impact of road network changes with the proposed Central highway development project on land use patterns, by giving special concern to the Kurunegala District.

To develop the study and examine the outcome, 121 existing nodes and 126 nodes with the construction of Central Highway were selected in Kurunegala District. As well as, in the road network types of class A, class B, class C roads were considered. Connectivity analysis combine with the GIS was used to measure the level of relative connectivity for each and every node of the study area. The Relative connectivity values were calculated as two sets to the existing road network and for the road network with proposed Central Highway of the selected study area. Land use pattern of the area were classified in to six main categories. Thereafter relative connectivity values were assigned for the entire area using Thiessen Polygon method and finally calculated the connectivity values for each and every land use type. Next the most affected areas were identified using road network connectivity and connectivity values of land use types.

The findings of this study shows that connectivity values of the land use has circulated to country side. As a result, plantation lands acquired substantial level of connectivity values, while buildup areas reached squat level of the connectivity values.

The study noted that with the development of the regional road network, there is need to put adequate development control mechanism in place for maximum effectiveness. The physical planning bodies should enforce the implementation of the provisions of road network developments to allow for balance in land allocation for various uses.

Key words: *Connectivity analysis, Road Network, Land use*

Chapter One

INTRODUCTION

1.1 Background of the Study

The road transport system is closely linked to the land-use system. The road system connects territories at all spatial scales as countries, region, urban areas, municipalities, etc. by forming the pattern of land use. Land-use is composed of two distinct attributes as the nature of land use, which relates to which activities are taking place where, and the level of spatial accumulation, which indicates their intensity and concentration.

Land use can be categorized according to above attributes as formal land use and functional land use. Formal land use encompasses the qualitative attributes of space such as its form, pattern and aspect. Functional land use concerns economic nature of activities such as production, consumption, residence, and transport and the nature of people (revenue, size of households, average age, occupation, etc.).

Land use encompasses different spatial scales: local, urban, regional, national and even international. But whatever the scale of analysis, formal and functional land use both influence by the transportation. The transportation and land use interaction can be summarized accordingly,

- The distribution of land uses, such as residential, industrial or commercial, over the urban area determines the locations of human activities such as living, working, shopping, education or leisure.
- The distribution of human activities in space requires spatial interactions or transport services to overcome the distance between the locations of activities.
- The distribution of infrastructure in the transport system creates opportunities for spatial interactions and can be measured as accessibility and the level of connectivity.
- The distribution of accessibility in space co-determines location decisions and so results in changes of the land-use system.

Land use and transportation systems are considered as the two most important subsystems determining urban form and structure in the long term. Meanwhile, land use change is one of the most important topics in urban studies, and its main driving forces are population growth and transportation development. Modeling and simulation are believed to be powerful tools to explore the mechanisms of urban land use evolution and provide planning support in growth management.

As an essential way to learn the urban land use evaluation, modeling and simulation is regarded as an efficient way to understand the mechanisms of urban dynamics, to evaluate current urban systems, and to provide planning support in urban growth management, e.g. land-use models may help to build future growth scenarios with special regard to the transportation investments (Lambin et al. 2006).

Since land use and urban transport system can be considered as the two subsystems, and then we should combine them as one whole system by using GIS technology and make more wide application of GIS in the field of urban land use and transport systems.

1.2 Significance of the Study

Transport networks in current urban models are usually held fixed or handled as variables. However the growth of transport networks greatly influences urban dynamics, and should be modeled. Road networks are bones of cities. Urban growth models in terms of morphological changes therefore can be built through modeling the evolution of road networks. This is a new direction to model urban growth.

Urban growth should consider land-use simulation, road network expansion and their interactions, since they determine urban structure in the long term. However, seldom existing urban growth studies involve road network changes and its dynamic interactions with land-use changes.

Hence decision making process in regional planning context important to identify the future trends in land use changes with upcoming development strategies. At the same time it leads to understand the evolving patterns in the spatial structures of a region. Determination of future land use changes with proposed development projects

provides guidelines for planning practices in selecting strategic locations for urban investments.

Cities consist of many interactive subsystems. Among major types of urban subsystems, land use and transportation networks change very slowly (Wegener 2004). However, when considering the changes of urban morphology in long term, land use and transportation systems are perhaps the two most important subsystems and they are supposed to influence each other over time. Apparently, the expansion of one road network would affect the location choice of firm/ household and land development. (Kelly 1994, Iacono et al. 2008).

Transportation investments have a significant influence on surrounding land uses. Land use patterns also affect the utilization of transportation facilities. These interrelated effects will occur regardless of whether city officials consider land use in determining their transportation investments. Integrating land use and transportation more effectively can help shape priorities for transportation investments and ensure that new transportation projects and land use plans support and reinforce each other.

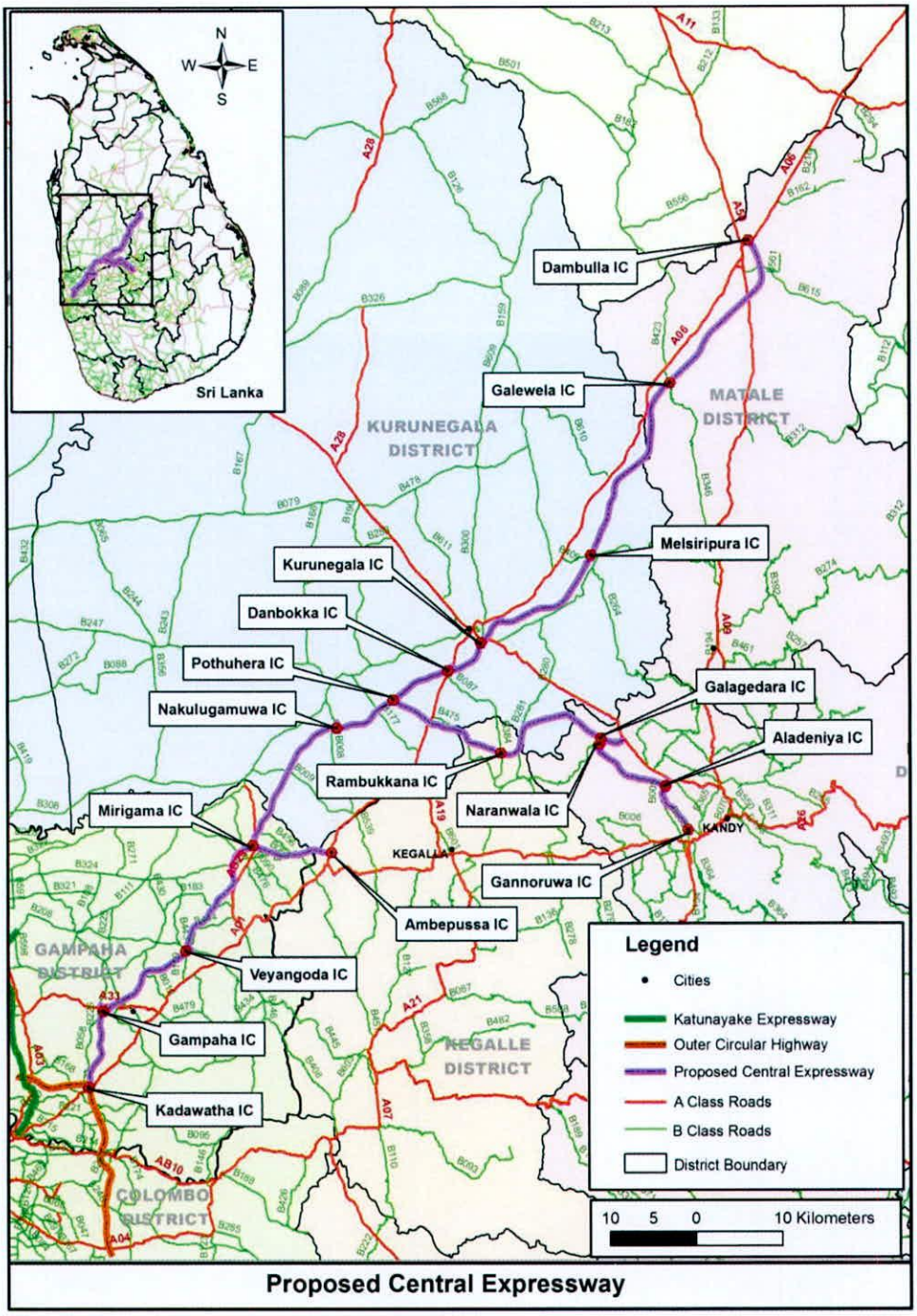
Land use planning and transportation infrastructure need to work together. Communities should plan for the future and be aware of how their transportation plans will affect the land use type and its changing over a period of time. The approaching highway and other transportation investments directly effect on the land use changes of an area over a long period of time. Therefore this study reflects on identification of interaction between land use and transportation network changes.

1.3 Problem Statement

Highway development projects in Sri Lanka have not adequately identified its affect on road connectivity and future trends of land use changes. Therefore following are not given due attention: the implications of transportation improvements with regard to the patterns of land development, time lags between transportation projects and land development and affected areas with transport network development. However, the responses of land use to transportation improvements usually lag, and the processes by which land use and transportation systems influence each other are dynamic and co-evolving. This co-evolutionary process is either not captured in

highway development projects of Sri Lanka. Therefore this study made an attempt to identify the most affected area and most affected land use types with the coming Central highway development project by giving special attention to the Kurunegala district.

Figure 1.1: Proposed Central Expressway



Source: Road Development Authority, 2016

1.4 Research Objective

General objective

Objective of this study is to examine the impact of road network changes on land use pattern

Specific objectives

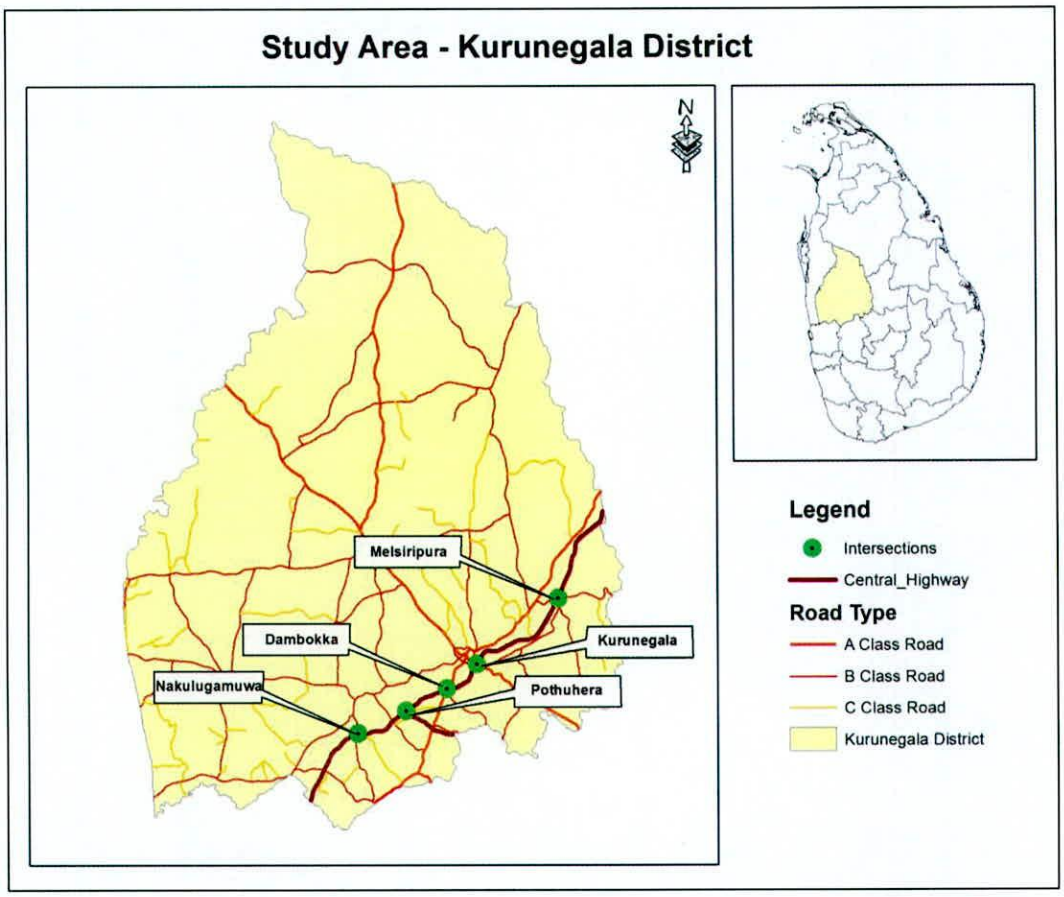
1. To calculate the relative connectivity of existing road network and post construction of Central highway
2. To identify the connectivity value for each land use type
3. To identify the most affected areas with road network connectivity and connectivity values of land use types

1.5 Introduction to Case Study Area

Kurunegala is located at the junction of several main roads linking to other important parts of the country. Kurunegala is a central city of Sri Lanka. It is directly connected to a large number of major cities and towns of the island as Colombo, Kandy, Puttalam, Negombo, Anuradhapura and Kegalle. Due to its status as a crossroads the city it has a good road connection system.

Topographically Kurunegala town is based on a plain area with the exception of the surrounding rock out crops. The District covers an area of 4816 km2, and according to the 2002 Agriculture Census there were about 2720 km2 of agriculture lands and 192 km2 is water bodies in Kurunegala District. Therefore Kurunegala urban center and its surrounding area has high possibility of urban growth and land use changes with coming development strategies due to, Road network system and land use distribution pattern.

Figure 1.2: Study Area



Source: Compiled by author, according to GIS data from Department of Survey, 2016

1.6 Scope and Limitations

This study expected to identify the connectivity values for each and every land use type by only using A, B and C class roads while excluding minor roads of the area. In this study didn't consider about types of the roads or any other factors in connectivity analysis by giving weight to those factors.

Past studies were examined relative road connectivity how influenced to a particular one urban center. They didn't consider about how the level of relative connectivity dispersed among enormous area. This study attempts to fill the above gab. But the level of connectivity and its statuses can't limit to an administrative boundary. Relative connectivity analysis has to be calculating manually because of the unavailability of computer applications. It consumes considerable time. There are

several issues that arise in the application of buffering in GIS. Some of these are technical. For example, a problem arises when a buffer zone extends beyond the geographical limits of the data sets used in the study.

The study area has limited to the Kurunegala District, but the level of connectivity can not be limit to a sepasific administrative boundary as it has a continous flow of distribution.