

# GIS Based Multi Criteria Evaluation for Locational Suitability of Residential Development in Colombo Sub Urban Area.

(Special Reference to Kaduwela Pradeshiya Sabha)

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11 JAN 2011  
Department of Estate Management &  
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*Cancelled*  
*CLC*

**E W M L R K Ekanayake**

**GIS Based Multi Criteria Evaluation for Locational  
Suitability of Residential Development in Colombo  
Sub Urban Area.**

**(Special Reference to Kaduwela Pradeshiya Sabha)**

**Dissertation submitted to the University of Sri Jayewardenepura as a  
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The work described in this dissertation was carried out under the supervision of Mrs. K G P K Weerakoon, Senior Lecturer, Head of the Department of Estate Management and Valuation and any report on this has not been submitted in whole or in part to any university or any other institute for another degree / examination or any other purpose.

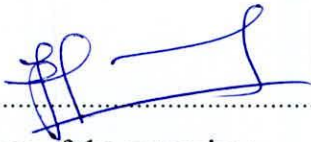
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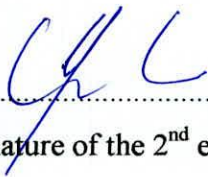
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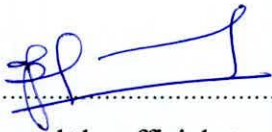
Hereby, I certify that Miss. Ekanayake Wijesinghe Mudiyansele Laxshmi Renuka Kumari Ekanayake, (GS / M.Sc / REMV 3059 / 07) duly completed the research titled "GIS Based Multi Criteria Evaluation for Locational Suitability of Residential Development in Colombo Sub Urban Areas. (Special Reference to Kaduwela Pradeshiya Sabha)" under my supervision and recommended to submit for the evaluation.



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## ABSTRACT

This research presented a GIS based Multi Criteria work for evaluating locational suitability of residential development from a resident's perspective in Sri Lanka. It integrates multi criteria analysis techniques with locational Suitability assessment models in a GIS environment. The tool has been developed within the Kaduwela Pradeshiya Sabha Area.

General Objective of the research was to identify the suitable land parcels for residential development. However, there were some other specific objectives: to identify criteria for locational suitability and to develop GIS frame work and formulate common guidelines for future residential development of the study area. In this study, the land suitability analysis has been carried out to identify suitable areas within the Kaduwela Pradeshiya Sabha Area for residential development.

The multi criteria evaluation tool can be used by researcher with knowledge in GIS (GIS software – in this case, the ArcView 3.2a has been used). The main components of the tool are: classification where "source" values of the criteria are classified from "worst" to "best" and weighted those using Pairwise comparison method with AHP based on questionnaire survey carried out with residents and experts. Most important six criterions were identified for the suitability analysis, such as Population Density, Proximity to Roads, Town Centers, Schools, Land Values and existing land use.

The spatial layers were used and incorporated into the Geographical Information System environment. The digital layers were reclassified and given weightings. Finally, suitability map was prepared with four suitability categories namely, "suitable", "moderately suitable", "less suitable" and "not suitable".

The analysis was found that 2% of the lands area (183 ha) are highly suitable for and also 55% lands (4,830 ha) are moderately suitable for residential development. Therefore it can be concluded that over 57% of lands available in Kaduwela Pradeshiya Sabha has potential for residential development. These two types of land areas completely are located in permissible zone for residential use.

Further analysis found that 9% of lands (789 ha) are belongs to less suitable category for residential developments. Out of these 9%, of less suitable lands are belongs to agricultural developments namely Rubber, coconuts etc. These areas are seen in lack of infrastructure facilities. Providing Proper infrastructure developments within these areas ensure the increase of residential use. These lands are support to fulfill the residential demand in near future.

The results of the Land Suitability Analysis will be used to support planning efforts throughout the undeveloped areas of Kaduwela Pradeshiya Sabha. The results can be used by the UDA, NHDA, and Housing Planning Development Authorities to select suitable sites for new housing development programmes and related projects to be implemented.

## **ABBREVIATIONS**

<b>AHP</b>	-	Analytical Hierarchy Process
<b>CCA</b>	-	Colombo Core Area
<b>CEA</b>	-	Central Environmental Authority
<b>CMC</b>	-	Colombo Municipal Council
<b>DMMC</b>	-	Dehiwala Mt.Lavinia Municipal Council
<b>DSD</b>	-	Divisional Secretariat Division
<b>ESRI</b>	-	Environmental System Research Institution
<b>FAO</b>	-	Food and Agriculture Organization of the United Nations
<b>GND</b>	-	Grama Niladhari Divisions
<b>GIS</b>	-	Geographic Information System
<b>GPS</b>	-	Global Positioning System
<b>GSD</b>	-	Government Survey Department
<b>KPS</b>	-	Kaduwela Pradeshiya Sabha
<b>MC</b>	-	Multi Criteria
<b>MCA</b>	-	Multi Criteria Analysis
<b>MCDM</b>	-	Multi Criteria Decision Making
<b>NBRO</b>	-	National Building Research Organization
<b>NHDA</b>	-	National Housing Development Authority
<b>PHI</b>	-	People Health Inspector
<b>PRDA</b>	-	Provincial Road Development Authority
<b>QS</b>	-	Quantity Surveyor
<b>RDA</b>	-	Road Development Authority
<b>SLLR &amp; DC</b>	-	Sri Lanka Land Reclamation & Development Co-operation
<b>TO</b>	-	Technical Officer
<b>TP</b>	-	Town Planner
<b>UDA</b>	-	Urban Development Authority



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# CHAPTER ONE

## Introduction

Land-use suitability is the ability of a given type of land to support a defined use. The process of land suitability analysis involved evaluation and grouping of specific areas of land in terms of their suitability for a defined use.

The principles of sustainable development make land-use suitability analysis become increasingly complex due to consideration of different requirements/criteria. It includes consideration not only inherent capacity of a land unit to support a specific land use for a long period of time without decline, but also the socio-economic and environmental costs.

In many situations it is extremely difficult to assign relative weights to the different criteria involved in making a decision on suitability of land mapping unit for a land-use type. Therefore it is necessary to adopt a technique that allows an estimation of the weights. One such technique is the Analytical Hierarchy Process (AHP).

Geographic Information System (GIS) is the powerful tool for input, storage and retrieval, manipulation and analysis, and output of spatial and attributes data. Meanwhile, land-use suitability analysis requires handling both spatial and attributing data in many data layers. Therefore, it is appropriate to use GIS to exploit its strong capability in handling spatial data.

Thus, an integration of GIS and AHP to land suitability analysis expect to produce promising results. This research presents results obtained through integrating GIS and AHP in analyzing locational suitability. A case study of Kaduwela Pradeshiya Sabha is illustrated.

### 1.1. Background of the study.

Urbanization is the process which has led to an increasing proportion of a country's population living within urban areas. It is impossible to say exactly when the process began. The population growth and urban development are the encouraging factors for the people to migrate from rural to urban. People moved from rural to urban for the benefits that larger cities offer in opportunities of regular employment, higher