DEVELOPING A NATURAL ACOUSTIC BARRIER FOR URBAN AREAS

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Degree of Master of Science in Civil Engineering.

Department of civil engineering

University of Moratuwa

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DECLARATION PAGE OF THE CANDIDATE & SUPERVISOR

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ABSTRACT

Increasing noise pollution has severally effected the urban areas where noise generated by traffic is considered as the major noise polluter. As a solution to the noise problem using noise barriers is an approach proven to be effective but due to land scarcity and social needs in urban areas applying noise barrier solution is challenging. Using a natural barrier as a noise barrier is a promising approach. Natural barriers are large or small closely grown tree belts, vegetation walls, natural stone structures, tree fences etc. Natural barriers, have emerged as the new trend to address problems in urban areas and has developed into vertical gardening, green roofs and hybrid natural barriers presently. The use of natural barriers as a solution is highly dependent on the human perception.

The research was carried out to identify the human perception and human acceptance of natural barriers in Sri Lankan context and find out the level of acoustic disturbance people are facing. Focusing urban and suburb areas a quantitative approach was adopted via a questionnaire survey and actual sound measurements were taken in the western province of Sri Lanka. Secondly field testing was carried out to evaluate the performance of existing natural barriers to identify their acoustic performance. Closely grown tree belts which assumes a cuboid shape were used as test barriers. Multiple Linear Regression (MLR) models Artificial Neural Network (ANN) models were used to evaluate the performance of natural barriers. Cuboid shape natural barrier with 85% of green cover or more and overall height closer to 2 meters or more has proven to be an effective acoustic barrier for urban areas.

DEDICATION

I dedicate this work to my loving parents and Mrs Sandani Molligoda

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

	Abbreviation	Phrase
01	*ANN*	*Artificial Neural Networks*
02	*ANSI*	*American National Standards Institute*
03	*ASTM*	*American Society for Testing and Materials*
04	*GC*	*Green Cover*
05	*IEC*	*International Electro-technical Commission*
06	*MLP*	*Multi-Layer Perceptron*
07	*MLR*	*Multiple Linear Regression*
08	*NIOSH*	*National Institute for Occupational Safety & Health*
09	*SLM*	*Sound Level Meter*
10	*SPL*	*Sound Pressure Level*
11	*US EPA*	*United States Environmental Protection Agency*
12	*VGS*	*Vertical Greenery System*
13	*WHO*	*World Health Organization*

LIST OF SYMBOLS

	Description	Symbol	Unit
01	*Sound level*	dB	*dB*
02	*A weighted time averaged noise level*	L_{Aeq}	*dB*
03	*Time averaged noise level*	L_{eq}	*dB*
04	*Equivalent Diurnal Noise Levels*	L_{eqD}	*dB*
05	*Sound intensity*	I	W/m^2
06	*Height*	h	*m*
07	*Temperature*	T	^0C
08	*Relative humidity*	RH	-
09	*Time (duration)*	t	*s*

THESIS