INVESTIGATION OF MICRO-CLIMATIC FEATURES (VEGETATION) AFFECTING THE INDOOR AIR QUALITY IN SUBURB CITIES OF COLOMBO

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(Adm No:118772N)

Degree of Master of Engineering in Environment Engineering And Management

Department of Civil Engineering

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DECLARATION OF THE CANDIDATE AND SUPERVISOR

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D.S.P.R.D.Premachandra Date

The above candidate has carried out research for the Masters under my supervision.

…… ……

Signature of the Supervisor: Date

Prof. (Mrs) C.Jayasinghe

Professor

Department of Civil Engineering

University of Moratuwa

ABSTRACT

Considerable number of studies show a favourable impact of vegetation and an adverse impact of synthetic built environment on urban micro-climates. Despite these findings, people eradicate these favourable micro-climatic features for built purposes. In the past few decades suburbs of the Colombo, the capital city of Sri Lanka, was subjected to a rapid development mainly for residential purposes. As a result, paddy fields, marshy lands and large tree canopies have been converted to a built environment with scattered green patches. This study was aimed at determination of the impact of micro-climatic features on air quality and thermal comfort.

Air quality investigations were carried out in five residential buildings which were selected based on the surrounding micro-climatic features. Indoor concentrations of CO_2, NO_2, $PM_{2.5}$, CO, VOC, temperature, relative humidity and wind speeds were measured during the day time from 9.00 AM to 4.00 PM in each sample building. The results were checked against the air quality standards and an attempt has been made to establish a relationship with micro-climatic features.

The results showed that the air quality in suburbs is still in the acceptable range except for peaking of $PM_{2.5}$ concentration beyond the threshold time to time. Lower levels of temperature and CO_2 concentration were observed with good micro-climatic features. Decrease of $PM_{2.5}$ concentration was also detected with the increase of distance to the main road and vegetation cover. These findings will benefit the township planning in terms of preserving the air quality and thermal comfort levels in suburbs.

***Key Words*: Indoor Air Quality, Micro-climate, Suburb, Thermal Comfort**

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LIST OF ABBREVIATIONS

Abbreviation	Description
AM	Ante Meridian
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
clo	Clothing insulation
COHb	Carbooxyhaemoglobin
CO	Carbon Monoxide
CO_2	Carbon Dioxide
EPA	Environmental Protection Agency
HVAC	Heating, ventilation, and air conditioning
IAQ	Indoor air quality
LEED	Leadership in Energy and Environmental Design
met	Metabolic Equivalent
NIOSH	National Institute for Occupational Safety and Health
NO_2	Nitrogen Dioxide
PM	Post Meridian
$PM_{2.5}$	Particulate Matter in diameter of 2.5 micrometer or smaller
PMV	Predicted Mean Vote
PPD	Predicted Percentage of Dissatisfied
ppm	Part Per Million
RH	Relative Humidity
UHI	Urban Heat Island
US EPA	United State Environmental Protection Agency
USGBC	United State Green Building Council
VOC	Volatile Organic Compound
WHO	World Health Organization