

**ANALYSIS OF ROADSIDE AIR POLLUTION IN
WESTERN PROVINCE OF SRI LANKA**

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Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree
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DECLARATION

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Date: 25th February 2025

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The undersigned hereby certify that I have read and recommended the thesis for acceptance in partial fulfilment of the requirements for the M.Eng in Highway & Traffic Engineering.

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Date: 25th February 2025

Dr. Loshaka Perera

DEDICATION

This dissertation is dedicated to my loving parents, my wife, my siblings and my friends for their endless love, support, and encouragement during this journey.

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ABSTRACT

Air pollution is now one of the largest issues in the world that is leading to climate change, global warming, more frequent weather extremities, and respiratory related fatalities. Vehicle exhaust is one of the primary causes of air pollution and it emits CO₂, NO₂, SO₂, and Particulate Matter (PM) among other air pollutants. Even though some of these targets and standards are being established by the World Health Organization (WHO) to limit the concentration levels of such toxic pollutants globally, no such clear system is yet visible to achieve such targets in Sri Lanka.

As a starting point, the objective of this research is to analyze the level of roadside air pollutants in the Western Province of Sri Lanka and to identify the annual variation of roadside air quality parameters. Followed by the development of a model to understand the correlation between road traffic and roadside emissions with the intention of proposing mitigation measures to control air pollution.

Air quality data from 40 fixed locations from 2013 to 2018 were collected and spatial analysis was carried out. NO₂ and SO₂ concentrations are analyzed using Arc GIS software and heat maps were generated visualizing the spatial distribution of pollutant concentration in the Western Province of Sri Lanka to identify critical locations with low air quality. Based on the spatial analysis results, it was observed that most of the urban areas have very high concentration levels of NO₂ and SO₂ which exceed more than twice the standard concentration level (WHO Air Quality Guideline-2005) during the period of measurements. It was also observed that from the year 2013 to 2017 there was a gradual decrease in NO₂, and SO₂ levels in the Western province although, in the year 2018, there was a sudden increase in NO₂ and SO₂ concentration levels.

In addition, roadside air quality data was collected in conjunction with traffic data from 2022 to 2024 at eight selected locations to identify the distribution of pollutants away from the road and up to about 75m distance from the road edge. Based on the results of additional locations it is clear that NO₂, PM_{2.5}, and PM₁₀ show a positive correlation with traffic data while CO₂ shows some deviation during daytime at some locations.

Keywords: vehicle emissions, air pollution, spatial distribution, air quality

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LIST OF ABBREVIATIONS

Abbreviation	Description
PCU	Passenger Car Unit
NBRO	National Building Research Organization
VET	Vehicle Emission Testing
ESSD	Environmental Studies & Services Division
CO ₂	Carbon Dioxide
NO ₂	Nitrogen Dioxide
PM _{2.5}	Particulate Matter that is 2.5 microns or less in diameter
PM ₁₀	Particulate Matter 10 micrometers or less in diameter
SO ₂	Sulfur Dioxide
WP	Western Province