



Dedicated to My Grandmother

Late Karuna Bala Bose

Whose Love and Blessings

I Believe will Forever Light

My Way

Statutory Declaration

I, the undersigned, hereby declare that the thesis entitled “**Urban Transport and Associated Vehicular Emissions in Siliguri City**” submitted for the degree of Doctor of Philosophy under the Department of Geography & Applied Geography, Faculty of Sciences, at the University of North Bengal, has been conducted in accordance with the Ph.D. rules and regulations of the University of North Bengal, bearing **Regn. No. Ph.D./Geog. (1316)/493/R-2021**.

This thesis has not been submitted for the award of any degree, diploma, or fellowship to any other university or institution, with the exception of certain parts that were submitted to peer-reviewed journals to partially fulfill the requirements for the Ph.D. Degree.

I affirm that the ideas, analyses, results, and conclusions presented in this Ph.D. thesis are entirely the product of my own efforts, except where otherwise acknowledged. I have duly recognized the work of other authors, organizations, or agencies wherever their contributions have been incorporated into this study, ensuring that proper acknowledgment is given at the relevant places with appropriate and feasible recognition. Published works, whether directly or indirectly utilized, have been employed with due respect. Any oversight in this regard is unintentional and will be corrected with proper acknowledgment to the concerned author(s), organization, or agency, although the likelihood of such an oversight is minimal.

In every aspect of this work, I have endeavored to establish originality and uniqueness with the aid of secondary data sources, published literary works, fieldwork, group discussions, interviews, etc.

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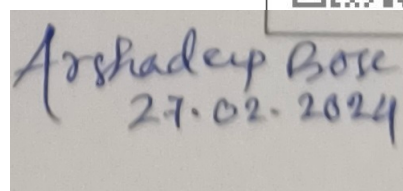
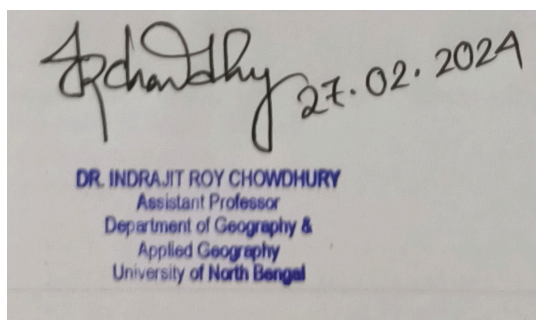
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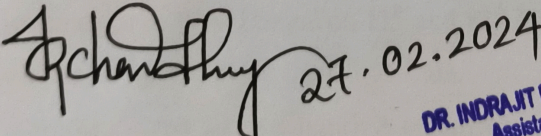
CERTIFICATE FROM THE SUPERVISOR

This is to certify that **Mr. Arghadeep Bose**, a UGC-JRF Research Scholar of the Department of Geography & Applied Geography, University of North Bengal, has carried out his Ph.D. research work entitled “**URBAN TRANSPORT AND ASSOCIATED VEHICULAR EMISSIONS IN SILIGURI CITY**” having Regn. No. Ph.D./Geog. (1316)/493/R-2021 under my supervision.

To the best of my knowledge and belief, it is his original research work based on extensive field surveys and secondary sources with the implementation of both quantitative as well as qualitative techniques to fulfil the objectives of the research work.

It may be further mentioned that Mr. Arghadeep Bose has fulfilled all the requisite criteria as per the Ph.D. rules and regulations of the University of North Bengal regarding the submission of the Ph.D. thesis. This thesis as a whole or any part of it has not been submitted to any other University/institution for any other degree.

I do hereby forward the said research work for the final submission and evaluation for the degree of Doctor of Philosophy (Ph.D.)


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Outcome of Ph.D. Thesis

This thesis has yielded two papers published in peer-reviewed journals indexed by SCOPUS and the Web of Science, following a rigorous peer-review process. Additionally, two seminar papers based on this research have been presented, demonstrating the work's scholarly impact.

➤ Published Article

1. Bose, A., & Roy Chowdhury, I. (2023). Investigating the association between air pollutants' concentration and meteorological parameters in a rapidly growing urban center of West Bengal, India: a statistical modeling-based approach. *Modeling Earth Systems and Environment*, 9(2), 2877-2892. (Impact Factor-**3.0** as of 2022, Springer)
2. Bose, A., & Chowdhury, I. R. (2024). Towards cleaner air in Siliguri: A comprehensive study of PM_{2.5} and PM₁₀ through advance computational forecasting models for effective environmental interventions. *Atmospheric Pollution Research*, 15(2), 101976. (Impact Factor-**4.5** as of 2022, Elsevier)

➤ Seminar Presentation

1. "Finding the association between air pollutants' concentration and meteorological parameters in a rapidly growing urban center of West Bengal, India: a statistical modeling-based approach", paper presented at the **5th Regional Science and Technology Congress, 2022-23** organized jointly by University of Gour Banga, Malda, West Bengal and Department of Science and Technology and Biotechnology, Government of West Bengal on 11th and 12th January 2023 and awarded among the 5 best papers by achieving the 4th position.
2. "Towards cleaner air in Siliguri: A comprehensive study of PM_{2.5} and PM₁₀ through advance computational forecasting models for effective environmental interventions", paper presented at the Two days **ICSSR-ERC Sponsored National Seminar on Urbanization, Urban Environment and Sustainability in Himalayan and Sub-Himalayan Region** held at University of North Bengal on 1st and 2nd July, 2023.

Preface

The nexus between rapid urbanization and its ensuing environmental challenges, particularly traffic congestion and air pollution, is a global concern that has increasingly come to the fore in developing countries. Siliguri, a vibrant city in West Bengal, India, stands at the crossroads of this phenomenon, showcasing both the opportunities and adversities brought about by its strategic position as a commercial and transportation hub. Nestled in the foothills of the Himalayas, Siliguri's transformation from a quaint village to a bustling metropolis mirrors the broader narrative of urban expansion in the region. This growth, while remarkable, has not been without its pitfalls. The city's burgeoning population and increasing vehicular density have exerted considerable pressure on its infrastructure, leading to persistent traffic congestion and escalating levels of vehicular emissions. These issues not only compromise the urban environment but also pose significant risks to public health, making it imperative to address them through comprehensive research and strategic planning. This thesis is motivated by a deep-seated concern for the sustainable development of urban spaces, with a focus on mitigating the adverse effects of vehicular pollution and enhancing the quality of life for urban residents.

This thesis unfolds across eight meticulously crafted chapters, each pivotal in weaving the narrative of this research. The introductory chapter sets the thematic and conceptual groundwork, framing the study within the broader context of urban pollution and its ramifications. Chapter II offers a vivid portrayal of Siliguri, delineating its physical, demographic, and socio-economic tapestry, while also spotlighting the city's pressing traffic and pollution challenges. In Chapter III, the focus narrows to the spatial dynamics of traffic flows and pollution, employing GIS and spatial analysis to map and interpret the data. Chapter IV examines the interconnections between air pollutant levels and meteorological variables, leveraging statistical models to uncover patterns and insights. The narrative then shifts in Chapter V, which probes the vexing issue of traffic congestion, employing both quantitative and qualitative analyses to unravel its causes and effects. Chapter VI delves into the public health implications of vehicular emissions, integrating time series forecasting and SEM to predict air quality trends and assess health impacts. Chapter VII is dedicated to exploring potential solutions and discussing transport action strategies and legislative frameworks aimed at mitigating pollution. Finally, Chapter VIII encapsulates the study's findings and recommendations, offering a concise yet comprehensive synthesis aimed at guiding policy and planning initiatives. Together,

these chapters embody a rigorous inquiry into the environmental and health challenges posed by urban transport, presenting a cohesive blueprint for navigating the path towards sustainable urban development in Siliguri and beyond.

Date: 27.02.2024

Place: University of North Bengal

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