Research Journal of Language, Literature and Humanities _____ISSN 2348-6252
Vol. **12(3),** 1-6, June **(2025)** *Res. J. Lang. Lit. Humanities*

Urban Traffic Congestion and Its Environmental Consequences in Kalimpong Municipality, Kalimpong: Towards Sustainable Transport Strategies

Banti Das* and Susmita Ghosh
Department of Geography, Nagar College, Murshidabad, West Bengal, India
bantidas957@gmail.com

Available online at: www.isca.in, www.isca.me
Received 1st April 2025, revised 14th May 2025, accepted 17th June 2025

Abstract

Due to rapid urbanization, population growth, unplanned settlement and road construction, urban traffic congestion has arrived as an important transportation problem in many towns and cities. Kalimpong municipality, located in Kalimpong-1 C.D. Block of Kalimpong district, West Bengal is also facing such challenges. The rapid urbanization, population growth, hilly topography, seasonal tourist flow has led to increase in traffic which results serious effects on environment and human health in this area. This paper investigates the main causes and impacts of traffic congestion on Kalimpong municipality and surrounding areas. With the help of primary data collection through traffic survey and necessary secondary data, it has been found that double parking, road reblocking, road checkpoints, rush hours, frequent accidents and malfunctions are some major causes of traffic congestion that leads to severe air pollution, noise pollution, greenhouse gas emissions, reduction of green spaces, and serious health issues in this municipality. To reduce such problems, the study give emphasis on sustainable transport management strategies such as adoption of electronic vehicles, congestion pricing, efficient traffic management, implementation of penalties for double parking, limitation of heavy vehicle movement during peak hours etc. Moreover, local government, policy makers and community involvement should act jointly to make the balance between urban growth and environmental preservation and achieve a sustainable and environment friendly transportation system.

Keywords: Air pollution, double parking, environmental impact, Kalimpong Municipality, sustainable transport system, urban traffic congestion.

Introduction

The role of transportation in the spatial and economic development of towns and cities is vital, as cities often grow around their transport networks, and as urban areas expand, their transportation needs also increase. With various activity centers geographically dispersed within a city, transportation becomes essential to bridge these spatial gaps, enabling efficient urban functioning[1]. However, urban traffic congestion has become one of the most pressing challenges faced by cities worldwide, particularly in rapidly urbanizing regions. The growth of urban populations and increased vehicular ownership often surpass the capacity of existing infrastructure, leading to an overwhelming presence of vehicles on the streets[2].

This issue is especially pronounced in cities where traditional infrastructure has not kept pace with rapid population growth and economic development[3]. Kalimpong, a hill station in the Kalimpong district of West Bengal, India, exemplifies this challenge. Over the years, the town has experienced significant demographic growth and an increase in vehicle numbers, which has resulted in severe traffic congestion. Kalimpong's unique geographical constraints, narrow roads, and limited urban planning further enhance the situation[4]. The impact of this congestion extends beyond daily commuting disruptions, negatively affecting residents and tourists alike with noise, air pollution, and increased greenhouse gas emissions[5]. As the city's infrastructure continues to struggle under the pressure of rising traffic, the environmental consequences, including concerns over climate change and ecosystem degradation, have become more pronounced.

Kalimpong, renowned for its scenic landscapes, mild climate, and colonial charm, has long been a popular tourist destination, attracting visitors year-round. However, its infrastructure, originally designed for a small population, is increasingly unable to handle modern traffic demands. Narrow, winding roads, vital to the town's character, are overwhelmed by the growing number of vehicles, particularly during peak tourist seasons. This has led to severe congestion, longer travel times, frequent traffic bottlenecks, and increased vehicle emissions, worsening air pollution and health risks, especially for those with respiratory conditions. Additionally, the constant traffic generates high noise levels, negatively affecting residents' mental well-being and disrupting the town's peaceful environment[6].

The rising number of vehicles also contributes to a larger carbon footprint, raising concerns about climate change and the degradation of Kalimpong's delicate ecosystem, including its forests and water resources. As a result, it is crucial to explore sustainable transport strategies that can balance growth with environmental preservation and improve the quality of life for its residents and visitors[7].

Objectives: The objective of this paper is to investigate the environmental consequences of traffic congestion in Kalimpong Municipality and propose practical, sustainable transport solutions that can alleviate the problem. This research will explore the urban transport challenges in the region and offer recommendation towards more sustainable, eco-friendly, and efficient transportation systems.

Methodology

This study employs both primary and secondary data collection methods. Primary data has been collected from 50 persons with the help of questionnaire survey which was distributed to local residents, commuters, and business owners to understand their perceptions of traffic congestion, while secondary data comes from different e-books, articles, online journals, published reports as well.

Study Area: Kalimpong, West Bengal's twenty-first district, was established on February 14, 2017, following its separation from Darjeeling district. Kalimpong district is the most northern district in West Bengal state and situated above the foothills of the Himalayas. The district serves as the entry point to both the neighbouring nation of Bhutan and the State of Sikkim. Kalimpong Municipality, shown in Figure-1, comprise of 23 wards, lies in 27°04′ North latitude and 88°28′ East longitude, under Kalimpong-l C.D. Block[8]. Total area under this municipality is 8.68 square km, no. of households is 10113; total population includes 49403 persons which are 19.63% of the district's population and having 90.19% literacy rate[9].

Present Traffic Situation in Kalimpong Municipality

Kalimpong municipality is an important hill station of West Bengal. It comprises of 23 wards and experiences moderate traffic flow for its small size, limited interconnected roads and geographical characteristics. However, in peak tourist seasons and local festivals, it faces severe congestion for tourist influx and increased local activities during rush times. Crowded and commercial areas are affected the most in this situation (Figure-2).

Primary survey (2024) has been done to know about the current traffic situation in this municipality and its root causes. The data has revealed that traffic congestion is becoming a regular challenge in this area as most of the congestion is happening 3-4 days and 1-2 days per week (Figure-3). Figure-4 depicts that congestion is affecting on morning and evening rush times, e.g. 6:00 AM to 10:00 AM and 2:00 PM to 6:00 PM on week days. During this rush times, commuters use to travel to their educational institutions or work places or other personal activities that probably leads to prolonged travel time.

Types of vehicles used in Kalimpong municipality based on survey responses is depicted by Figure-5 that out of the total respondents, 30% reported using public transport, while 70% respondents rely on private transport. It is evident that a large group of people give preference to use privet transport for better transport access, while a smaller group of people rely on shared public transport system in this area.

Causes: Primary survey identified eight main causes of traffic congestion in Kalimpong municipality (Figure-6). 60% of respondents believe that double parking and road reblocking are two main causes of traffic congestion in this area. It reduces the accessibility of roads and creates bottlenecks in congested areas. Rush hours, accidents, road construction, malfunction, traffic lights and checkpoints also have significant contribution to make traffic a major issue in this municipality.

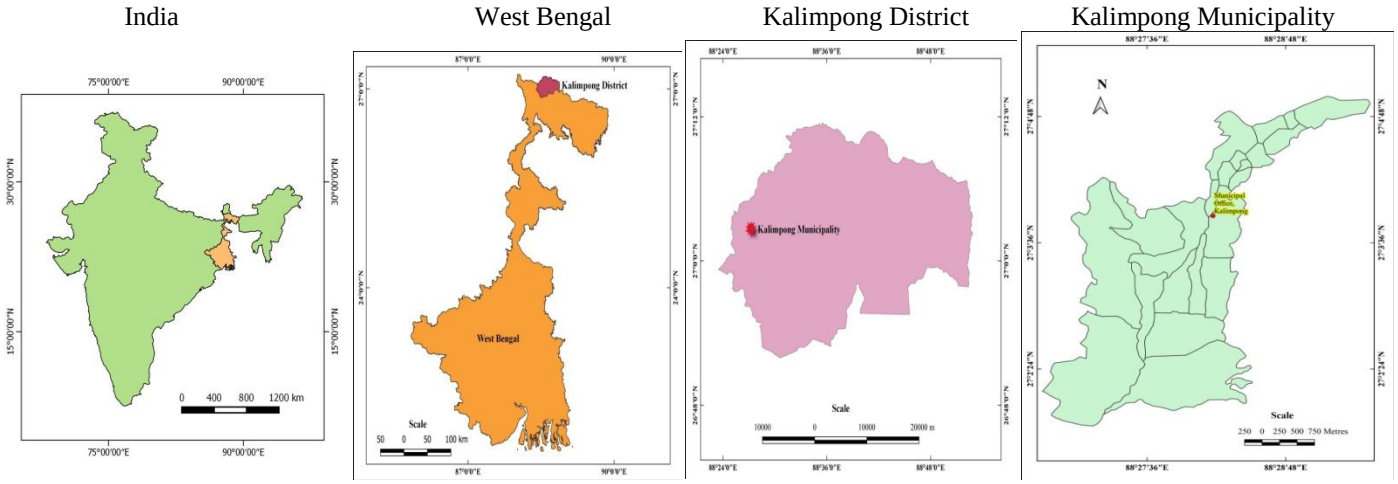

Figure-1: Location Map of the Study Area.

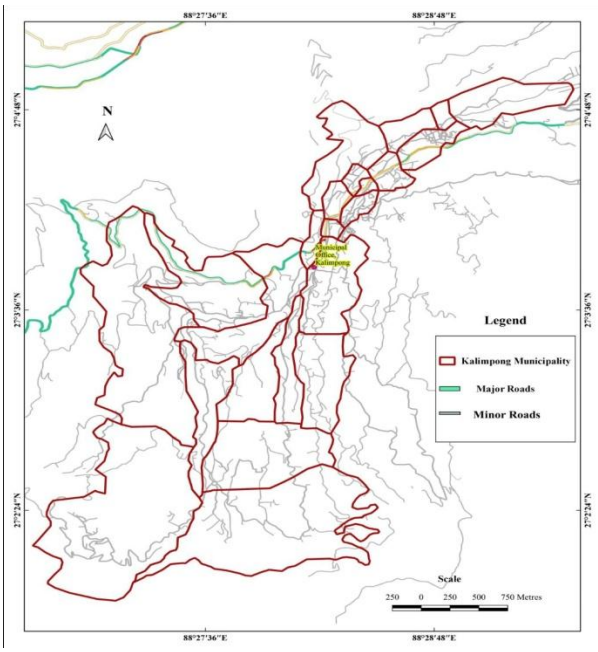

Figure-2: Traffic Map of Kalimpong Municipality, Kalimpong District.

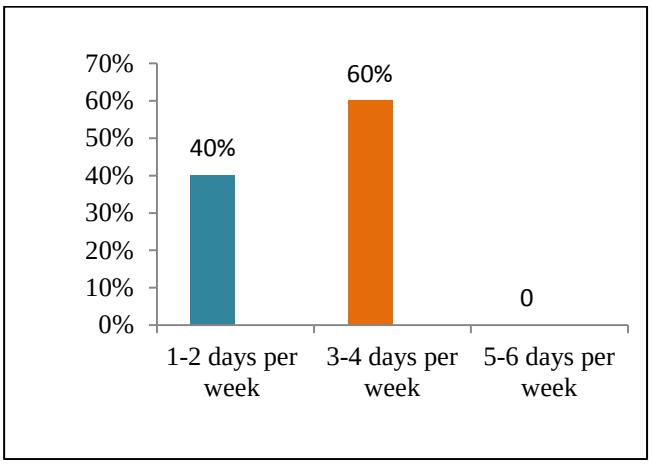

Figure-3: Occurrence of Traffic Congestion in Kalimpong Municipality.

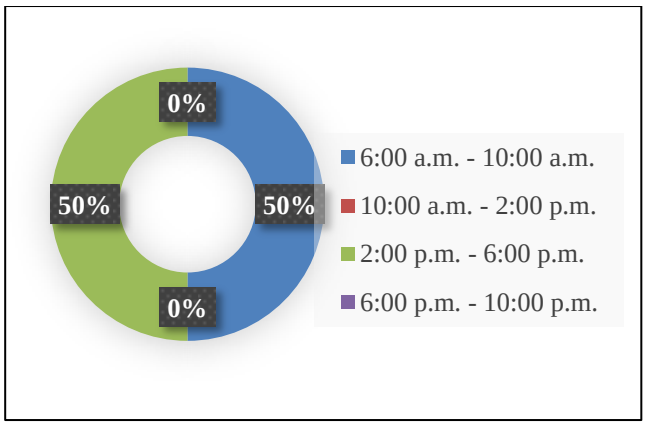

Figure-4: Traffic Congestion Timing.

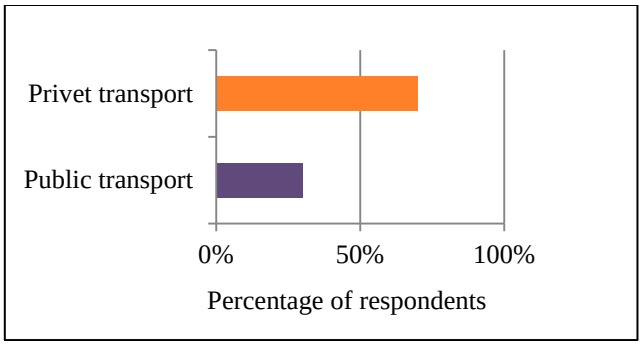

Figure-5: Mode of Transport Used by Respondents.

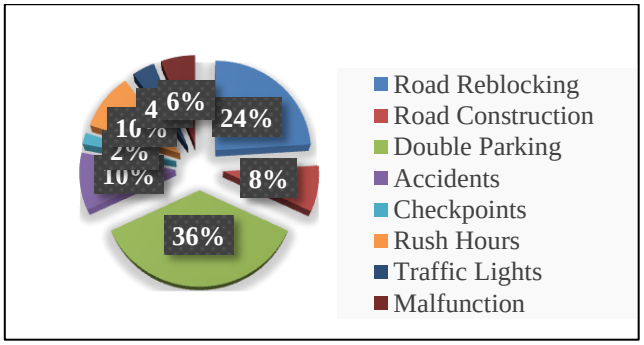

Figure-6: Main Causes of Traffic Congestion in Kalimpong Municipality.

Impact of Traffic Congestion on Environment: With increasing population and the process of urbanization in Kalimpong municipality, a number of vehicles are increasing on roads, creates traffic congestion and greenhouse gas emission. It leads to various effects on surrounding environment:

Air pollution: The air quality in this area is gradually deteriorating as too much air pollutants like Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Sulfur Dioxide (SO_2) and Suspended Particulate Matters (SPM) are releasing from vehicles and remains in the air[10]. Vehicular emissions are a significant contributor to urban air pollution as it contributes to 20-30% to the country's urban air pollution[11]. In Kalimpong municipality, where the vehicles are not well-maintained, this situation is deteriorating. Figure-7, 8 and 9 are showing gradual concentration of Suspended Particulate Matters, NO_2 and SO_2 respectively in the atmosphere in this area[12, 13].

Noise pollution: Traffic congestion leads to high noise levels due to honking, engine noise, and vehicle vibrations. Excessive exposure to noise pollution can have serious health effects and can disrupt daily life and further diminish the overall living environment in this area.

Carbon emissions: Carbon emission is another significant issue created by traffic congestion. Growing number of vehicles contributes to more carbon emission and it impacts on global climate change, weather phenomenon, ecosystem and human health[14].

Geographically, Kalimpong municipality has unique characteristics like steep slopes, narrow roads that cause drivers to stop and start the vehicles repeatedly. As vehicles need more fuel for repeated stopping and starting, this acceleration adds much more emissions to the air.

Effects on health: The harmful pollutants release from vehicles affects the surrounding environment and has direct impact on human health. Poor air quality leads to respiratory disease, cardiovascular disease, skin disease and other health problems. It worsens the quality of life and creates pressure on healthcare system.

Reduction of green spaces: Green spaces play an important role to protect the environment as it provides shelter for many plant and animal species and helps carbon sequestration. In Kalimpong municipality, gradual reduction of green spaces to create parking spots, widening roads can lead to severe environmental degradation.

Apart from these, traffic congestion in this area may indirectly impacts on soil, water and ecosystem in this area. Vehicle runoff can damage soil fertility, contributes to soil erosion, water pollution, and leads to species extinction. Solid vehicle waste can also damage the environment and reduce aesthetic value.

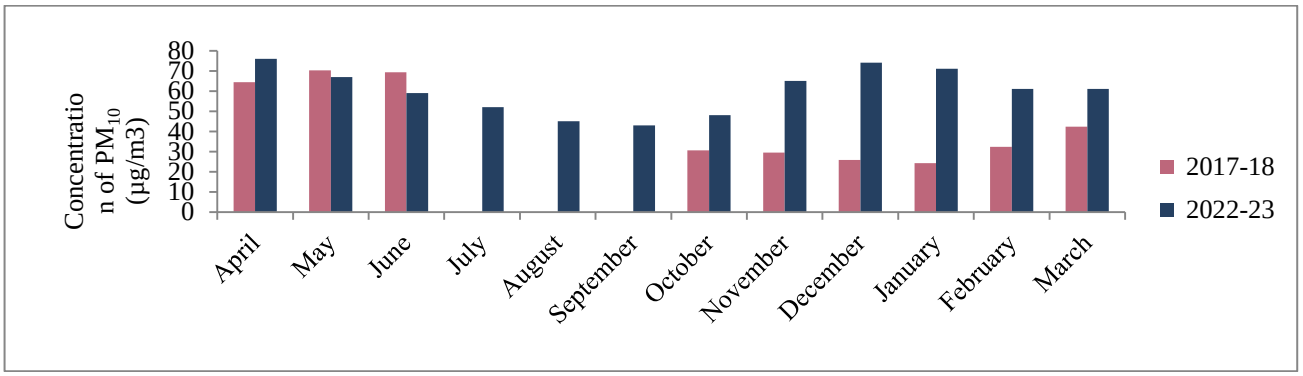

Figure-7: Temporal Changes in Concentration of PM_{10} in Kalimpong Municipality from 2017-18 to 2022-23.

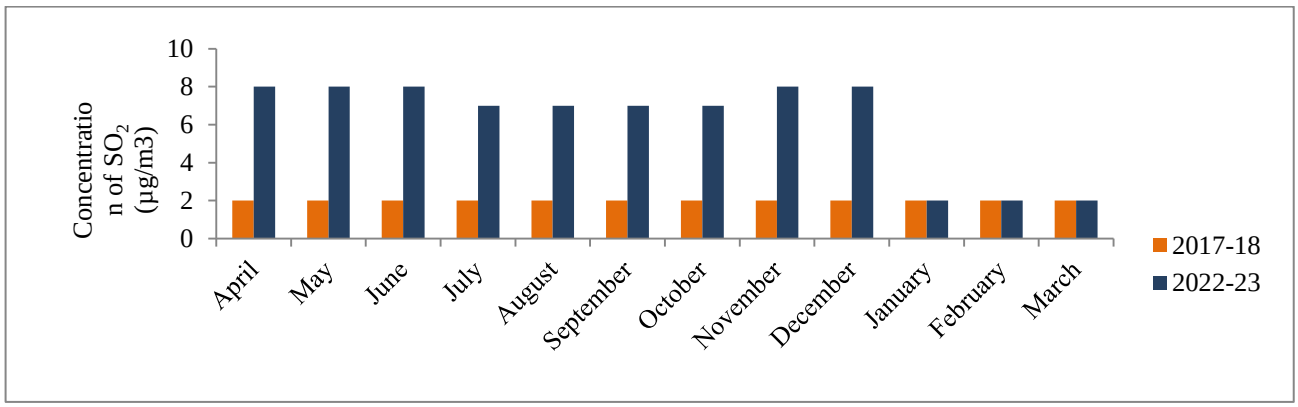

Figure-8: Temporal Changes in Concentration of SO_2 in Kalimpong Municipality from 2017-18 to 2022-23.

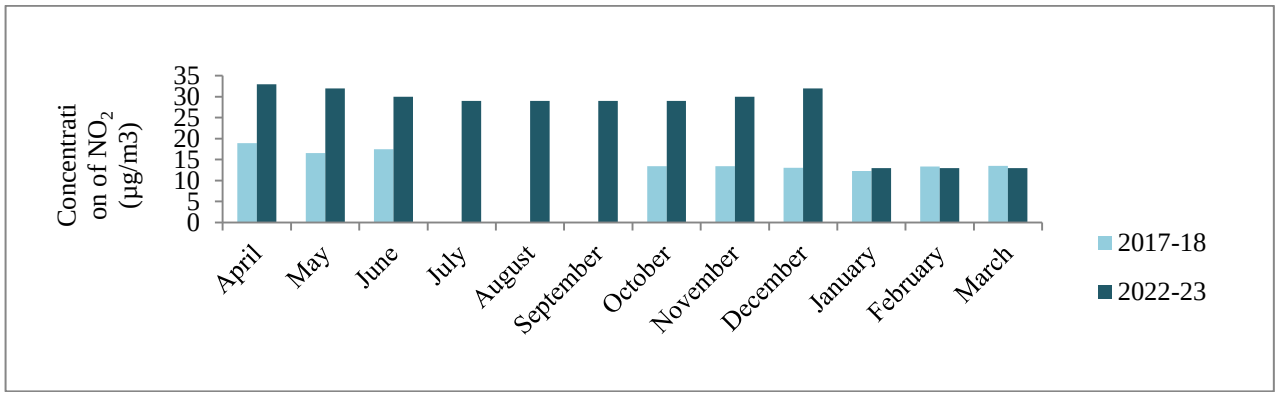

Figure-9: Temporal Changes in Concentration of NO_2 in Kalimpong Municipality from 2017-18 to 2022-23.

Recommendations - Towards Sustainable Transport Management: To reduce the impact of traffic congestion in Kalimpong municipality, the following environment friendly transport techniques are suggested to follow by the people:

Adoption of electric vehicles: Adoption of electronic vehicles is an effective way to reduce carbon emissions and support the environment. Interest in electronic vehicles can be increased by giving subsidies, tax benefits to people and expanding charging stations throughout the area. It will help to conserve the non-renewable energy sources and make the environment healthy.

Congestion pricing: Congestion pricing is another fruitful strategy to control traffic congestion in a crowded and specified commercial area. Many developed countries have already applied this method to control traffic and make transportation more reliable. It is a process by which vehicles are charged a certain amount of money to access specified areas during rush times[15]. This strategy will help people to avoid unnecessary travelling in congested areas, reduce automobiles in busy roads, and choose public transports and cycling as alternative way to travel in these areas. The amount collected by congestion pricing can be use to improve traffic control or investment in the infrastructure of public transport.

Efficient traffic management: Proper management of traffic can reduce the congestion of a particular area. Smart traffic signals that adjust to traffic volume in real-time minimize wait times. Real-time monitoring helps authorities spot bottlenecks and manage traffic better.

Implementation of penalties for double parking: Double parking is illegal and can be seen as an offence. Implementation of penalties is necessary to reduce such safety hazard. The local concerning authority can play major role to control temporary parking on busy roads and congested areas.

Regulation of heavy vehicle movement on busy hours: Heavy vehicle movement on rush hours should be restricted to reduce traffic congestion in this area. As the area has defense importance, there will be some military movement. To reduce excessive movements during busy periods, the Military Station and the district administration can work together.

Community awareness: Raising awareness regarding the harmful impact of traffic congestion on human health and environment can cause behavioural change of people. Educational initiatives and awareness programs regarding the benefits of walking, bicycling, and public transportation and using electric vehicles can encourage local people to use them and support sustainable transport management system.

Traffic police and concerning authority of Kalimpong Municipality has taken few measures jointly to improve the traffic situation in this area such as installment of traffic lights at road intersections like Thana Dara, Damber Chowk, and 10th Mile. Additionally, promoting walking and bicycling helps to reduce traffic-related issues and promotes the town's environmental goals.

Conclusion

Urban traffic congestion is a serious problem in Kalimpong municipality that negatively affects on environment. It increases air pollution, carbon emission, water pollution, noise pollution, biodiversity loss and worsens physical and mental health of people. The situation can be controlled by adapting sustainable transport strategies such as tendency to use public transport and avoidance of unnecessary privet transports, promotion of electronic vehicles, cycling etc. Community awareness can play a crucial role in these circumstances. A collaborative effort of local government, community involvement and utilization of technological innovation can help to reduce such problem and make Kalimpong environment friendly and more livable.

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