

## Quantitative Analysis Of Traffic Dynamics And Violation Patterns Triggered By Cruise Ship Tourism In Victoria, British Columbia

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**Abstract :** Victoria (BC), Canada, is a major cruise ship destination, attracting over 600,000 tourists annually. Residents of the James Bay neighborhood, home to the Ogden Point cruise terminal, have expressed concerns about the impacts of cruise ship activity on local traffic, air pollution, and safety compliance. This study evaluates the effects of cruise ship-induced traffic in James Bay, focusing on traffic flow intensification, density surges, changes in traffic mix, and speeding violations. To achieve these objectives, traffic data was collected in James Bay during two key periods: May, before the peak cruise season, and August, during full cruise operations. Three Miovision cameras captured the vehicular traffic mix at strategic entry points, while nine traffic counters monitored traffic distribution and speeding violations across the network. Traffic data indicated an average volume of 308 vehicles per hour during peak cruise times in May, compared to 116 vehicles per hour when no ships were in port. Preliminary analyses revealed a significant intensification of traffic flow during cruise ship "hoteling hours," with a volume increase of approximately 10% per cruise ship arrival. A notable 86% surge in taxi presence was observed on days with three cruise ships in port, indicating a substantial shift in traffic composition, particularly near the cruise terminal. The number of tourist buses escalated from zero in May to 32 in August, significantly altering traffic dynamics within the neighborhood. The period between 8 pm and 11 pm saw the most significant increases in traffic volume, especially when three ships were docked. Higher vehicle volumes were associated with a rise in speed violations, although this pattern was inconsistent across all areas. Speeding violations were more frequent on roads with lower traffic density, while roads with higher traffic density experienced fewer violations, due to reduced opportunities for speeding in congested conditions. PTV VISUM software was utilized for fuzzy distribution analysis and to visualize traffic distribution across the study area, including an assessment of the Level of Service on major roads during periods before and during the cruise ship season. This analysis identified the areas most affected by cruise ship-induced traffic, providing a detailed understanding of the impact on specific parts of the transportation network. These findings underscore the significant influence of cruise ship activity on traffic dynamics in Victoria, BC, particularly during peak periods when multiple ships are in port. The study highlights the need for targeted traffic management strategies to mitigate the adverse effects of increased traffic flow, changes in traffic mix, and speed violations, thereby enhancing road safety in the James Bay neighborhood. Further research will focus on detailed emissions estimation to fully understand the environmental impacts of cruise ship activity in Victoria.

**Keywords :** cruise ship tourism, air quality, traffic violations, transport dynamics, pollution

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