Chapter 6
Accidents in Mass Transit Systems:
The Case of Trolleybus in Mexico City

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ABSTRACT

The chapter presents the results of a spatiotemporal analysis of accident occurrence of the trolleybus mass transit system in Mexico City. Chi-square analysis for goodness of fit method was employed to assess the relationship between the temporal variables and the accident occurrence. The ArcGis software was used for the analysis of the spatial visualization. The employed data were for 2017. The main conclusion were a) accidents do not have a uniform distribution weekly and hourly (All lines and Line A), on weekdays and the seasons of the year for Lines B and C, and crashes occurring hourly for the case of lines D-G; b) there was not a relationship between weekdays and hourly accident occurrence when considering the seven lines altogether and Line A; c) the most-affected boroughs were those related to Cuauhtémoc (27%), Coyocan (21.6%), and GAM (20.5%); they accounted for 69.1% of the accidents; and d) the peaks of trolleybus accident occurrence depend on the lines, that is, Line F (one peak of hours), Lines B-E (two), and Lines A and G (three).

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INTRODUCTION

The UN agenda for Sustainable Development Goals (SDGs) aim at building an inclusive, sustainable, and resilient future for people and planet (UN General Assembly, 2015). To achieve these aims, 17 Goals were adopted in 2015; in relation to road safety, two sets of goals were established: first, "by 2030, to halve global deaths and injuries from road traffic accidents" (Goal 3), and second, "to provide access to safe, affordable, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situation, women, children, persons with disabilities" (Goal 11) (UN General Assembly, 2015).

In order to achieve these goals, it becomes of paramount importance to gain a better understanding of factors that contribute to traffic accidents, and the negative impacts of such road crashes. There has been a vast amount of research on these issues worldwide (Liao, et al., 2023; Lu, et al., 2021; Mohammed, et al., 2023; Fort, et al., 2011; Geng, et al., 2023; Karacasu, et al., 2011). For example, one of the negative impacts of traffic crashes is that related to congestion and therefore contributors to CO2 emissions (Bharadwaj et al., 2017; Liao, et al., 2023; Deng, et al., 2023; Xia, et al., 2020). Moreover, it may be argued that congestion becomes even worst if traffic crashes occur at rush hours (Geng, et al., 2023). In a way, the increase of CO2 emissions constitutes a lateral effect of traffic accidents in urban environments, which has also been one of the targets of Goal 13 of the SDGs, i.e.: "Integrate climate change measures into national policies, strategies and planning" (UN General Assembly, 2015). In particular, it has been argued that energy-related CO2 emissions rose by 6% for 2021, reaching their highest level ever (UN-SDG, 2023).

Road accidents are the result of several factors such as road conditions, environmental, mechanical, behavioral. Moreover, traffic accidents vary spatially and temporally (Mohammed, et al., 2023; Ziakopoulos and Yannis, 2020). A number of approaches to spatial modelling have been developed over the years to investigate spatial traffic crashes, spatial correlation, spatial autocorrelation that contribute traffic accidents, among others (Mansour, et al., 2022; Mollalo, et al., 2020; Mohammed, et al., 2023). In relation to the temporality, it has been reported that meteorological conditions in winter and summer time influences negatively on drivers' performance and increasing the risk of road accidents; in a similar study, it has been reported that traffic accidents occurred mostly between April and October (Farrel, et al., 1996). More recently, it has been found that accidents occurred mostly between 18:00-19:00 p.m. (Karacusu, et al., 2011).

Research on traffic crashes of the mass transit trolleybus system is lacking in the context of Mexico. The chapter addresses traffic accidents by considering the temporal and spatial aspects of these. The aim of the study is to shed some light on