

UNIVERSITI TEKNOLOGI MARA

**DEVELOPING A SYSTEMIC AND
SUSTAINABLE TRANSPORT
FRAMEWORK TO PROMOTE
CYCLING SAFETY IN MALAYSIA
USING MULTI-CRITERIA
DECISION MODEL**

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ABSTRACT

Cyclist safety is a growing concern in Malaysia as cycling becomes more common for commuting and recreation, yet cyclists remain among the most vulnerable road users. This study aimed to examine factors influencing risky behaviours, identify high-risk groups, analyse interactions with other road users, and develop a cyclist safety framework tailored to the Malaysian context. Field observations were conducted in Kuala Lumpur, Shah Alam, and Cyberjaya across selected midblock and intersection locations, yielding 11,190 observations. Binary logistic regression was used to analyse demographic and contextual influences on risky behaviours, while decision tree analysis classified cyclists into high- and low-risk groups. Interactions with other road users, including bicycle lane misuse and close passing distances, were also modelled. The findings showed that young cyclists, females, solo riders, and electric bicycle users were more likely to engage in risky behaviours such as helmet and reflective clothing non-use. Risky interactions were more frequent at intersections, particularly involving cars and pedestrians misusing bicycle lanes, while close passing distances were strongly associated with female cyclists, solo riders, and encounters with motorcycles. A systemic and sustainable cyclist safety framework was developed, aligned with the Malaysia Road Safety Plan 2022–2030, covering governance, monitoring, safer commutes, protection of high-risk groups, vehicle interactions, and micromobility. The framework offers practical insights for policymakers, planners, and safety advocates, providing a foundation for reducing cyclist risk and promoting safer, more sustainable urban mobility in Malaysia.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

In Malaysia, the safety of cyclists is an urgent issue that requires a structured road safety framework to reduce rising risks. In 2025, as of August, 178 traffic crashes involving cyclists were reported in Malaysia, resulting in 72 deaths and 12 serious injuries (Royal Malaysia Police, 2025). Despite the numerous environmental, health, and economic benefits of cycling, safety measures remain limited, and enforcement is often inconsistent. As cycling gains popularity for various purposes such as recreation, commuting, and commercial delivery, concerns surrounding cyclist vulnerability on Malaysian roads have become increasingly evident. Observations in urban areas suggest that cyclists are often exposed to unsafe road environments, particularly in mixed traffic conditions. A comprehensive research published in *Planning Malaysia* found that cyclist safety remains a significant concern in Malaysia, emphasizing the importance of understanding risky cycling behaviours (such as helmet non-use and lack of reflective clothing) to develop effective safety interventions (Intan et al., 2025). These circumstances highlight the need for a deeper understanding of the factors that place cyclists at risk. Without a clear and coordinated strategy to address these safety concerns, efforts to promote cycling as a sustainable and mainstream mode of transport may continue to face significant obstacles.

Globally, countries like the Netherlands, Denmark, and Singapore have developed comprehensive cycling policies and infrastructure, creating safer environments for cyclists. The Netherlands has significantly reduced cyclist fatalities through long-term investment in over 35,000 km of dedicated cycling lanes, area-wide traffic-calming measures that lowered road traffic crashes by up to 70%, redesigned intersections, and nationwide awareness campaigns targeting vulnerable groups like young cyclists (Callum, 2022). Similarly, Denmark integrates cycling infrastructure into urban planning by creating a comprehensive network of protected bike lanes, physically separated from both sidewalks and roads, which is a core principle of Danish city design (Marianne, 2021). Singapore's Active Mobility Act (AMA) sets out rules