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An analysis of traffic incidents on an Australian urban road network

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Abstract

Assessing and prioritising cost-effective strategies to mitigate the impact of traffic incidents on non-recurrent congestion on major roads are currently a major challenge for road network operations. There is a lack of relevant local research in this area. Several incident duration models developed from international research are not considered appropriate for Australian conditions due to different driver behaviour and traffic environment contexts. A comprehensive data mining research project was undertaken to analyse traffic incident data, obtained from the Queensland Department of Transport and Main Roads' STREAMS Incident Management System (SIMS) for a one year period ending in November 2010. Various factors that contributed to frequency, type, characteristics, duration and location of traffic incidents were examined and the findings are discussed in this paper. Results indicate that breakdown, multiple vehicle crash and debris were the major sources of incidents. Although incident frequency dropped sharply on weekends, the average incident duration was similar or longer than those of weekdays. Also, rainfall increased the incident duration in all categories. Furthermore, a variety of probability distribution functions were employed in order to test the best model for each category of incident duration frequency distribution. Log-normal distribution was inferred to be appropriate for crash and stationary vehicle incidents and gamma distribution for hazard incidents. Future research directions have been identified, particularly the estimation of the impact (cost) of traffic incidents, to assist in prioritising investment.

1. Introduction

Traffic congestion has steadily increased especially in urban networks as a result of population growth and density and increased motorisation. This has reduced transport mobility and consequently has resulted in millions of hours of vehicle delays, air pollution and fuel consumption that might lead to social, economical and environmental problems.

Congestion may be considered as either recurrent or non-recurrent. Recurrent congestion relates to everyday peak period traffic flow when demand exceeds capacity. Conversely, non-recurrent congestion is due to unsteady and unpredictable changes from time to time or day to day; and also to the unexpected occurrences such as incidents, work zones, weather, and special events, where peak demands are higher than normal (Lomax et al., 2003).

The Bureau of Transport and Regional Economics (2007) estimated that urban congestion from capital cities in Australia cost the economy a total of $9.4 billion in 2005. Brisbane's share of this total was 12.8% which equates to $1.2 billion. By 2020, the overall costs of congestion to the Australian economy are expected to be $20.4 billion, with the cost to Brisbane of $3 billion, more than twice of the base year. Thus Brisbane's share of congestion costs will increase by 14.7%, while its population growth is estimated to increase by only 9% over the 15 years to 2020. Brisbane is expecting the greatest increase of congestion costs among capital cities in Australia.

In a study by Ikhrata and Michell (1997), it was estimated that as much as 50% of the delay experienced on US highways was caused by non-recurrent congestion. In a later study, an investigation was undertaken to evaluate the congestion levels in 85 large metropolitan areas