Development of Collision Prediction Models and Quantifying the Road Safety Benefits of Transit Buses

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As more and more people require transportation, not only must it be efficient and economically affordable, it must also increase safety and be environmentally friendly. High road traffic collisions have been recognized as a global major public health and safety problem. Present auto-dominant culture results in more traffic congestion, collisions, and environmental deterioration. So, there is a need to shift people from auto to a more sustainable transportation system that will promote reduced congestion levels, reduced environmental pollutions, improved road safety, and regional economic growth. This research quantified the road safety benefits of sustainable transportation in the form of increased transit services.

The objective of the research was: (1) to develop an auto-based transportation planning model of the Regional District of Central Okanagan (RDCO) for year 2006 and 2020; (2) to conduct road safety analysis due to future transit and road network improvements; and, (3) to identify collision prone locations of the region.

This research built AM period 4-step transportation planning model of the RDCO for the years 2006 and 2020. It proposed RDCO specific trip generation rate and a new auto mode share model, which can be used for future transportation modeling of the region. This research developed collision prediction models (CPMs) for the RDCO, which can be used to predict future AM period collisions. This research also built RDCO transportation planning model for 2020 having four sub-scenarios: (1) do-nothing; (2) only road improvements; (3) only transit improvements; and, (4) both transit and road improvements. It was found that transit improvements have the potential to significantly reduce urban and rural collisions. This research also suggests that construction of new roads in rural areas might result in collision increases. This is a very important consideration for transportation planners before constructing new

roads in rural areas. This research also identified, ranked and analyzed collision prone locations (CPLs) which would help decision makers as they consider where to spend resources, targeting locations with the highest potential for safety improvements. It is believed that the results of this research would contribute significantly in future transportation planning and road safety evaluation of the region.

Table 1 Comparison of the RDCO transportation planning model outputs

Scenario	Total vehicle km travelled (VKT) (x 1000)	Total length of road (TLKM)	Avg. urban VC/TAZ	Avg. rural VC/TAZ	% of Auto user/TAZ
Base	520.95	3,269.02	0.139	0.07	86.76
#1	1,385.57	3,269.02	0.285	0.228	86.76
#2	1,422.21	5,850.24	0.225	0.219	86.76
#3	1,270.16	3,269.02	0.261	0.209	79.56
#4	1,306.94	5,850.24	0.121	0.114	79.56

*** 2006 rural collision prediction models for the RDCO**

Urban Collision Prediction Models (total collisions)

$$\mathrm{TU} = 0.01535.\mathrm{VKT}^{0.724}.\mathrm{e}^{0.00562\mathrm{INTD}}$$

Urban Collision Prediction Models (severe collisions)

$$SU = 0.3749.TLKM^{0.597}$$

Rural Collision Prediction Models (total collisions)

$$TR = 0.2139.TLKM^{0.636}.e^{0.02379\,INTD}$$

Rural Collision Prediction Models (severe collisions)

$$\mathrm{SR} = 0.09.\mathrm{TLKM}^{0.59}.\mathrm{e}^{0.01375\,\mathrm{INTD}}$$

Where,

VKT = vehicle kilometre travelled
INTD = intersection density
TLKM = total length of road network in km

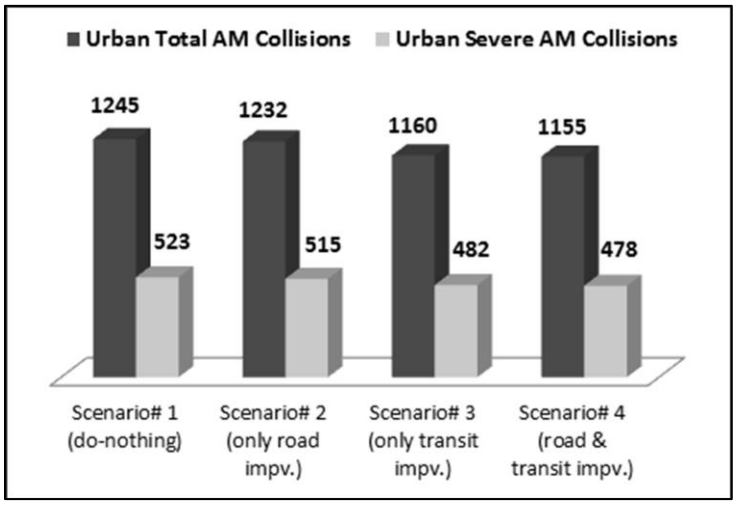

Figure 1 Predicted 3 years road collisions in RDCO urban areas in 2020

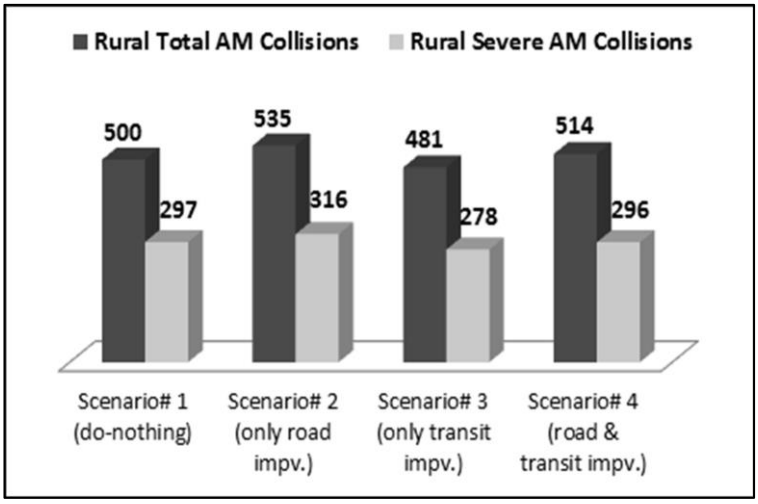

Figure 2 Predicted 3 years road collisions in RDCO rural areas in 2020