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MINISTRY OF TRANSPORT

Domestic Transport Costs and Charges study

Implications from the study of Road Transport Accident Costs

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Recap: Task Brief

Derive estimates of the **Social costs** of road transport-related *"accidents"* in NZ

- All those involving **Motor Vehicles**
- **Non-motorised users** (NMUs) on their own (pedestrians, bicycles, etc)

(Originally also reviewed rail/sea accidents)

Costs to be investigated

- **Total** Costs (by road/vehicle type)
- **Average** Costs (per VKT / PKT / NTK)
- **Marginal** Costs (c/ΔVKT)
- Assessment of **Internal vs External** Costs

Input: Average economic/social cost per accident

Source: Miller T. R & Guria J. (1991). The Value of Statistical Life in New Zealand: Market Research on Road Safety

Cost components	Injury severity			
	Fatal	**Serious**	**Minor**	***Non-injury***
WTP to avoid: Loss of life/permanent disability	$4,527,300	$452,700	$18,100	-
Loss of output (temporary disability)	-	$1,400	$300	-
Medical (hospital, emergency, follow-on)	$7,000	$15,500	$900	-
Legal and court	$21,100	$2,800	$900	-
Vehicle damage	$6,600	$5,200	$5,200	*$3,200*
Total (incl. motor vehicle)	**$4,562,000**	**$477,600**	**$25,500**	***$3,200***
Total (non-motor vehicle)	**$4,555,500**	**$472,500**	**$20,300**	***$100***

Total/Average Road Accident Costs Summary

Average number of casualties / year:
Fatal – 378 *Serious – 4,392*
Minor – 37,351 *Non-Inj – 272,942*

	Road type	Bicycle	Pedestrian	Cars, LCV, other light	Mot'cycle including Moped	Bus	Truck	TOTAL
Total Costs **shared** ($m/year)	*Open (≥80km/h)*	26	42	2,809	329	52	317	**3,576**
	Urban (≤70km/h)	85	177	1,539	182	25	62	**2,069**
	All	**110**	**219**	**4,349**	**511**	**77**	**379**	**5,645**
Cost shared per distance travelled by **vehicle** (c/VKT)	*All*	35.7	31.0	9.9	123.1	25.5	12.6	**11.6**
Cost shared per distance travelled by **person** (c/PKT)	*All*	35.7	31.0	6.3	123.1	2.8	12.6	**7.4**

Total/Average Non-Motorised Accident Costs (not involving motor vehs)

Average number of casualties / year:
Fatal – 1 *Serious – 183*
Minor – 36,307 *Non-Inj – 1,794*

Based on Crash Analysis System (CAS) and ACC datasets

- Including pedestrians, cyclists, wheelchair users, small-wheeled devices (skateboards, scooters, etc)

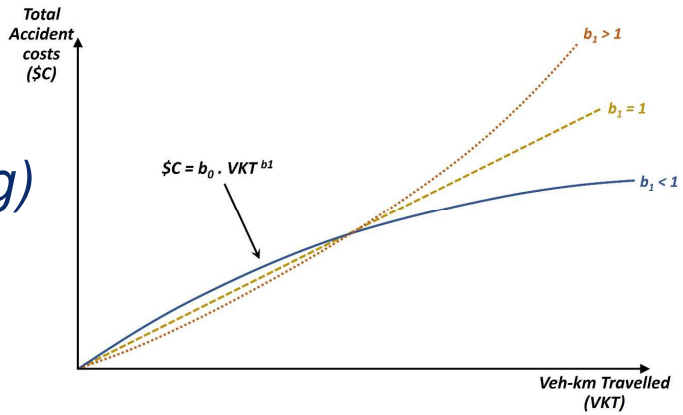
Many accidents by these modes not captured by Police crash records but reported through hospital & ACC data

e.g. Slips, Falls

Note the health and other benefits of active modes outweigh these costs

	Total NMU-only
Distance travelled by person (PKT, million km)	1014m km
Neutral costs shared ($m/year)	**$830m**
Cost shared per distance travelled by person (c/PKT)	82c

Marginal Accident Costs



What is the extra accident cost that adding (or removing) ***one extra vehicle-km*** *to the traffic flow pattern brings?*

Accident prediction **models** used to estimate numbers

Average costs per accident vary in ***three*** key dimensions:

- Higher **speeds** (e.g. on rural roads) → more serious injuries & deaths
- **Intersections** have different accident types than **mid-block** sections
- **Congested** situations (e.g. rush hour) → lower speeds and severity

Modelled urban/rural/motorways, intersection/mid-block, pedestrian/cycle

- Total **vehicle-kms travelled** (VKT) is the key model input

Calculated Marginal Costs

**MC/AC* = Ratio of Marginal Costs to Average Accident Costs*

Sub-model	MC/AC*	Marginal costs (c/VKT)	Combined MC (c/VKT)
Urban mid-block (uncongested)	1.00	13.2	Urban uncongested **17.3**
Urban intersection (uncongested)	0.44	4.1	
Urban mid-block (congested)	-1.40	-18.4	Urban congested **-33.1**
Urban intersection (congested)	-1.56	-14.7	
Rural mid-block (uncongested)	0.80	51.3	Rural uncongested **56.9**
Rural intersection (uncongested)	0.46	5.6	
Motorway mid-block (uncongested)	1.40	5.1	**5.1**
Motorway mid-block (congested)	-1.85	-6.8	**-6.8**
Cycle all (uncongested)	0.20	8.1	-
Pedestrian vs MV (uncongested)	0.40	12.4	
Pedestrian only (uncongested)	0.40	46.2	

Road accidents: Limitations and Further Work/Updates

Limitations:

- Interpretation of ACC data used
- Available splits of VKT data by road type and vehicle type
- Robustness of accident prediction models used for marginal costs
- Inconsistent or limited usage/ injury data for new travel modes
- No breakdown of truck types

➔ Further work:

- Refine non-motorised costs using hospital admission datasets
- Review the average social cost per road accident (incl. components)
- Refine marginal cost models
- More detailed/consistent usage data by road and vehicle types
- Review internal vs external cost components

True costs of NZ non-motorised user (NMU) accidents

Current safety analysis identified **$830m**/yr in social costs across NZ

- Determined by combination of CAS and ACC claims data for these users
- But involved some extrapolation of values from different ACC categories

A separate recent study for Akld Trpt of serious NMU injuries in Auckland used Ministry of Health (MoH) hospital data

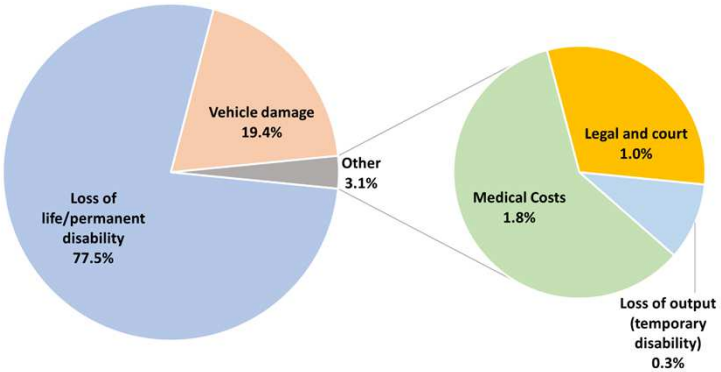
- Social cost of these injuries was about **$500m**/yr in Auckland alone

➔ *national estimate may be conservative…*

Further review the national estimate, using a similar MoH data set for all NZ?

- Would enable an approximate split of “serious” or “minor” injuries, by considering length of hospitalisation

Reviewing the relative breakdown of road accident cost components



Valuation of Statistical Life (VOSL) in NZ based on a study **>30** years ago

- Subsequent adjustments each year for cost-of-living increases
- Some studies have reviewed it more recently; new local research now?

Large focus on current value for **WTP** to avoid loss of life/permanent disability

- Relatively smaller components for medical costs and vehicle damage may also be under-estimated, based on current pay-out costs

➔ **All** components making up current VOSL estimates should be reviewed

*Also examine more closely the likely proportion of each cost component considered **internal** or **external** to road users*

Accident data by Vehicle types

Unlike other transport data sets, no additional detail is provided in CAS to differentiate the various types of heavy trucks *(other than 50MAX trucks)*

e.g. Small truck, 4-axle rigid, Truck+trailer, B-train, etc

➔ Would be useful to have additional categorisation of **truck types** involved

New modes of travel are becoming popular, and datasets should be adapted to better include these, esp.:

- Low-powered electric mobility devices such as e-scooters
- Unpowered transport devices, including kick scooters and skateboards
- E-bikes (separate from unpowered bikes)
- Bike share and scooter share schemes
- Alternatives to taxi services, e.g. Uber, Ola

Urban vs Rural accidents

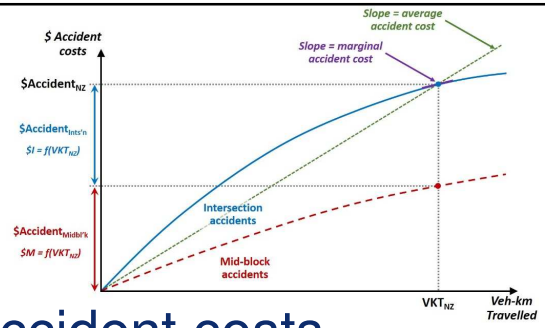
There is a lack of consistency of the definitions of urban vs rural across different datasets

- CAS considers a **70 km/h+** road to be ***rural***
- NZTA's VKT measures classify roads **up to 70 km/h** as ***urban***
- *Is a high-speed **motorway** within a city "urban" or "rural"?*

Ideally

- CAS approach should be used, i.e. urban is ≤60kmh, rural is ≥70kmh
- Add a ***third*** category distinguishing motorways and other limited-access high-speed expressways
- OR use **One Network Framework** (ONF) classifications instead?

Review of marginal accident costs



We developed an ***updated*** method for calculating marginal accident costs

- Partly based on the previous 2005 study valuation approach
- Incorporating more recent research on accident prediction models
- More recent understanding of speed/volume/cost relationships

Limited opportunity to test it fully to explore implications of some assumptions

- Economic marginal cost theory, incl. validity of ***negative*** marginal costs
- Method of splitting **intersection** and **mid-block** costs
- Further disaggregating urban/rural/motorway models by **vehicle type**
- Improve models for **pedestrian** and **cycle** accident marginal costs

Would be preferable to further review the existing marginal cost models

Conclusions

Road accidents (motorised and non-motorised) cost NZ about **$6.4 billion** a year in social costs

- A large part of this reflects the **WTP** to avoid pain/grief/suffering
- **Motorcycle** & **bicycle** accidents have highest cost per veh-km
- A lot of **non-motorised** accidents not captured by CAS data (or MoT)
- In congested situations, marginal costs can potentially be **negative**

Still some issues to explore further about methods and data used

- Appropriate **road/vehicle categorisation** of various datasets
- Better **valuations** of different cost estimations
- Review method used for **marginal cost** calculation

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Thank you!

Questions?

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