Submission to Inquiry into the Increase in Victoria’s Road Toll during 2019
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Preface

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Ethics approval was not required for this project.
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EXECUTIVE SUMMARY

The Economy and Infrastructure Committee (Legislative Council) at the Parliament of Victoria is conducting an inquiry into the increase in Victoria’s Road Toll. The Committee is required to consider eight issues that form the Terms of Reference (ToR) of the Inquiry. Monash University Accident Research Centre (MUARC) was invited to prepare a submission that addresses the ToR. The key points summarising MUARC’s full response to each ToR are given below.

ToR 1: Current Victorian Towards Zero Road Safety Strategy 2016-2020 and progress towards its aim of a 20 per cent reduction in fatalities with 200 or less lives lost annually by 2020

- Annual road death counts will have an inherent variability in them from year to year even if the underlying risk and exposure in the road transport system remain the same.
- If the 2018 road death toll was ignored, modelling of the annual toll projected from 2017 would have predicted an average fatality count of 255, with an expected range from 224 to 286. The final 2019 road toll of 268 is within the bounds of likely statistical variation.
- The projected failure of the original Towards Zero strategy to reach the target of 200 deaths per year is largely due to population and travel growth in Victoria well in excess of what was predicted in formulating the strategy originally. Investment in road trauma countermeasures needs to increase at much higher rate than travel to offset this.
- Random breath test delivery during 2019 was above that planned and assumed in the forecast of the impact of countermeasures. In comparison, mobile speed camera hours and road safety infrastructure delivery during 2019 were both slightly below that planned.
- Further assessment of the actual delivery of Towards Zero initiatives during 2019 is necessary to understand their impact on 2019 fatalities.

ToR 2: Adequacy and scope of the current driver drug and alcohol testing regime

- The prevalence of Methylamphetamine (“ice”) in drivers on the road and the seriously injured has trended up steeply during the last decade.
- Drug-driving with Methylamphetamine can be deterred by increasing the positive detection rate from roadside drug testing, particularly by targeted testing.
- Drug-driving with THC can be deterred by increasing both random and targeted roadside drug testing.
- The 50% increase to 150,000 roadside drug tests during 2019, particularly targeted tests, is expected to have saved 3 fatal crashes and 55 serious injury crashes.
- Further increases in targeted and random roadside drug tests are warranted, up to 426,500 total tests per year in the first instance. It is estimated that 24.5 fatal crashes and 140.5 serious injury crashes would be saved per year.
Resources should not be diverted from roadside breath testing for alcohol to facilitate the increases in roadside drug testing.

ToR 3: Adequacy of current speed enforcement measures and speed management policies

Speed enforcement

- Mobile speed cameras on Victoria’s rural roads are not as effective as they could be due to the site selection criteria, the limited number of sites, and the visibility and predictability of their enforcement operations.
- Queensland’s overt mobile speed cameras achieve substantial crash reductions up to 4 km from rural camera sites due to site selection based only on crash history and randomised scheduling of operations to those sites.
- Victoria’s mobile speed cameras could achieve crash reductions over 8 km sections of rural roads ranked highly by their serious crash history. New sites should be selected as in Queensland and camera visits should be randomly-scheduled to each site for shifts totalling at least 35 hours per year.
- The Victorian Government’s announcement to increase mobile speed camera hours by 75% should take the form of at least 75% increase of rural sites. The new sites should be selected on the basis of a serious crash history within 2.5 km and should consider all category A, B and C rural roads.
- Mobile speed cameras operated at these new rural sites could be expected to save 22.5 fatal crashes and 172 serious injury crashes per year. Social cost savings would exceed 45 times the cost of camera operations.
- While still a new technology, mobile point-to-point camera units have the potential to enforce speeding over much longer rural road sections than the traditional spot-speed mobile cameras.

Speed limits in local streets

- There is strong local and international support by the community for lower speed limits in local (residential) streets.
- Reducing speed limits in these regions is likely to reduce the likelihood of fatal and serious injuries to vulnerable road users.
- The Melbourne City Council has already implemented 30 km/h in some shared roads (e.g., Swanson Street) in the CBD.

ToR 4: Adequacy of current response to smart phone use, including the use of technology to reduce the impact of smart phone use on driver distraction

- Mobile phone use makes up 7% of all non-driving tasks that are initiated by Australian drivers and drivers spent 7% of their total driving time using a mobile phone. Half of this involved a hand-held mobile phone.
- Data from the US show that illegal visual-manual phone use (e.g. texting, dialling) is associated with an 83% increase in the risk of a severe, moderate, or minor crash occurring.
- Several technologies have been designed to reduce the impact of smart phone use on driver distraction, including automated mobile phone detection.
enforcement cameras, mobile phone blocking technology and driver selected Apps which limit phone functionality.

- In December 2019, NSW became the first jurisdiction in the world to implement an automated mobile phone detection camera enforcement program, using both fixed and transportable cameras.
- The potential effectiveness of an automated mobile phone enforcement camera program in NSW has been estimated by MUARC as resulting in an annual reduction of 67 casualty crashes (19 fatal and serious injury (FSI) crashes), 86 casualties (21 FSI) and $25 million in crash costs.
- In Victoria, widespread roll-out of automated mobile phone enforcement is predicted to prevent 95 casualty crashes per year and $21 million in crash costs.

**ToR 5: Measures to improve the affordability of newer vehicles incorporating driver assist technologies**

**Measures currently available**

- Average adult wages increased by 55% over 10 years whilst the prices for equivalent popular vehicles increased only between 5 and 10%, effectively making vehicles much more affordable.
- Despite improving affordability, consumers were less likely to prioritise safer vehicle choices. MUARC research estimated that overall road trauma could have been reduced by 24% if everyone had purchased the safest vehicle available in class.
- Part of this reduction in safe vehicle choices has been brought about by increasing consumer preference for purchasing types of vehicles that are inherently less safe. In particular the growing market share of commercial utilities, and the growing proportion of small and light vehicles.
- Efforts need to be made to increase the priority consumers give to safety in determinants of vehicle choice, through use of ANCAP ratings for new vehicles and Used Car Safety Ratings for older vehicles.
- Safer choices do not necessarily come at a cost to consumers, simply only requiring the substitution of one vehicle for a safer one at the same price.

**Future vehicles**

- In spite of what we think, Autonomous Electric Vehicles (ELVs) of some form will be upon us in the next 10 or so years, given their attraction and the effort that Original Equipment Manufacturers (OEMs) have committed to their development.
- It is critical, therefore, that we are fully prepared for their introduction.
- Current trials will be useful in highlighting potential benefits and problems but clearly more research in terms of societal impact is clearly still urgently needed.
- Potentially safety benefits, reduction in consumer costs, and community improvements is necessary to be sure we get the appropriate business models and policies.
Critical for government agency involvement and leadership to be sure maximum societal improvements are obtained.

**ToR 6: Adequacy of current road standards and the road asset maintenance regime**

- Programs such as the Safer Roads Investment Plans (SRIPs) and the Safer Roads Program need to be extended beyond their current funding schedules to continue to provide safety benefits.
- A continuing focus on the adoption of a safe system approach to road design and maintenance is vital to address the apparent increase in severe injuries on rural highways and undivided roads.
- With the imminent arrival of autonomous vehicles, it is critical to be sure that the interaction of the vehicle and the infrastructure receive even stronger focus to ensure the potential safety benefits of these new technologies is realised.

**ToR 7: Adequacy of driver training programs and related funding structures such as the L2P program**

- Work-related vehicles (light and heavy vehicles) represent a large proportion of the road traffic environment and should be managed under workplace and public health approaches to reduce the road toll.
- Effective and sustainable approaches to positively changing the behaviour of work-related drivers are focused on challenging drivers' attitudes and beliefs associated with unsafe driving behaviour.
- Skill-based driver training is not effective in improving driving performance and reducing crashes.
- Incentivising behaviour using extrinsic benefits (e.g., financial incentives) is not effective in improving driving performance.
- Hazard perception training is effective in improving hazard perception skills; this type of skill-based driver training that has been found to be effective in improving driver performance.
- The behaviour modification techniques, group discussion and goal setting and feedback, are effective in improving driver performance.

**ToR 8: Adequacy and accuracy of road collision data collection.**

The limited availability of key staff with expertise on this ToR has prevented a written submission at this time, however MUARC may be able to provide a supplementary submission and/or provide oral evidence if requested.
INTRODUCTION

The Economy and Infrastructure Committee (Legislative Council) at the Parliament of Victoria is conducting an inquiry into the increase in Victoria's Road Toll. The Committee is required to consider the increase in the Victorian road toll in 2019, including but not limited to, an examination of the following issues that form the Terms of Reference (ToR) of the Inquiry.

1. Current Victorian Towards Zero Road Safety Strategy 2016-2020 and progress towards its aim of a 20 per cent reduction in fatalities with 200 or less lives lost annually by 2020;
2. Adequacy and scope of the current driver drug and alcohol testing regime;
3. Adequacy of current speed enforcement measures and speed management policies;
4. Adequacy of current response to smart phone use, including the use of technology to reduce the impact of smart phone use on driver distraction;
5. Measures to improve the affordability of newer vehicles incorporating driver assist technologies;
6. Adequacy of current road standards and the road asset maintenance regime;
7. Adequacy of driver training programs and related funding structures such as the L2P program; and
8. Adequacy and accuracy of road collision data collection.

Monash University Accident Research Centre (MUARC) was invited to prepare a submission that addresses any aspects of the Terms of Reference above. The following sections are MUARC’s response, numbered by the ToR number. Each section addresses the adequacy of the current situation in Victoria, as perceived by MUARC, and makes recommendations or comments to improve the situation, where warranted.

During 2019, 268 lives were lost on Victoria's roads compared with 213 lives lost during 2018, an increase of 26%. Some extent of this increase was due to the relatively low number of lives lost during 2018. The five-year average number per year during 2014-2018 was 252 and the 2018 figure was 15% below this average. However, the number of lives lost during 2019 is not consistent with the aim of Victoria’s road safety strategy to reduce annual lives lost to at most 200 by 2020.

The largest contribution to the increase in lives lost during 2019 was in rural Victoria where there were 149 road deaths compared with 109 in 2018, an increase of 37% and well above the five-year average of 138. In Melbourne, there were 119 lives lost during 2019 compared with 104 in 2018, an increase of 14% and also above the five-year average of 114. All together these figures indicate that the increase in the road toll during 2019 needs attention in both Melbourne and rural Victoria, with a particular focus on the adequacy of the current situation on Victoria’s rural roads.
1 VICTORIAN ROAD SAFETY STRATEGY AND PROGRESS TOWARDS ACHIEVING ITS AIM FOR FATALITY REDUCTION

Assessment of the progress of the Victorian Toward Zero Road Safety Strategy and the aim of achieving a 20% reduction in the annual road toll to under 200 deaths needs to consider both the long-term trends in fatalities in Victoria and the likely impact of both past and planned future road safety countermeasures. The Monash University Accident Research Centre (MUARC) has recently completed work for the Victorian Road Safety Partners modelling the impact of major road safety programs and other socio-demographic and economic factors on historical road safety trends in Victoria. Outcomes from this analysis have also been used to project likely future road safety trends under the existing policy setting. Known as the ‘baseline road safety trend’ these trends have been used as the basis for applying strategic modelling to assess the impact of planned future road safety programs and the likelihood that these programs will meet stated targets for future road trauma in Victoria.

It is informative for the purpose of commenting on road safety trends in Victoria to examine the results of the baseline road trauma trends model. Assessment of outcomes from this model gives a general picture of where road fatality trends in Victoria are heading under the policy regime in place to the end of 2018. Trends to this time are essentially driven by road safety programs implemented under the original Victorian Toward Zero Road Safety Strategy and do not account for additional road safety activities planned since the review of the strategy in 2017. Comment on the likely impacts of the additional measures planned after the review will be considered later.

As background to the general road fatality trends in Victoria, and in particular the 2019 road toll which has prompted this inquiry, the 2019 road toll in Victoria was 268, up 25.8% on the final 2018 road toll. For comparison, the 2017 final year total was 259 and the 2016 total was 290. One of the initial questions relevant to assessment of the question of whether the 2019 road toll is considerably higher than what would have been expected based on strategic road safety analysis. Consideration has included quantifying the impacts of any variation in the delivery of key road safety programs. Commentary presented in this document is based on analysis conducted in preparing the baseline road trauma trends model, the purpose of which is to project likely future road trauma trends under a ‘business as usual’ approach with no additional strategic investment in road safety programs beyond what is currently occurring. The current analysis gives consideration only to changes in delivery of road safety programs included explicitly in the baseline trauma trends model. Further consideration of the implementation of road safety initiatives planned under the revised Towards Zero (TZ) road safety package that commenced in 2018 will be described later.
1.1 ANALYSIS OF GENERAL TRENDS

To support development of the new Victorian Road Safety Strategy, using the baseline road trauma trends model, MUARC has previously estimated potential road trauma trends to 2030 taking into account the impact of existing major road safety programs. In addition, the likely effects of implementing the TZ (Towards Zero) countermeasure package on future reductions in road trauma has been estimated using the eMETS (Enhanced Macro Estimates for Target Setting) model assuming rollout of various countermeasures at specified times. Including observed monthly fatality data to the end of 2018, the baseline forecast prediction for fatalities for 2019 was 240 with existing road safety programs. This predicted to fall to between 180 and 200 by the end of 2020 with TZ initiatives included. The official 2019 road toll is quoted at 268.

There was some concern about the accuracy of the 2019 road trauma forecasts given the apparently low fatality total recorded in 2018. The most recent observed data can have a sizeable impact on the future forecasts produced by the baseline road trauma trends model. It appears that the number of fatalities observed for 2018 of 213 may have been low, perhaps by chance. It was well below the previous 4-year average of 249. In order to assess the impact of the 2018 fatality data on the 2019 forecast, the forecast road trauma trends for 2019 were re-estimated without using the actual fatalities of 2018 in the time series model (i.e. a forecast was made from December 2017). This resulted in adjusted estimated fatalities for 2019 of 255. This is 15 higher than for forecasts made including the 2018 data showing the impact of 2018 data in the forecast model.

It is useful to note that annual road death counts will have an inherent variability in them from year to year even if the underlying risk and exposure in the road transport system remain the same. This reflects road fatalities having an element of randomness in their occurrence, similar to many other public health outcomes. Much of the scientific literature considers annual road fatality counts to have a Poisson statistical distribution in their inherent variability. In practice, this means that if the real underlying risk in the network predicts an average fatality count of 255, an observed fatality count within the range 224 to 286 could occur through pure chance variation. Variation in the count beyond this range could also occur but with less than 5% probability. If the underlying system risk predicted a toll of 240, as did the initial baseline model, the possible range of variation in the observed counts is 210 to 270. Hence, the 2018 road toll was at the extremes of variation if the underlying risk predicted 240 fatalities, but lower than expected if the underlying risk predicted 255. Again, this is without considering any potential impacts of planned road safety initiatives resulting from the 2017 strategy review.

Regardless of whether the underlying risk of the system predicted 240 or 255 fatalities from the baseline trauma trends model, the final 2019 road toll of 268 is within the bounds of likely statistical variation for either. It is also worthy of note that there is likely a regression to the mean effect in comparing the 2018 and 2019 road tolls. When an annual road toll is at an extreme of the expected range, as 2018 appeared to be, regression to the mean dictates that the road toll for the following year will have a high probability of being higher, as was observed. These
observations show that governments should not be too reactive to road toll variation within the expected range. Instead, long term trends should be the focus of measuring progress as well as measuring the progress of delivery of strategic road safety programs and ultimately measuring their effectiveness through comprehensive evaluation of outcomes.

The following figure shows the observed annual fatalities in Victoria from 2006 to 2018 (Figure 1.1; note the final figure for 2018 was an estimate at the time of analysis at 215 compared to the observed 213). It also shows the forecast fatalities to 2030 based on the business as usual delivery of road safety programs at 2018 levels. The chart suggests that the 2018 fatality count was indeed a low aberration in the series and predicted a return to high levels in subsequent years. Despite continued investment in road safety infrastructure and the regeneration of the vehicle fleet with newer, safer vehicles, future annual fatality counts were predicted to plateau at around 230 over the next decade. Unprecedented population growth, which correlated strongly with travel demand, was the primary reason for the plateau being predicted. It was also concluded in conducting the analysis for the strategy review that the projected failure of the original TZ strategy to reach the target of 200 deaths per year was largely due to population and travel growth in Victoria well in excess of what was predicted in formulating the strategy originally. In the face of increasing exposure, the underlying safety of the road transport systems needs to be increased proportionally to maintain a constant outcome. To improve the outcome, in this case road fatalities, investment in safety countermeasures needs to increase at much higher rate than travel.

![Figure 1.1 Observed annual fatalities in Victoria from 2006 to 2018](image-url)
If the impact of road safety initiatives, as estimated by eMETS, is included in the forecast, the estimated 2019 trauma levels are 215 (excluding 2018 data in the forecast model) or 200 (including 2018 data in the forecast model). For either of these forecasts, the 2019 fatality count of 268 is outside the bounds of statistical variation suggesting the TZ initiatives might not have been implemented to the extent or within the time frames modelled in eMETS, or their effectiveness has been less than assumed in eMETS. This possibility is considered further in the next section.

1.2 IMPACT OF THE DELIVERY OF ROAD SAFETY PROGRAMS

In interpreting the efficacy of the baseline road trauma models accurately predicting 2019 road trauma outcomes, it was important to assess whether the assumed levels of delivery of road safety programs in the baseline trauma model were accurate. This has been assessed through comparing assumed levels in the models with actual levels that have since been documented. Program delivery for random breath tests delivered from buses, hours of mobile speed camera enforcement and road safety blackspot infrastructure expenditure through the SSRIP program have been considered. Projected outputs from these programs versus actual outputs are shown in the following figures (Figure 1.2, Figure 1.3, Figure 1.4).

As can be seen, random breath test delivery was above that assumed in the forecast. In comparison, mobile speed camera hours and road safety infrastructure delivery were both slightly below that assumed in the forecast models.

![Figure 1.2 Monthly random breath tests]
Detailed information regarding the implementation of Safe Roads & Roadsides and Safe Speeds initiatives is not yet available to MUARC, however an initial scan provided by the Department of Transport Safer Roads team suggests that the majority of planned road infrastructure programs are planned to be delivered by the end of 2020. Some implementation lag is evident, with the model assuming a higher proportion of benefits may have been realised by the end of 2019. Consequently, the full benefits to road trauma may not be realised until 2021. Two speed limit reduction initiatives were modelled: 50-40 km/h on 50% of local roads and 100-80 km/h on 50% of high speed local and low volume state-administered roads. Together, these were expected to yield conservative reductions of between seven and eight fatalities and 100 seriously injured persons per annum, but MUARC is not aware of the extent to which these two will be implemented by the end of 2020.

Using forecasts derived from data to December 2017, the impact of the variation in road safety program delivery was estimated on forecast 2019 fatalities. The revised forecast fatalities for 2019 were 254, almost identical to the previous forecast.
reflecting the effects of lower mobile speed camera hours and road safety infrastructure being offset by increased random breath testing. Overall, the forecasts from the baseline road trauma trends model have not been adversely impacted by significant variation in road safety program outputs from that assumed.

Another factor that could impact the accuracy of the forecast model is the assumed rate of future travel growth represented by population growth trends. No updated population projection beyond that used to construct the baseline trauma models was available for consideration in this analysis. Population projections generally only change with updated census data which has not become available since formulation of the last baseline road trauma trends model.

As noted, the next step in the review of the 2019 road toll will be to assess the actual delivery of TZ initiatives against those assumed in the eMETS to see how this might have impacted 2019 fatalities. This will be described in a separate paper but will give consideration to the general points about annual road toll variability and observations on the baseline road trauma model made in this paper.

1.3 KEY POINTS

- Annual road death counts will have an inherent variability in them from year to year even if the underlying risk and exposure in the road transport system remain the same.
- If the 2018 road death toll was ignored, modelling of the annual toll projected from 2017 would have predicted an average fatality count of 255, with an expected range from 224 to 286. The final 2019 road toll of 268 is within the bounds of likely statistical variation.
- The projected failure of the original Towards Zero strategy to reach the target of 200 deaths per year is largely due to population and travel growth in Victoria well in excess of what was predicted in formulating the strategy originally. Investment in road trauma countermeasures needs to increase at much higher rate than travel to offset this.
- Random breath test delivery during 2019 was above that planned and assumed in the forecast of the impact of countermeasures. In comparison, mobile speed camera hours and road safety infrastructure delivery during 2019 were both slightly below that planned.
- Further assessment of the actual delivery of Towards Zero initiatives during 2019 is necessary to understand their impact on 2019 fatalities.
2 DRIVER DRUG AND ALCOHOL TESTING

2.1 ROADSIDE DRUG TESTING

Preliminary Oral Fluid tests (POFTs) for drugs were introduced in Victoria in December 2004. Initially these tests were carried out by the Road Policing Drug and Alcohol Section (RPDAS), mainly at bus-based testing stations in conjunction with random breath testing. From 2007, an increasing number of POFTs were carried out by Highway Patrols (HP) and the Heavy Vehicle Unit (HVU). These tests were more targeted at the locations and times where they were more likely to detect one or more of the proscribed drugs (THC, Methylamphetamine or MDMA).

2.1.1 Trends in preliminary oral fluid tests (POFTs) and detection rates

Figure 2.1 shows the number of POFTs each year during 2004-2018 conducted by each type of operation in the Melbourne metropolitan (Metro) and rural police divisions. Figure 2.2 shows the detection rates of POFTs positive for a proscribed drug at each type of testing operation over the period. From 2010, the detection rate at the HP/HVU targeted operations grew faster than that at RPDAS operations which were mainly random drug tests (RDTs) at bus-based stations. The increases in detection rates during 2010-2013 were apparently due to the increasing prevalence of THC and Methylamphetamine in drivers on the road (Figure 2.3).
Detection Rate of Positive POFTs by operation type, location and year
(Note: 2011 rates based on recorded POFTs and detected positive tests)

Figure 2.2: Detection rates from roadside drug tests in Victoria, 2004-2018

Detection Rate of Positive POFTs by drug type and year
(Note: 2011 rates based on recorded POFTs and detected positive tests)

Figure 2.3: Detection rates of THC and Methylamphetamine (Meth) from roadside drug tests in Victoria, 2010-2017
2.1.2 Trends in driver serious injuries involving drugs

Confirmation of the increased role of Methylamphetamine (Meth) in drug-driving is shown in Figure 2.4. The presence of Meth in seriously injured drivers has increased consistently whereas THC initially increased then decreased from 2010.

![Graph showing rate of drug presence in seriously injured drivers](image)

Figure 2.4: Rate (%) of THC and Methylamphetamine presence detected in seriously injured drivers in Victoria, 2006-2016

2.1.3 Relationships between roadside drug testing and drug involvement in seriously injured drivers 2006-2016

Recent MUARC research has modelled the relationships between drug presence in seriously injured drivers and (a) increased POFTs during 2006-2016 and (b) the positive detection rates from these tests (Clark, Thompson and Newstead, 2019). The analysis used the information in Figures 2.1-2.4 within each Police Region, allowing greater sensitivity to establish the relationships. They found that:

- Relative odds of THC involvement in seriously injured drivers decreases with the increased total POFTs (random and targeted)
- Relative odds of Methylamphetamine (Meth) involvement in seriously injured drivers decreases with the increase in the positive detection rate of any of the proscribed drugs (THC, Meth, MDMA) from the combined random and targeted POFTs.

The relative odds (essentially the risk) due to THC involvement related to the annual POFTs is shown in Figure 2.5. The relative odds due to Meth involvement related to the detection rate is shown in Figure 2.6. Both relationships are of the diminishing-returns type, suggesting that the reduction in risk continues but
becomes smaller for each increase in the POFTs or detection rate. This implies that future increases in the roadside drug testing program and its detection rates may reach a point where the savings in seriously injured drivers and their crashes no longer justify further increase in the program.

**Figure 2.5:** Relative odds of THC presence in seriously injured drivers by annual POFTs delivered per Police Region

**Figure 2.6:** Relative odds of methamphetamine presence in seriously injured drivers by POFT detection rate
2.1.4 Relationship between roadside drug testing and drug involvement in killed drivers 2005-2009

Relationships between drug involvement in killed drivers and annual numbers of POFTs had been previously found by Cameron (2013) from Victoria Police data published by Boorman (2010). The relationship during 2005-2009 between POFTs was stronger for the involvement of any impairing drug than that for the involvement of the proscribed drugs (THC, Meth or MDMA). The relative risk of driver fatality due to an impairing drug, related to the annual POFTs, is shown in Figure 2.7.

![Figure 2.7: Relative risk of driver fatality with impairing drug by annual POFTs](image)

2.1.5 Traffic Enforcement Resource Allocation Model (TERAM)

TERAM was developed for Victoria Police to assist them to plan levels of enforcement of speeding, drink- and drug-driving, and unlicensed driving (Cameron, Newstead and Diamantopoulou 2016). When first developed, TERAM was used to estimate the fatal crash savings from further increases in random POFTs in 2009 (22,141 tests) based on Cameron’s (2013) relationship. No relationship with targeted POFTs was available for use in the model. In the update of TERAM (Cameron and Newstead 2018), the relationship established from 2005-2009 experience (Figure 2.7) was used to estimate fatal crash savings from a 50% increase in the random POFT component of the planned 100,000 POFTs during 2015 (and subsequent years; see Figure 2.1). Savings in non-fatal serious injury crashes due to increased POFTs were estimated based on analogy with RBT and the comparative effects of annual breath tests on fatal and non-fatal crashes.

The new relationships outlined in section 2.1.3 have now been included in TERAM and allow the savings in serious injury crashes to be modelled explicitly. The role of the targeted POFTs has also been included, including their effect on overall detection rates because of the much higher detection rate of the targeted (HP/HVU)
operations compared with the mainly random (RPDAS) operations since about 2013 (see Figure 2.2).

Unfortunately, no new relationships of the type in section 2.1.3 could be explored for killed drivers with THC and Meth because the fatal blood test results from the VIFM have not been matched with Police crash reports since 2012. For this reason, TERAM continues to estimate fatal crash savings by extrapolation of the relationship in Figure 2.7 applied to the increase in annual random POFTs. This may underestimate the contribution of the targeted POFTs to reducing fatal crashes.

2.1.6 Effects of increased POFTs and detection rates during 2019

During the 2018-19 financial year, Victoria Police planned to increase the annual POFTs to 150,000 from the 100,000 tests in the three previous years. The effect of this increase can be seen in Figure 2.1 where the 2018 POFTs were already above previous calendar years. TERAM was used to estimate the savings in fatal and serious injury crashes during 2019 (150,000 POFTs) from a base level in 2017 (99,769 POFTs). The number of POFTs allocated to RPDAS operations (mainly random testing) was scheduled to increase by 14.15% compared with 2017-18, whereas targeted POFTs were scheduled to increase by 85.85% during 2018-19. Thus Victoria Police aimed to substantially increase targeted POFTs to more than the approximate 50% of total POFTs that was achieved in 2017. This increase in targeted POFTs will have increased the overall detection rate of positive POFTs. Together these increases should have reduced the number of seriously injured drivers with drugs during 2019, based on the new relationships in section 2.1.3. The estimated savings in fatal and serious injury crashes during 2019 are shown in Table 2.1 together with their economic value and benefit-cost ratio (BCR). The marginal BCR is the ratio of benefits to costs of the next increase in POFTs of each type.

Table 2.1 shows that the increase in POFTs during 2019 could be expected to have saved just over 3 fatal crashes and nearly 55 serious injury crashes. It also shows that the increased POFTs would return social cost benefits more than 3.5 times the increased program cost, even using the conservative Human Capital cost of crashes ($2.653 million per fatal crash and $677,859 per hospitalisation crash in 2017).

The marginal benefit-cost ratio (BCR) is the ratio of benefits to costs of the next increases in POFTs above the level planned for 2019 (150,000 tests). Marginal BCRs in Table 2.1 indicate that there is further economic value (and fatal and serious injury savings) if the annual POFTs were increased further, particularly in rural Victoria.
Table 2.1: Crash savings per year, Human Capital cost savings, BCR and marginal BCR from planned POFT increases in 2019

<table>
<thead>
<tr>
<th>Enforcement type</th>
<th>Base level 2017 (Tests)</th>
<th>Increase in level (%)</th>
<th>Increase (Tests pa)</th>
<th>Offence detected rate with increased POFTs</th>
<th>Fatal crashes saved per year</th>
<th>Serious injury crashes saved per year</th>
<th>Crash cost saving per year ($m)</th>
<th>Total additional cost ($m pa)</th>
<th>BCR (Increase benefits/increase costs)</th>
<th>Marginal BCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>RURAL</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Random POFT</td>
<td>18,091</td>
<td>14.15%</td>
<td>2,560</td>
<td>1.90%</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Targeted POFT</td>
<td>21,266</td>
<td>85.85%</td>
<td>18,257</td>
<td>16.76%</td>
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<tr>
<td>Increased total POFT</td>
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</tr>
<tr>
<td>Random POFT</td>
<td>32,782</td>
<td>14.15%</td>
<td>4,639</td>
<td>1.88%</td>
<td></td>
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</tr>
<tr>
<td>Targeted POFT</td>
<td>27,630</td>
<td>85.85%</td>
<td>23,720</td>
<td>14.54%</td>
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<tr>
<td>Random + Targeted</td>
<td>60,412</td>
<td>47%</td>
<td>28,359</td>
<td>12.47%</td>
<td>1.53</td>
<td>40.42</td>
<td>31.464</td>
<td>7.745</td>
<td>4.06</td>
<td>3.68</td>
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<tr>
<td>Increased total POFT</td>
<td>88,771</td>
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<tr>
<td>Random POFT</td>
<td>50,873</td>
<td>14.15%</td>
<td>7,199</td>
<td>1.9%</td>
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<tr>
<td>Targeted POFT</td>
<td>48,896</td>
<td>85.85%</td>
<td>41,977</td>
<td>15.5%</td>
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<tr>
<td>Random + Targeted</td>
<td>99,769</td>
<td>49%</td>
<td>49,176</td>
<td>13.5%</td>
<td>3.10</td>
<td>54.62</td>
<td>45.242</td>
<td>14.006</td>
<td>3.23</td>
<td>3.54</td>
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</table>
2.1.7 Effects of further increases in roadside drug testing

The roadside drug testing program in Victoria has achieved substantial reductions in fatal and serious injury crashes, but could be expanded further. Further expansion is justified not only by its potential savings in serious road trauma, but also because it would be a good economic investment up to a level where the social cost savings continue to exceed the costs at the margin.

A range of percentage increases in the random and targeted POFTs were considered until increases were found that produced a marginal BCR of one (Table 2.2). This maximum level was indicated if the 50,783 random POFTs conducted during 2017 were increased by 200% and the 48,896 targeted POFTs were increased by 460%. The total POFTs per year would increase by nearly 330% to 426,437. In the short term, the positive detection rate would increase from 8.6% to 10.6%, reflecting the different percentage increases in each type of operation.

For the given percentage increases in random and targeted POFTs, TERAM estimated that 24.5 fatal crashes and 140.5 serious injury crashes would be saved per year.

An analysis also considered the maximum level if fatal crashes were valued more highly using the Willingness-to-Pay method ($9.166 million per fatal crash). In this case, the random POFTs could be increased by 600% (6 times the 2017 level) and the targeted POFTs increased by 1400% (14 times), to a total of 1,065,000 POFTs per year, before the marginal BCR falls to one (Cameron and Newstead 2019).

Estimates of road safety benefits calculated in this analysis assume that the expansion of the roadside drug testing program has no negative impacts on the delivery of other police enforcement programs, such as roadside alcohol testing, due to constraints on overall human resources. This assumption is particularly pertinent given the requirement for high levels of targeted enforcement which have historically been delivered by the Highway Patrols or the Heavy Vehicle Unit.

2.1.8 Key points

- The prevalence of Methylamphetamine (“ice”) in drivers on the road and the seriously injured has trended up steeply during the last decade.
- Drug-driving with Methylamphetamine can be deterred by increasing the positive detection rate from roadside drug testing, particularly by targeted testing.
- Drug-driving with THC can be deterred by increasing both random and targeted roadside drug testing.
- The 50% increase to 150,000 roadside drug tests during 2019, particularly targeted tests, is expected to have saved 3 fatal crashes and 55 serious injury crashes.
- Further increases in targeted and random roadside drug tests are warranted, up to 426,500 total tests per year in the first instance. It is estimated that 24.5 fatal crashes and 140.5 serious injury crashes would be saved per year.
- Resources should not be diverted from roadside breath testing for alcohol to facilitate the increases in roadside drug testing.
Table 2.2: Crash savings per year, Human Capital cost savings, BCR and marginal BCR from maximum POFT increases

<table>
<thead>
<tr>
<th>Enforcement type</th>
<th>Base level 2017 (Tests)</th>
<th>Increase in level (%)</th>
<th>Increase (Tests pa)</th>
<th>Offence detected rate with increased POFTs</th>
<th>Fatal crashes saved per year</th>
<th>Serious injury crashes saved per year</th>
<th>Crash cost saving per year ($m)</th>
<th>Total additional cost ($m pa)</th>
<th>BCR (Increase benefits/increase costs)</th>
<th>Marginal BCR</th>
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<tr>
<td>RURAL</td>
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<tr>
<td>Random POFT</td>
<td>18,091</td>
<td>200%</td>
<td>36,182</td>
<td>1.90%</td>
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<tr>
<td>Targeted POFT</td>
<td>21,266</td>
<td>460%</td>
<td>97,824</td>
<td>16.76%</td>
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<tr>
<td>Random + Targeted</td>
<td>39,357</td>
<td>340%</td>
<td>134,006</td>
<td>12.75%</td>
<td>12.39</td>
<td>36.55</td>
<td>57.636</td>
<td>37.017</td>
<td>1.56</td>
<td>1.12</td>
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<td>Increased total POFT</td>
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<tr>
<td>Random POFT</td>
<td>32,782</td>
<td>200%</td>
<td>65,564</td>
<td>1.88%</td>
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<tr>
<td>Targeted POFT</td>
<td>27,630</td>
<td>460%</td>
<td>127,098</td>
<td>14.54%</td>
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<tr>
<td>Random + Targeted</td>
<td>60,412</td>
<td>319%</td>
<td>192,662</td>
<td>10.23%</td>
<td>12.15</td>
<td>103.99</td>
<td>102.723</td>
<td>47.776</td>
<td>2.15</td>
<td>0.91</td>
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<td>Increased total POFT</td>
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<tr>
<td>Random POFT</td>
<td>50,873</td>
<td>200%</td>
<td>101,746</td>
<td>1.9%</td>
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</tr>
<tr>
<td>Targeted POFT</td>
<td>48,896</td>
<td>460%</td>
<td>224,922</td>
<td>15.5%</td>
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</tr>
<tr>
<td>Random + Targeted</td>
<td>99,769</td>
<td>327%</td>
<td>326,668</td>
<td>11.3%</td>
<td>24.54</td>
<td>140.53</td>
<td>160.359</td>
<td>84.793</td>
<td>1.89</td>
<td>1.00</td>
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<tr>
<td>Increased total POFT</td>
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</tbody>
</table>
2.1.9 References


Cameron, M.H. (2013). Random drug testing in Australia, analogies with RBT, and likely effects with increased intensity levels. Proceedings, International Conference on Alcohol, Drugs and Traffic Safety, Brisbane.


3 SPEED ENFORCEMENT MEASURES AND SPEED MANAGEMENT POLICIES

3.1 SPEED ENFORCEMENT

Automated speed enforcement in Victoria takes the form of camera-based units at fixed locations or movable camera units covering many locations for short shifts. The fixed cameras are either:

- Fixed spot-speed cameras on freeways measuring speeds at the spot,
- Point-to-point (P2P) cameras at each end of a freeway section, measuring average-speeds over the section, or
- Red-light/speed cameras at signalised intersections measuring spot-speeds on an approach road as well as red-light running offences.

The movable cameras are either:

- Mobile speed cameras (MSC) measuring spot-speeds at each road location they are moved to for a period typically of 2-3 hours, or
- Mobile P2P camera units measuring average-speeds over each pre-defined road section for a shift period yet to be defined [mobile P2P cameras are being trialled in some Australian States but have yet to be introduced].

Research has found that the fixed camera systems have very limited range of effect on speeds and crashes around the locations operated, except in the case of fixed P2P camera operations where the effect is over the whole freeway section.

In the case of mobile spot-speed cameras, the effect on speeds and crashes can extend well beyond the locations operated. This is because, in Victoria, MSCs are operated covertly from unmarked standard vehicles without signage on the approaches and are relatively unpredictable, especially in urban areas. Other Australian States (e.g. Queensland and Western Australia) have achieved broad effects of their relatively-overt MSCs by operating them at many more sites than Victoria and randomly-scheduling site visits to increase unpredictability.

3.1.1 Mobile speed cameras (MSC) on rural roads in Victoria

Sites for operation of mobile speed cameras in Victoria are chosen and operated according to both a set of site selection criteria based on a serious crash or speeding history or unsafe behaviour, and a set of physical field criteria, dictating the suitability of a site for siting and operation of a mobile camera unit.

The Victorian Auditor General’s Office (VAGO 2011) conducted a review of the Victorian traffic camera program. They identified research evidence supporting the siting of mobile speed cameras using sites based only on physical criteria, but not necessarily on demonstrated crash or speed risk at the site as specified in the site selection criteria. This is because the primary purpose of the Victorian mobile camera program is to create a general, area-wide effect – the perception by drivers that the program could be in operation anywhere at any time so as to encourage universal compliance with speed limits. This is in contrast to the fixed speed camera program which is designed to deter speeding only in an area local to the camera. VAGO
considered that there are factors that have led the mobile speed cameras in essence becoming an extension of the fixed camera program, especially on rural roads.

VAGO (2011) expressed a concern that use of narrow site selection criteria can limit the extent to which siting of mobile cameras has an area-wide effect, particularly if the number and spread of sites across the network is insufficient. It also noted that if there is a systematic pattern of deployment of mobile cameras, regular road users can identify this and adjust their behaviour according to their knowledge of where a camera is likely to be. As the perceived risk of detection falls, the deterrence effect of mobile cameras is also diminished. It noted that siting of mobile camera operations based on physical criteria alone might reduce the likelihood of an identifiable pattern and therefore potentially heighten the level of area-wide effect. This approach would also increase the number of sites available for cameras which had been diminishing over time due to development of the surrounding environment, thus excluding sites based on the necessary physical criteria.

3.1.2 Trial of alternative operations and additional MSC sites

In response to a VAGO (2011) recommendation, Victoria Police conducted a trial of mobile speed camera deployments based only on the physical field criteria during 2014-2015. In three Police Divisions, the number of MSC sites was approximately doubled by choosing new sites without any constraint to needing a history of serious crashes or speeding in the vicinity. The total hours of operation of MSCs in each Division continued unchanged.

The analysis found about 5% reduction in casualty crashes in the lower speed limit zones (up to 60 km/h) of the trial Divisions (Cameron, Newstead and Budd 2019). There was no evidence of an effect on crashes on roads with higher speed limits, principally rural roads. It was concluded that there was no advantage in relaxing the site selection criteria (based on serious crash or speeding history) for MSC sites on higher speed limit roads in Victoria. However, nor is there a disadvantage in increasing the number of MSC sites on these roads and spreading the total hours of MSC operation over all sites in a Division (approximately halving the intensity per site). The “covert” MSCs may still be visible and obvious on typical higher speed limit roads in Victoria, but an increase in MSC sites leads to a broader coverage of the road system because the local effects of MSC operations multiply.

Experience with the operation of overt MSCs in Queensland indicates how the local effects of Victorian MSCs on rural roads can achieve a broader halo of influence than current operations and maintain a longer-term local effect than that just during MSC presence at each site. The Queensland experience and research are outlined in the following section.

3.1.3 Local effects of Queensland’s mobile speed cameras

Queensland MSCs are randomly scheduled to approved sites within the camera operator’s Police District prior to each shift commencing, with the intention of reducing the predictability of camera placements. MSC sites are located after identifying an area with diameter of one kilometre (urban regions) or five kilometres (rural regions) in
which at least two “speed camera criteria” crashes have occurred during a previous five-year period. “Speed camera criteria” crashes are defined as either:

- Speed-related crash (i.e. reported by Police as exceeding the speed limit, or excessive speed for the circumstances), or
- Serious casualty crash (i.e. resulting in death or hospitalisation) not at an intersection, or
- Either an “out of control” or “off path on curve” type of crash.

Newstead et al (2017) and Cameron et al (2017) estimated the local crash effects each program year from 2008 to 2015 (Table 3.1). The zones of influence considered in the analysis were up to 1 km from camera sites in urban areas and up to 4 km from sites on rural roads. In the period analysed, MSC operations grew from 5,640 to 8,980 hours per month at 3,134 active sites during 2015.

Table 3.1: Estimated local effects measured at Queensland MSC sites in urban and rural areas within 1 km and 4 km analysis halos, respectively

<table>
<thead>
<tr>
<th>Years</th>
<th>Hours per month</th>
<th>Fatal crashes</th>
<th>Serious casualty crashes</th>
<th>All casualty crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
<td>0-1 km</td>
<td>0-4 km</td>
</tr>
<tr>
<td>2008</td>
<td>3999</td>
<td>1639</td>
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</tr>
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<td>4051</td>
<td>1550</td>
<td>51.3%</td>
<td>11.2%</td>
</tr>
<tr>
<td>2010</td>
<td>4458</td>
<td>1729</td>
<td>56.6%</td>
<td>23.8%</td>
</tr>
<tr>
<td>2011</td>
<td>4608</td>
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<td>2013</td>
<td>6354</td>
<td>1749</td>
<td>70.3%</td>
<td>41.3%</td>
</tr>
<tr>
<td>2014</td>
<td>6849</td>
<td>1489</td>
<td>67.5%</td>
<td>42.3%</td>
</tr>
<tr>
<td>2015</td>
<td>7483</td>
<td>1497</td>
<td>61.0%</td>
<td>33.5%</td>
</tr>
</tbody>
</table>

The crash effects of Queensland MSCs in rural areas are of greater interest to Victoria than urban areas because Victoria’s covertly-operated MSCs are known to have strong general effects on urban crashes and their injury severity.

Table 3.1 shows the estimated crash reductions within 4 km of the rural MSC sites during 2008 to 2015. The rural MSC hours per month were reduced during 2014 and 2015 from the relatively high level during 2013. The reductions in serious casualty and all casualty crashes near rural MSC sites were also substantially lower during those years compared with reductions during 2013. The crash effects within 4 km during 2013 represent more typical effects, namely 41% reduction in fatal crashes, 30% reduction in serious casualty crashes and 27% reduction in all casualty crashes.

3.1.4 Transportability of Queensland experience to Victoria’s rural MSCs

It is suggested that the effects of Queensland’s MSC program on rural roads could be used to estimate that at new MSC sites on Victoria’s rural roads if:

- New sites were chosen by having at least two serious casualty crashes within 2.5 km during a recent five-year period as the principal criterion.
• MSC sessions are randomly scheduled to all new sites within each operator’s area during each operator’s shift
• Each new site is visited and operated for at least 35 hours per site per year, the average intensity per site in Queensland during 2015.

With these MSC site selection, scheduling and visitation characteristics, it is expected that crashes would be reduced within 4 km of rural sites by the percentages shown in Table 3.1.

Current MSC operations at existing sites in rural Victoria are expected to influence crashes at most 1 km from each site, in a similar way as a fixed speed camera at the site. This is because existing MSC sites have probably become well known, the presence of an MSC is predictable, and when present the “covert” MSC vehicle is probably visible from a substantial distance, allowing the driver to correct any speeding. It is not known whether the random scheduling of MSC sessions to existing sites would overcome their predictability and increase their effect halo. However, the existing rural sites are currently visited for more than 44 hours per site per year which exceeds the Queensland visitation rate.

### 3.1.5 Estimated crash effects of new rural MSC sites in Victoria

During December 2013, there were 1079 rural MSC sites and 910 urban sites in Victoria. These were increased by about 300 sites during the trial of alternative operations in 2014-2015, but it is understood that the number has returned to pre-2014 levels following the completion of the trial.

In May 2019, the Victorian Government announced plans to increase the operational hours of MSCs by 75%. On rural highways, this should take the form of an increase in MSC sites. If these new sites are selected, scheduled and visited by MSCs as in Queensland, then it could be expected that they would reduce crashes over 8 km sections centred on the sites (Cameron and Newstead 2018).

All 8 km sections of rural category A divided roads and A, B and C undivided roads in Victoria were ranked by their number of serious crashes during 2006-2015 (10 years). This provided a stable indicator of the relative crash problem on these sections. The 75% increase of the existing rural MSC sites, namely 810 new sites, was distributed over the four categories of rural roads in proportion to their length. The highest ranked 8 km sections within each road category were selected as potential new MSC sites near the centre of each section (subject to constraints due to physical field criteria).

Table 3.2 shows the estimated savings in crashes of each severity if MSCs were randomly scheduled to operate at each of these new sites for at least 35 hours per year (e.g. 14 visits at 2.5 hours per visit). It is likely that there is a greater focus of the proposed new sites onto category B and C roads than existing MSC sites in Victoria. While these roads are more lightly trafficked than category A roads, they still cover a substantial proportion of serious crashes due to their length. In total, the 8 km sections cover 34% of the total length of each rural road category.
Table 3.2: Crash savings per year, Human Capital cost savings, BCR and marginal BCR from 75% increase in new sites for randomly-scheduled overt mobile speed cameras (MSC). Also estimated effects of 10 new sections for mobile P2P cameras.

<table>
<thead>
<tr>
<th>Rural road type</th>
<th>Length (km)</th>
<th>Enforcement type</th>
<th>Percent increase in sites*</th>
<th>New sites (or P2P sections)</th>
<th>Increase in hours per year</th>
<th>Fatal crashes saved per year</th>
<th>Serious injury crashes saved per year</th>
<th>Minor injury crashes saved per year</th>
<th>Crash cost saving per year ($m)</th>
<th>Total additional cost ($m pa)</th>
<th>BCR (Increase benefits/increase costs)</th>
<th>Marginal BCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divided A Roads</td>
<td>418</td>
<td>Overt MSC</td>
<td>New site numbers distributed by road length</td>
<td>18</td>
<td>617</td>
<td>3.00</td>
<td>51.89</td>
<td>112.34</td>
<td>45.910</td>
<td>0.087</td>
<td>524.97</td>
<td>353.04</td>
</tr>
<tr>
<td>Undivided A Roads</td>
<td>2,606</td>
<td>Overt MSC</td>
<td></td>
<td>110</td>
<td>3,848</td>
<td>4.04</td>
<td>24.63</td>
<td>28.13</td>
<td>28.122</td>
<td>0.545</td>
<td>51.58</td>
<td>24.16</td>
</tr>
<tr>
<td>Undivided B Roads</td>
<td>3,907</td>
<td>Overt MSC</td>
<td></td>
<td>165</td>
<td>5,769</td>
<td>5.01</td>
<td>29.53</td>
<td>33.28</td>
<td>34.142</td>
<td>0.817</td>
<td>41.77</td>
<td>14.21</td>
</tr>
<tr>
<td>Undivided C Roads</td>
<td>12,252</td>
<td>Overt MSC</td>
<td></td>
<td>517</td>
<td>18,090</td>
<td>10.42</td>
<td>65.85</td>
<td>75.57</td>
<td>74.158</td>
<td>2.563</td>
<td>28.93</td>
<td>4.56</td>
</tr>
<tr>
<td><strong>All Highways A-C Total</strong></td>
<td><strong>19,183</strong></td>
<td><strong>Overt MSC</strong></td>
<td><strong>75%</strong></td>
<td><strong>810</strong></td>
<td><strong>28,324</strong></td>
<td><strong>22.48</strong></td>
<td><strong>171.90</strong></td>
<td><strong>249.32</strong></td>
<td><strong>182.332</strong></td>
<td><strong>4.013</strong></td>
<td><strong>45.43</strong></td>
<td><strong>16.78</strong></td>
</tr>
<tr>
<td>All Highways A-C</td>
<td>19,183</td>
<td>Mobile P2P cameras</td>
<td>New sections</td>
<td>10</td>
<td>350</td>
<td>1.91</td>
<td>15.10</td>
<td>14.49</td>
<td>15.664</td>
<td>0.431</td>
<td><strong>36.37</strong></td>
<td><strong>28.45</strong></td>
</tr>
</tbody>
</table>

* Increase from 1079 rural MSC sites operated for 48,091 hours per year during 2013 and essentially unchanged during 2014-2018
The estimated annual savings in crashes across the road sections influenced by MSC operations at the new sites are 22.5 fatal crashes, 172 serious injury crashes and 249 minor injury crashes. The benefit-cost ratio (BCR) of the social cost savings, based on Human Capital costs of crashes, compared with the costs of camera operations, would be 45. The marginal BCR of further increases in new sites would be nearly 17, indicating that more than the 75% increase in rural sites would be warranted.

### 3.1.6 Mobile P2P cameras

Table 3.2 also shows estimated crash savings if mobile point-to-point (P2P) [average-speed] cameras operated on rural highways, covering ten sections of category A-C roads, the number chosen only to illustrate effects (Cameron and Newstead 2018). Mobile P2P camera units are a new technology that makes use of two units parked at the terminals of a carefully-surveyed road length to measure the average speed in the same way as fixed P2P camera systems. Each unit could be either vehicle- or trailer-based. It is expected that each one-way section will need to be visited on average for 35 hours per year, as visited by the mobile MSCs in rural Queensland, to produce a long-term time-halo effect along each section in a similar way to the effect produced by a fixed P2P system operating continuously.

No mobile P2P cameras yet operate in Victoria. It is envisaged that in suitable rural road environments, long sections would be selected, longer than the halo of influence of each spot-speed MSC. Sections typically 20 km in length would be ranked by their serious crash rate per kilometre and the top ranked sections selected.

In Table 3.2, the estimated effect of mobile P2P was analysed by initially considering the ten highest-ranked 20 km sections of rural roads. An allowance of $20,000 per annum was made for the establishment and maintenance of each surveyed road section. Two P2P mobile camera units would be required to enforce each mobile P2P hour, but the cost to process each average-speed offence was assumed to be the same as those detected by a spot-speed MSC. While expensive to operate, mobile P2P has the potential to cover long rural road sections, longer than can be covered by spot-speed MSCs, and achieve benefits well in excess of the costs.

### 3.1.7 Key points

- Mobile speed cameras on Victoria’s rural roads are not as effective as they could be due to the site selection criteria, the limited number of sites, and the visibility and predictability of their enforcement operations.
- Queensland’s overt mobile speed cameras achieve substantial crash reductions up to 4 km from rural camera sites due to site selection based only on crash history and randomised scheduling of operations to those sites.
- Victoria’s mobile speed cameras could achieve crash reductions over 8 km sections of rural roads ranked highly by their serious crash history. New sites should be selected as in Queensland and camera visits should be randomly-scheduled to each site for shifts totalling at least 35 hours per year.
- The Victorian Government’s announcement to increase mobile speed camera hours by 75% should take the form of at least 75% increase of rural
sites. The new sites should be selected on the basis of a serious crash history within 2.5 km and should consider all category A, B and C rural roads.

- Mobile speed cameras operated at these new rural sites could be expected to save 22.5 fatal crashes and 172 serious injury crashes per year. Social cost savings would exceed 45 times the cost of camera operations.
- While still a new technology, mobile point-to-point camera units have the potential to enforce speeding over much longer rural road sections than the traditional spot-speed mobile cameras.

3.1.8 References


3.2 SPEED MANAGEMENT POLICIES

The limited availability of key staff with expertise on the subject of this ToR has prevented a written submission by 31 January 2020. However, the relevant staff may be able to provide a supplementary submission during February and/or provide oral evidence if requested by the Economy and Infrastructure Committee.

3.3 SPEED LIMITS IN LOCAL STREETS

Victoria has default speed limit of 40 km/h for school zones and shopping strips, 50 km/h for built-up areas in urban and rural areas all urban streets and 100 km/h in rural Victoria (Vicroads, 2019). It can be upgraded to 60km/h with appropriate signage and approval and on urban freeways, 80 and 100 km/h are commonplace. In shared zones where the road or path for vehicles is also used by pedestrians, lower speed limits can apply when fitted with a shared zone sign. For example, the Melbourne Central City and Hoddle Grid is currently set at 40 km/h with some 30 km/h exceptions such as Swanson Street (City of Melbourne, 2020).

It has been argued that a 40 km/h speed limit across the central city improves safety for drivers, pedestrians and cyclists without significantly affecting vehicle travel times or conditions. Research estimates that a 40 km/h limit will save lives...
and prevent an estimated 25 casualties from crashes every year. Recently, there was a movement to further reduce the urban speed limit to 30 km/h in the Melbourne CBD (Centre for Road Safety, 2019; Victoria Walks, 2020).

In a first for Australia, a trial is underway to reduce the urban speed limit even further to 30 km/h in local residential streets in selected regions of Collingwood and Fitzroy in a move to further improve road safety (City of Yarra, 2018). Should the trial be shown to have associated speed reduction benefits and community support, the new lower speed limit could be proposed for other areas in and around Melbourne and help in the push Towards Zero crash outcomes.

A similar initiative was undertaken in the UK by the “20s Plenty for Us” Campaign, a not-for-profit local campaign initiative by local communities. To date, they have 30 participating councils and another 210 local campaign groups “pressing for change in their regions” (King, 2020). Nottingham City Council in the UK as part of the “20s Plenty for us” program, conducted a similar trial of 20 km/h (32 km/h) for local residential streets in 2013 where they reported lower average speeds in their trial site, higher speed reductions at the 85th percentile and good community acceptance (Road Safety Team, 2014).

3.3.1 City of Yarra Preliminary Findings

The City of Yarra trial is nearing completion and the final report is expected by the end of February 2020. While the analysis is still underway, preliminary findings suggest there were significant speed reductions in the trial area for vehicles travelling at and above 40 km/h compared with an associated control area, and with an increase in acceptance of the lower speed limit by local residents.

3.3.2 Key points

- There is strong local and international support by the community for lower speed limits in local (residential) streets.
- Reducing speed limits in these regions is likely to reduce the likelihood of fatal and serious injuries to vulnerable road users.
- The Melbourne City Council has already implemented 30 km/h in some shared roads (e.g., Swanson Street) in the CBD.
3.3.3 References


King R. “20’s Plenty Where People Live”, Downloaded January 2020: www.20splenty.org

Road Safety Team, “ADI Presentation 20mph – 11062014” Traffic & Safety Development Nottingham City Council, Nottingham NG2 3NG.


WHO. “Global Status Report on Road Safety: Time for Action”, World Health Organization, Switzerland, 2009
4 SMART PHONE USE AND DRIVER DISTRACTION

This section of MUARC’s submission begins by providing the best current evidence of the size of the problem of illegal mobile phone use in Australia, in terms of the prevalence of, and the crash risk associated with, illegal mobile phone use whilst driving. Several technologies to address the problem are then presented and the potential effectiveness of automated mobile phone detection cameras is discussed.

4.1 PREVALENCE OF MOBILE PHONE USE AMONGST AUSTRALIAN DRIVERS

4.1.1 Prevalence of mobile phone use from the Australian Naturalistic Driving Study (ANDS)

Recent Naturalistic Driving Studies show that mobile phone use is just one of many non-driving tasks that drivers engage in when driving. In the Australian Naturalistic Driving Study (ANDS), drivers spent just under 45% of their total driving time engaging in observable non-driving tasks (Young et al., 2019a; 2019b). Mobile phone use made up 7% of all non-driving tasks that were initiated and drivers spent 7% of their total driving time using a phone. Approximately half of that time (3.5% of total driving time) was spent using the device illegally (hand-held) (see Table 4.1).

Table 4.1 Number (%) of instances and percentage of total driving time engaged in non-driving tasks: data from the Australian Naturalistic Driving Study (ANDS)

<table>
<thead>
<tr>
<th>Non-driving Task</th>
<th>N (%)</th>
<th>% of driving time</th>
</tr>
</thead>
<tbody>
<tr>
<td>All tasks</td>
<td>1,620</td>
<td>44.4</td>
</tr>
<tr>
<td>Adjusting vehicle devices (e.g. seatbelt, mirrors)</td>
<td>307 (19.0)</td>
<td>0.57</td>
</tr>
<tr>
<td>Adjusting centre stack controls</td>
<td>263 (16.2)</td>
<td>0.69</td>
</tr>
<tr>
<td>Looking at object/event OUTSIDE vehicle</td>
<td>200 (12.3)</td>
<td>1.44</td>
</tr>
<tr>
<td>Personal Hygiene</td>
<td>142 (8.8)</td>
<td>0.96</td>
</tr>
<tr>
<td>Reaching for object/phone (includes moving)</td>
<td>117 (7.2)</td>
<td>0.54</td>
</tr>
<tr>
<td>Interacting with passengers</td>
<td>113 (7.0)</td>
<td>24.92</td>
</tr>
<tr>
<td>Talking/Singing to self</td>
<td>101 (6.2)</td>
<td>2.00</td>
</tr>
<tr>
<td>Looking at object INSIDE vehicle (not reaching/touching)</td>
<td>66 (4.1)</td>
<td>0.20</td>
</tr>
<tr>
<td>Phone, manipulating (hand-held)</td>
<td>55 (3.4)</td>
<td>0.94</td>
</tr>
<tr>
<td>Adjusting steering wheel buttons</td>
<td>55 (3.4)</td>
<td>0.67</td>
</tr>
<tr>
<td>Manipulating object (other than phone)</td>
<td>37 (2.3)</td>
<td>0.50</td>
</tr>
<tr>
<td>Drinking</td>
<td>28 (1.7)</td>
<td>1.17</td>
</tr>
<tr>
<td>Holding object (other than phone)</td>
<td>28 (1.7)</td>
<td>1.03</td>
</tr>
<tr>
<td>Eating</td>
<td>18 (1.1)</td>
<td>3.00</td>
</tr>
<tr>
<td>Phone, manipulating (hands-free)</td>
<td>18 (1.1)</td>
<td>0.24</td>
</tr>
<tr>
<td>Phone, holding</td>
<td>17 (1.0)</td>
<td>1.22</td>
</tr>
<tr>
<td>Phone, talking (hands-free)</td>
<td>16 (1.0)</td>
<td>3.24</td>
</tr>
<tr>
<td>Phone, talking (hand-held)</td>
<td>7 (0.4)</td>
<td>1.34</td>
</tr>
<tr>
<td>Reading and/or writing</td>
<td>3 (0.2)</td>
<td>0.04</td>
</tr>
<tr>
<td>Other</td>
<td>29 (1.8)</td>
<td>0.25</td>
</tr>
</tbody>
</table>
4.1.2 Prevalence of illegal mobile phone use from the NSW Mobile Phone Camera Detection Trial

During 2019, the NSW Centre for Road Safety and NSW Roads and Maritime Services conducted a trial of fixed and transportable mobile phone detection cameras to detect drivers illegally using mobile phones. Over 8.5 million drivers were photographed, which makes this the largest survey of illegal mobile phone use amongst Australian drivers that has been conducted. More than 100,000 (1.2%) of drivers photographed were detected using their phones illegally (Wall et al., 2019).1

4.1.3 Summary

The NSW trial of cameras in specific locations found 1.2% of drivers at those locations were using their mobile phones illegally. The higher prevalence of illegal mobile phone use (3.5%) found in the ANDS study reflects the prevalence across an entire trip, including when the vehicle was stationary and in motion.

4.2 CRASH RISK ASSOCIATED WITH ILLEGAL MOBILE PHONE USE

The most methodologically sound research into the crash risk associated with illegal mobile phone use showed an 83% increase in the risk of a severe, moderate, or minor crash occurring when conducting visual-manual tasks on a mobile phone (e.g. dialling, texting, etc.)2.

This estimate was calculated from recent analysis of data collected in the Second Strategic Highway Research Program (SHRP2) naturalistic driving study (NDS) from the USA. The SHRP2 NDS is the largest NDS conducted so far, collecting data from 3,542 drivers over a period of between one and two years. Owens, Dingus, Guo, Fang, Perez & McClafferty (2018) conduct a case-crossover study using data collected during the SHRP2 NDS to estimate the relative risk of crashing whilst performing visual-manual tasks on a mobile phone, adjusted for a large number of potential confounding factors.

This methodologically sound research provides the best available evidence of the crash risk associated with visual-manually interacting with a mobile phone whilst driving. The reasons for choosing this estimate over those derived from other

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1 The laws governing mobile phone use whilst driving in NSW are comparable to those in Victoria. That is, fully licensed drivers may use a mobile phone to make/receive a call, use audio/music functions or navigational functions if the phone is secured in a cradle/commercially designed holder and can be used without touching any part of the phone. Probationary drivers are prohibited from using a mobile phone for any purpose whilst driving.

2 The odds of a driver conducting visual-manual tasks on a mobile phone in the six seconds before a crash were 83% higher than the odds of conducting visual-manual tasks on a mobile phone during a comparable six second period when the driver did not crash (odds ratio=1.83, 95% confidence interval 1.03-3.25).
analyses of the SHRP2 data, or analyses of other NDS (including, for example, the 100 Car study, or the meta-analysis by Simmons, Hicks and Caird (2016)) are:

- SHRP2 is the only NDS with a large enough sample size to use crashes as the sole outcome of interest when estimating crash risk. All other published analyses of NDS data also included near-crashes and sometimes other safety related events as outcomes and recent research suggests the relationship between mobile phone use and non-crash outcomes is not the same as for crashes (Kidd & McCartt, 2015, section 4.3.1).
- The recent case-crossover analysis of the SHRP 2 study is the only study that has used crashes as the only outcome of interest, while also controlling for other potential confounding variables. Previous research found that when you control for potential confounders, the association between mobile phone use and crashes is smaller than when confounders are not controlled for (Klauer et al., 2010; Victor et al., 2015). Essentially this means that the studies that don't control for confounders are reporting an estimate that does not represent the independent risk associated with mobile phone use, and that part of the risk in those studies is due to other risk factors that happened to co-occur with mobile phone use in those samples.
- The risk estimate specific to visual-manual interactions with the phone was chosen because these behaviours that are illegal while driving, and importantly, will be detected by a camera enforcement program.

### 4.3 TECHNOLOGY TO REDUCE THE IMPACT OF SMART PHONE USE ON DRIVER DISTRACTON

There are several technologies designed to reduce the impact of smart phone use on driver distraction, for example:

- Automated mobile phone detection enforcement cameras
- Mobile phone blocking technology
- Mobile phone apps drivers can elect to use whilst driving
- In-vehicle camera-systems that detect distraction and provide warnings (e.g. camera systems that detect eye movements)
- In-vehicle systems that detect driver performance decrements that may result from distraction and either warn (e.g. lane departure warnings, forward collision warnings) or actively assist the drivers (e.g. lane keep assist, autonomous emergency braking)

In 2019, MUARC conducted research for the Victorian and NSW governments to estimate the potential benefits of automated mobile phone detection cameras in reducing road trauma by reducing illegal mobile phone use amongst drivers. This will be the focus of this submission.

#### 4.3.1 Automated mobile phone detection cameras

Camera-based technology has been developed to automatically detect motorists using mobile phones whilst driving. After a successful trial in the first half of 2019, in December 2019 NSW became the first jurisdiction in the world to implement an automated mobile phone detection camera enforcement program, using both fixed
and transportable cameras. High definition cameras take images of the driver of a vehicle and artificial intelligence is used to detect whether the driver is using a mobile phone illegally. The images where illegal mobile phone use is detected are then reviewed by a human operator to determine whether an offence was committed. The cameras can be used in all weather and light conditions (Transport for NSW, 2019).

MUARC conducted a research project for the NSW Centre for Road Safety to estimate the potential effectiveness of an automated mobile phone enforcement camera program in reducing road trauma in NSW. With widespread roll-out using fixed and mobile cameras across NSW and assuming 30% deterrence, it was estimated there would be an annual reduction of 67 casualty crashes (19 fatal and serious injury (FSI) crashes), 86 casualties (21 FSI) and $25 million in crash costs (MUARC, 2019).

In a separate research study conducted prior to this for the Victorian government agencies under the MUARC Baseline Research Program, MUARC also modelled the potential effectiveness of a mobile phone camera automated enforcement program in Victoria\(^3\). If mobile phone detection cameras were to be placed at current fixed speed camera sites on the freeway network, annually, five casualty crashes would be prevented with cost savings of approximately $1 million. If cameras were deployed more widely, however (e.g. by using transportable cameras) greater reach would be achieved and the projected benefits would be greater. An automated mobile phone enforcement camera program that reached all drivers (not just those on the freeway network) is estimated to prevent 95 casualty crashes per year and save $21 million.

Both of these analyses indicate that the widespread use of automated mobile phone detection cameras as part of an enforcement program designed to achieve general deterrence has the potential to be effective in reducing road trauma and associated costs.

### 4.4 KEY POINTS

- Mobile phone use makes up 7% of all non-driving tasks that are initiated by Australian drivers and drivers spent 7% of their total driving time using a mobile phone. Half of this involved a hand-held mobile phone.
- Data from the US show that illegal visual-manual phone use (e.g. texting, dialling) is associated with an 83% increase in the risk of a severe, moderate, or minor crash occurring.
- Several technologies have been designed to reduce the impact of smart phone use on driver distraction, including automated mobile phone detection

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\(^3\) Slightly different assumptions underpinned these two research projects. For the Victorian analysis, it was assumed that 5% of drivers illegally use their mobile phone at any one time; that 20% of drivers would be deterred from using their phone illegally when the program was in operation; and Victorian crash cost estimates are calculated using the human capital approach. For the NSW analysis, the measured prevalence from the camera trials was used; 30% of drivers would be deterred by the program; and NSW crash costs are calculated using the inclusive willingness to pay approach.
enforcement cameras, mobile phone blocking technology and driver selected Apps which limit phone functionality.

- In December 2019, NSW became the first jurisdiction in the world to implement an automated mobile phone detection camera enforcement program, using both fixed and transportable cameras.
- The potential effectiveness of an automated mobile phone enforcement camera program in NSW has been estimated by MUARC as resulting in an annual reduction of 67 casualty crashes (19 fatal and serious injury (FSI) crashes), 86 casualties (21 FSI) and $25 million in crash costs.
- In Victoria, widespread roll-out of automated mobile phone enforcement is predicted to prevent 95 casualty crashes per year and $21 million in crash costs.

4.5 REFERENCES


5 AFFORDABILITY OF NEWER VEHICLES

This Chapter sets out to examine the various measures available to improve the affordability of newer vehicles that incorporate driver assist technologies. In addition, new passenger vehicle designs are rapidly changing through technology disruptions and substantial changes are expected over the next 10 years that will have major economic impacts.

5.1 MEASURES CURRENTLY AVAILABLE

Affordability of safer vehicles is generally not considered the primary barrier to choosing the safest vehicle available. According to research by CommSec, average adult wages increased by 55% over the 10 years from 2003 whilst the prices for equivalent popular vehicles only increased between 5 and 10% in the same time, effectively making vehicles much more affordable. In contrast to increasing affordability, recent research by MUARC has estimated that the potential safety gains from safer vehicle choices has actually increased over this period, showing that despite improving affordability, consumers were less likely to prioritise safer vehicle choices. MUARC research estimated that in 2001 overall road trauma could have been reduced by 24% if everyone had purchased the safest vehicle available in class. In 2016, the estimated savings had increased to 32%.

Part of this reduction in safe vehicle choices has been brought about by increasing consumer preference purchasing for types of vehicles that are inherently less safe. In particular the growing market share of commercial utilities (the Toyota Hilux has been the top selling vehicle in Australia for the last 3 years running) was estimated in the MUARC research to have potentially increased overall road trauma by up to 4%. At the other end of the market the growing proportion of the fleet which are small and light vehicles has also grown.

These trends demonstrate that vehicle affordability is not the primary determinant of safer vehicle choices. Rather general market trends driven by priorities other than safety seem to be the major driver. Efforts need to be made to increase the priority consumers give to safety in determinants of vehicle choice. Better use of well-developed resources such as ANCAP ratings for new vehicles and Used Car Safety Ratings for older vehicles. As demonstrated a number of MUARC projects on vehicle safety optimisation, safer choices do not necessarily come at a cost to consumers, simply only requiring the substitution of one vehicle for a safer one at the same price. The Used Car Safety Ratings show that in every market group and price range of vehicle there are a range of safety performances achieved. The challenge is to get consumers to choose the safest vehicle as a priority.

5.1.1 Key points

- Average adult wages increased by 55% over 10 years whilst the prices for equivalent popular vehicles increased only between 5 and 10%, effectively making vehicles much more affordable.
- Despite improving affordability, consumers were less likely to prioritise safer vehicle choices. MUARC research estimated that overall road trauma could
have been reduced by 24% if everyone had purchased the safest vehicle available in class.

- Part of this reduction in safe vehicle choices has been brought about by increasing consumer preference for purchasing types of vehicles that are inherently less safe. In particular the growing market share of commercial utilities, and the growing proportion of small and light vehicles.
- Efforts need to be made to increase the priority consumers give to safety in determinants of vehicle choice, through use of ANCAP ratings for new vehicles and Used Car Safety Ratings for older vehicles.
- Safer choices do not necessarily come at a cost to consumers, simply only requiring the substitution of one vehicle for a safer one at the same price.

5.2 FUTURE VEHICLES AND LIKELY AFFORDABILITY

It is clear from various sources that within this decade or the next, energy-efficient, and part or full autonomous vehicles are likely to be available and in use, subject to regulation approval. Moreover, on-demand service vehicles are expected to be widespread that will lead to substantial reductions in the individual cost of transport for users, both private and commercial users. These developments if real will potentially lead to significant reductions in the affordability of new vehicles in the years ahead.

Tony Seba, a Silicon Valley entrepreneur, instructor in entrepreneurship, disruption and clean energy advocate at Stanford’s Continuing Studies Program in the US has been vocal in analysing and promoting the likelihood and impact of technology disruptors in future transport trends and economics. His research addresses three key issues in future transport, namely electric vehicles (EVs), autonomous vehicles (AVs) and on-demand service vehicles (Transport as a Service or TaaS). The impacts of these developments are discussed further below.

5.2.1 Electric vehicles

The International EV Outlook (2018) reported that between 2013 and 2017, the number of electric vehicles (EVs) in China, US, Europe and others went from 0.35 to 3.1 million, and last year, exceeded 5.1 million EVs. Seba (2014; 2018) further argued that by 2030 or earlier, the cost of electricity will be considerably less than fuel through market growth in solar energy which will likely accelerate these sales.

He noted electric energy will disrupt fuel demand and systematically shift the auto industry into electric vehicles. EVs comprise only 20 engine parts, compared with more than 2,000 parts in petrol-driven engines. He maintains that this will offer extended engine life, and substantially reduce the price of new cars by approx. 70%.

Kok et al (2019) claimed that the share of electric vehicles globally will increase by at least 30% by 2030, although Seba (2018) claims it will be far more than this, given the vast superior economics of these vehicles. Johnston and Walker (2017) also predicted Peak Car Ownership and the Market Opportunity for Electric Automated Mobility Services.
5.2.2 Autonomous Vehicles (AVs)

Dosen et al., (2017) surveyed eleven members of the Auto industry (OEMs) in Australia on when they anticipated they would have autonomous vehicle models for sale locally (see Figure 5.1). Four of these OEMs claimed by 2020, another three by 2021, and the rest sometime after 2020. Government regulators will need to consider rules for their use on our roads, but they don’t expect this will be a major issue, given the number of trials currently underway in countries such as the US, Europe, China, Singapore and Australia. While autonomous vehicles are loaded with high-level technologies such as Lidar sensors, the cost of these technologies is rapidly falling and will not add substantially to the cost of these vehicles (Seba 2018). The Nordic Council of Ministers (Laine et al. 2018) further suggested that autonomous vehicles will also reduce Greenhouse Gas reductions by 30% alone or up to 65% for EV and AV units.

5.2.3 On-demand Service vehicles

The third element of future vehicles related to vehicle ownership. Nelson (2018) points out that on-demand service or TaaS vehicles have been expanding rapidly internationally in recent times as they become attractive and cheaper in providing flexible transportation options without needing to own a personal vehicle. Over the last 10 years, the number of on-demand service users has risen from 0.35 million to over 7 million annually (Statistica. 2018) and they predict that on-demand users worldwide will top 36 million by 2025.

Seba (2018) points out that by expanding the number of shared vehicles used as an alternative to private ownership, there will be less vehicles on the road, as each service vehicle will have greater percent usage rate than that of the current 4% rate for private vehicles. He argued that this is likely to lead to a 10% reduction in current costs and be an attractive option for private motorists. Moreover, fewer service vehicles are likely to lead to significant reductions in congestion and fewer parking spaces needed in cities.

5.2.4 Affordability of these Disruptions

According to these analyses, EV and AV service vehicles will have a substantial impact on the affordability of private transportation in the coming years. Authors such as Seba (2018) are predicting private vehicle running costs could be 10 times or cheaper than current costs. He argued that economic forces alone will drive these disruptions and the designs of tomorrow’s vehicles. Importantly, governments must play a major role in this area to ensure these vehicles are as attractive as predicted for the community, and equally, provide safety benefits in fewer deaths and severe
injuries in enhanced road safety. This will be critical in meeting road safety targets in the push Towards Zero crash outcomes.

5.2.5 Key points

- In spite of what we think, Autonomous Electric Vehicles (ELVs) of some form will be upon us in the next 10 or so years, given their attraction and the effort that OEMs have committed to their development;
- It is critical, therefore, that we are fully prepared for their introduction;
- Current trials will be useful in highlighting potential benefits and problems but clearly more research in terms of societal impact is clearly still urgently needed;
- Potentially safety benefits, reduction in consumer costs, and community improvements is necessary to be sure we get the appropriate business models and policies;
- Critical for government agency involvement and leadership to be sure maximum societal improvements are obtained

5.2.6 References

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6 ROAD STANDARDS AND MAINTENANCE

6.1 ROAD STANDARDS IN AUSTRALIA

Current road standards are developed by the National Road Transport Commission and form the basis for state and territory road rules across Australia and New Zealand Austroads (2015). These rules were initially based on the US Standards for Interstate Highways in the United States by the American Association of State Highway and Transportation Officials (AASHTO) but have since undergone significant modification for use in Australasia. In recent times, a stronger focus has been on how the Safe System approach can be incorporated into the road design process. Austroads (an organisation of Australasian state traffic authorities) play a major role in determining current and new road design standards.

The Safe System approach to crash prevention has been adopted nationally as a critical pathway in a Towards Zero vision of road safety for the future. This approach includes the 4-elements of safe behaviour, safe roads, safe speeds and safe vehicles. It assumes that the best approach to address crash prevention is a systemic one, where all elements need to be examined and addressed. Safe road design and roadside infrastructure are critical elements in this approach.

6.2 CONSUMER TESTS

Effectiveness of roads and road structures is the responsibility of the national and state road authorities. Australia relies heavily on road transport due to its large area and low population density in considerable parts of the country. Australian roads are fundamentally different to others, given our unique country side and a higher proportion of unsealed and remote roadways.

To assess the quality of its roads, many states are involved in the AusRAP program, based on the earlier European Road Assessment Program (EuroRAP) established in 1999. Both programs aim to reduce death and serious injury by a systematic assessment of risk and identifying the major shortcomings that can be addressed (Smith et al, 2007).

6.2.1 AusRAP Assessments

By 2013, AusRAP, had examined 21,921 kms of national highway with a speed limit of 90 kilometres per hour or above. Safe rating roads generally comprised dual lane divided carriageways with good line marking and wide lanes while less safe roads tended to be undivided, single-lanes with poor line marking and hazards such as trees, poles and steep embankments close to the edge of the road (AAA, 2013).

AusRAP went on to develop the Safer Roads Investment Plans (SRIPs) for Australia’s national highways. These include a range of road and infrastructure countermeasures with benefit cost ratios (BCR) that will deliver a positive economic return on investing in road improvements. In particular, greater attention to off-road collisions, lane separations and intersection treatments that reduce conflicts were identified as priority treatments worth investment.
6.2.2 The Safer Roads Program

The Transport Accident Commission provide considerable funding to VicRoads (now the Dept. of Transport) in Victoria to address some of these high-risk crashes. Treatments such as edge-line Wire Rope Barriers (WRB), shown to have high BCRs in run-off-road collisions with injurious trees and poles, and intersection treatments such as Raised Safety Platforms that reduce speed and conflicts were prioritised. A number of other potential treatments such as centre-line WRB and other intersection treatments have also been identified for future funding.

It is important that programs such as the Safer Roads Investment Plans (SRIPs) and the Safer Roads Program be extended beyond their current funding schedules to continue to provide these benefits, especially given the apparent increase in severe injuries on rural highways and undivided roads.

6.2.3 Key points

- Programs such as the Safer Roads Investment Plans (SRIPs) and the Safer Roads Program need to be extended beyond their current funding schedules to continue to provide safety benefits;
- A continuing focus on the adoption of a safe system approach to road design and maintenance is vital to address the apparent increase in severe injuries on rural highways and undivided roads
- With the imminent arrival of autonomous vehicles, it is critical to be sure that the interaction of the vehicle and the infrastructure (V2I) receive even stronger focus to ensure the potential safety benefits of these new technologies is realised

6.2.4 References


6.3 ROAD ASSET MANAGEMENT AND MAINTENANCE

The limited availability of key staff with expertise on the subject of this ToR has prevented a written submission by 31 January 2020. However, the relevant staff may be able to provide a supplementary submission during February and/or provide oral evidence if requested by the Economy and Infrastructure Committee
7 DRIVER TRAINING PROGRAMS

7.1 PROFESSIONAL DRIVER TRAINING AND LICENSING

7.1.1 Extent of the Problem in Occupational Drivers

Road freight has been identified as the most dangerous industry in Australia, with the highest death rate of its employees compared to that of other industries (Safe Work Australia, 2016; Transport Workers Union of Australia, 2015). To illustrate, Safe Work Australia reported in 2016 that more than one quarter of fatalities occurred in the Transport, postal and warehousing industry (47 fatalities), followed by Agriculture, forestry and fishing (44 fatalities) and Construction (35 fatalities) (Safe Work Australia, 2016). The magnitude of the problem in the transport industry is likely to worsen - given the national freight task is projected to double by 2030 (IBIS, 2015).

Light vehicle fleets (<4.5 tonnes) also present a significant public health issue given that more than 30% of registered motor vehicles in Australia are work-related vehicles, with an estimated 33% of work-related fatalities occurring while driving (Driscoll et al., 2005). This emerging public health problem is not solely occurring in Australia, with work-related road traffic deaths estimated to account for 22% of work fatalities in the USA and 16% in New Zealand (Driscoll et al., 2005). There is also evidence suggesting that work-related vehicles comprise up to 5.3 fatalities per 100,000 registered fleet vehicles (Stuckey et al., 2010), and that there is an over-representation of work-related drivers in road traffic crashes compared with non-work-related drivers (Downs et al., 1999; Lynn & Lockwood, 1998; Murray et al., 2003; Newnam & Watson, 2009).

7.1.2 History of Driver Training in the Workplace

Driver training is one of the most commonly used workplace road safety interventions (e.g. Haworth et al., 2000; Murray et al., 2009; Watson et al., 1996). However, there has been much debate about the potential safety benefits associated with occupational driver training, with early research showing minimal effectiveness (e.g., Brown et al., 1987). It has been argued that driver training programs lack effectiveness due to a reliance on knowledge and vehicle handling skills, rather than addressing the factors affecting judgement and decision-making (e.g., attitudinal factors), and their failure to incorporate key behavioural objectives and teaching strategies (Christie, 1995; 2001; Watson et al., 1996)

In addition to concerns about the effectiveness of occupational driver training, in some cases, driver training designed to improve road safety has been found instead to have the opposite effect. For example, one study found that certain types of driver training may increase driver confidence as well as driver skill (Gregresen et al., 1996). Increased driver confidence has been associated with more risky driving intentions (Horswill & McKenna, 2004) which may counteract the safety benefits associated with improving skill.
7.1.3 Driving Skills

A number of researchers have argued that driver training programs place too much emphasis on skill improvement, such as braking techniques, braking avoidance or handling a skidding car (Gregresen et al., 1996). In fact, driver training programs which focus on specific skills, such as skid control and braking techniques, consistently demonstrate no improvements in driving performance (e.g. Katila et al., 1996).

In the workplace driving setting, improvements in driving skill have been observed following training based on formal instruction and extensive practice (Mayhew et al., 1999; Groeger & Brady, 2004; Groeger & Clegg, 2000). In particular, the evidence suggests that training programs which incorporate an educational component focusing on the motivational and psychological aspects of driving are effective in improving driving performance (Groeger & Banks, 2007; Watson, 2003).

Given this body of research, more recent approaches have focused on higher order (cognitive) skills, rather than vehicle handling skills or driver knowledge, in an effort to produce better safety outcomes for work-related driving.

7.1.4 Hazard Perception Training

One type of skill-based driver training that has been found to be effective in improving driver behaviour is hazard perception training. Hazard perception refers to a driver’s ability to anticipate potentially dangerous incidents in the traffic environment (Horswill & McKenna, 2004). The validity of hazard perception tests have been demonstrated by establishing a negative relationship between test performance and crash involvement (Pelz & Krupat, 1974; Quimby et al., 1986; Quimby & Watts, 1981).

Hazard perception tests have been found to differentiate among drivers of different levels of experience. For example, one study found that expert drivers responded faster to hazards than experienced drivers, who, in turn, responded faster than novice drivers (McKenna & Crick, 1994). Scores on hazard perception tests have also been shown to reflect other situations where it would be expected that hazard perception performance would be affected (Smith et al., 2009). For example, test performance decreases with increased sleepiness, and with age-related cognitive and visual declines (Horswill et al., 2008).

The importance of hazard perception for driving is that it is arguably the only driving-specific skill consistently found to be associated with crash risk (Darby et al., 2009; Horswill et al., 2010). However, to date, the majority of research (e.g. Chapman et al., 2002, Isler et al., 2009; Pradhan et al., 2006) on hazard perception training has focused on novice drivers due to their high crash risk, with only one study exploring the effectiveness of hazard perception training for work-related drivers.

The single study of work-related driving found that drivers who received a hazard perception training intervention responded significantly faster to hazards than those who received a placebo intervention, both immediately following the intervention and after a delay of at least one week (Horswill et al., 2013). There was no evidence that the training effect decayed during the delay. However, the hazard perception
training also had the effect of increasing driver confidence, which can be associated with riskier driver intentions.

### 7.1.5 Incentive Schemes

One attitude/behaviour-based intervention that has been widely used in workplace road safety is incentive schemes. Based on the operant perspective of behaviour change (Skinner, 1974), this approach typically provides rewards (e.g., money) for safe driving behaviour. There is some support for the role of incentive schemes in reducing crashes (Gregersen et al., 1996), and increasing employees’ use of seatbelts (e.g., Geller et al., 1987; Marchetti et al., 1992). For example, in a review of the evaluations of 28 different programs at nine work settings; an increase in employees’ use of seatbelts from 12% over baseline to 285% as a result of a financial incentive scheme was observed. Long-term follow up also found support for the effectiveness of the program.

However, similar to driver training, the research has yielded mixed results (Gregersen et al., 2006; Haworth et al., 2000). For example, one study found that incentive schemes were not as effective as training programs or a discussion group in reducing crash rates. There are several possible explanations for the mixed results. First, financial incentive schemes have the potential to shift the focus from a decrease in crash rates to a reduction in costs (Watson et al., 1996). Research has found that reporting is reduced for minor crashes in order to receive the rewards associated with a low claim rate. Second, financial incentives do not necessarily educate employees with regard to safety. Rather, they can detract from the safety message by rewarding and focusing on desired behaviours without encouraging a greater understanding of the primary issue (Montemayor, 1996). There is a tendency for employees to practice safe behaviour to attain the reward, not because safety is an inherent part of their beliefs. Furthermore, the effectiveness of rewards is limited because they seldom result in permanent behaviour change.

### 7.1.6 Group-Based Discussions

Research has found some support for discussion-based interventions in improving work-related driver behaviour and safety outcomes (Geller et al., 1987; Gregersen et al., 1996; Ludwig & Geller, 1991). For example, Salminen (2008) conducted three rounds of group discussions which consisted of: (1) identifying traffic environment problems in work-related driving; (2) discussion of solutions to the identified problems, and; (3) discussion of the decisions regarding the identified problems. Group discussions were found to decrease traffic environment-related occupational crashes by 72%, while no change was identified in crashes unrelated to the road traffic environment (Salminen, 2008). Although this was a well conducted study, there was no discussion of the behavioural techniques undertaken to achieve these results, and as such it is difficult to pinpoint the processes that explain why this initiative was successful, and to generalise the results for future applications.

Using a similar research approach, significant increases in seatbelt use has been observed using relevant behaviour change techniques (i.e., awareness session, group consensus, safety reminders) (Ludwig & Geller, 1991; 2000). Newnam and Watson (2009) adapted and extended on these methods and evaluated the
effectiveness of a participative education intervention on a group of work-related drivers (Newnam & Watson, 2009). This study found support for a safety awareness session followed by feedback as an effective intervention in reducing self-reported speeding over a six-month period. Specifically, the results indicated that the safety awareness intervention significantly reduced self-reported speeding in the experimental group, while participants in the control group reported a non-significant increase in speed across the three phases of the intervention.

7.1.7 Goal Setting and Feedback

A goal-setting and feedback approach was trialed by conducting a series of seven field studies with a sample of pizza delivery drivers (Ludwig & Geller, 2000). The intervention strategies included: awareness sessions and promise cards; assigned and participative goal-setting and feedback; static and dynamic goal setting; group goal-setting with public individualised feedback with/without competition; mandated company policy; and, community agents. This research found support for the role of goal-setting and feedback in improving performance and safety outcomes. Other researchers have also found a significant decrease in over-speed violations following an intervention incorporating these behaviour modification techniques (Newnam et al., 2014).

7.1.8 Key points

- Work-related vehicles (light and heavy vehicles) represent a large proportion of the road traffic environment and should be managed under workplace and public health approaches to reduce the road toll.
- Effective and sustainable approaches to positively changing the behaviour of work-related drivers are focused on challenging drivers' attitudes and beliefs associated with unsafe driving behaviour.
- Skill-based driver training is not effective in improving driving performance and reducing crashes.
- Incentivising behaviour using extrinsic benefits (e.g., financial incentives) is not effective in improving driving performance.
- Hazard perception training is effective in improving hazard perception skills; this type of skill-based driver training that has been found to be effective in improving driver performance.
- The behaviour modification techniques, group discussion and goal setting and feedback, are effective in improving driver performance.

7.1.9 References


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8 ACCURACY OF ROAD COLLISION DATA COLLECTION

The limited availability of key staff with expertise on the subject of this ToR has prevented a written submission by 31 January 2020. However, the relevant staff may be able to provide a supplementary submission during February and/or provide oral evidence if requested by the Economy and Infrastructure Committee.