Benefits of Safety and Traffic Management Technologies

19 June 2018

Today's moderator

Eliz Esteban

Communications Officer

Austroads

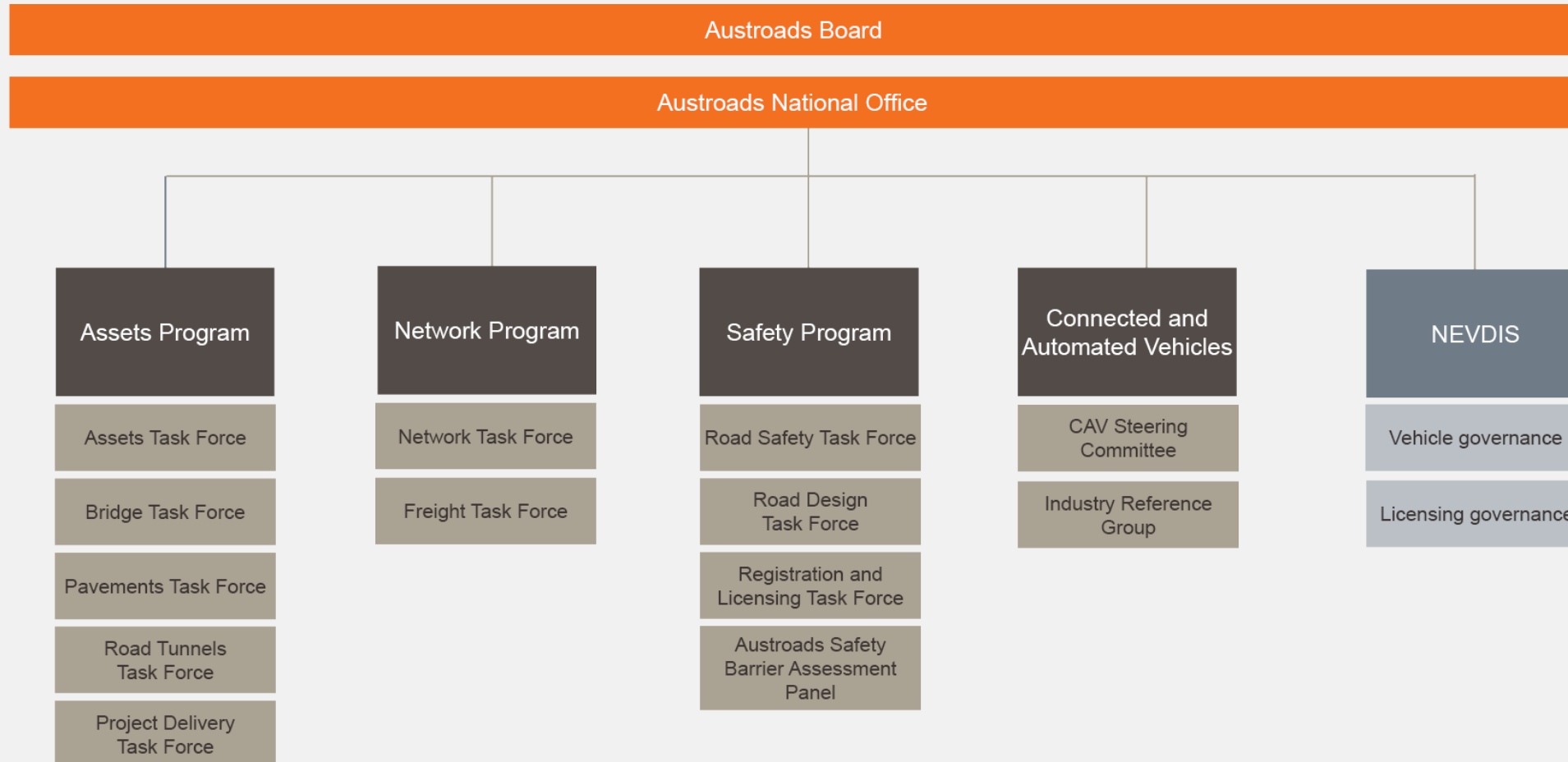P: +61 2 8265 3302

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About Austroads

The peak organisation of Australasian road transport and traffic agencies

- Roads and Maritime Services New South Wales

- Roads Corporation Victoria

- Department of Transport and Main Roads Queensland

- Main Roads Western Australia

- Department of Planning, Transport and Infrastructure South Australia

- Department of State Growth Tasmania

- Department of Transport Northern Territory

- Transport Canberra and City Services Directorate, Australian Capital Territory

- Department of Infrastructure, Regional Development and Cities

- Australian Local Government Association
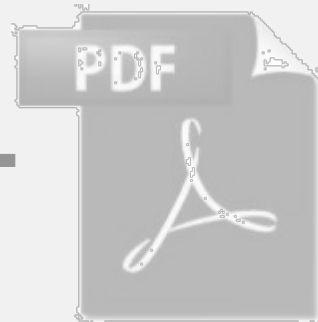
- New Zealand Transport Agency

Our structure

Austroads

Austroads Board

Austroads National Office

Assets Program
- Assets Task Force
- Bridge Task Force
- Pavements Task Force
- Road Tunnels Task Force
- Project Delivery Task Force

Network Program
- Network Task Force
- Freight Task Force

Safety Program
- Road Safety Task Force
- Road Design Task Force
- Registration and Licensing Task Force
- Austroads Safety Barrier Assessment Panel

Connected and Automated Vehicles
- CAV Steering Committee
- Industry Reference Group

NEVDIS
- Vehicle governance
- Licensing governance

Housekeeping

Presentation = 35 mins

Question time = 15 mins

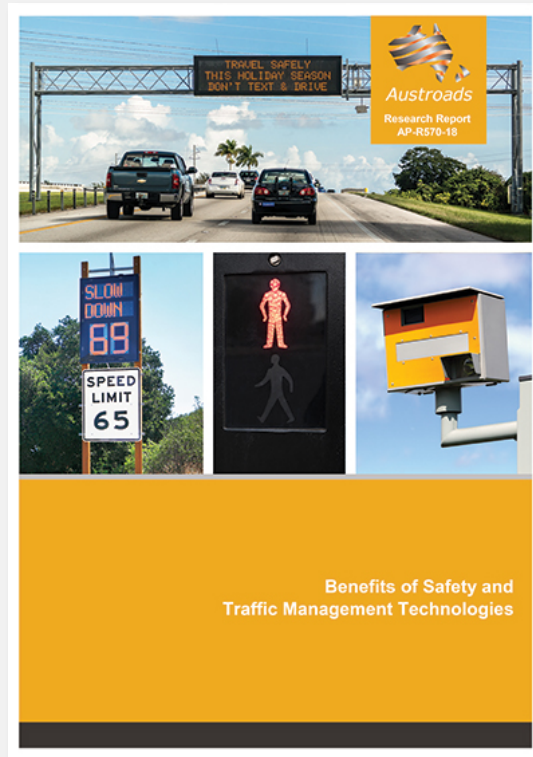+ PDF = www.austroads.com.au/webinars E-MAIL

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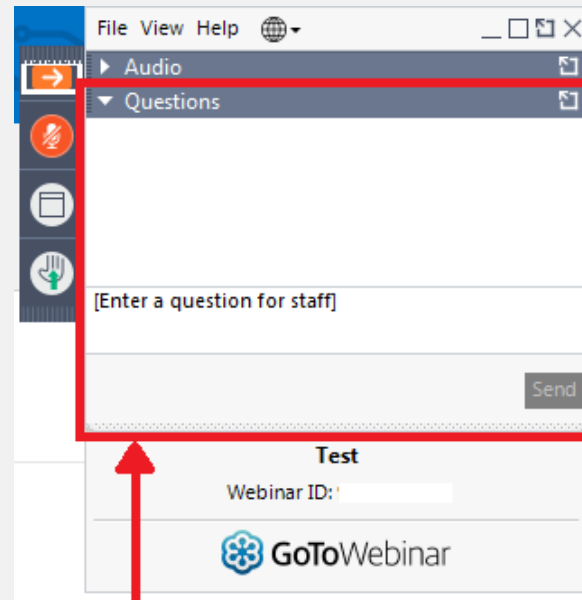
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Austroads report

Download from Austroads Website:

https://www.onlinepublications.austroads.com.au/items/AP-R570-18

Today's presenter

Dr Glenn Geers

Principal Technology Leader

ITS

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Agenda

Topic	Presenter
Project Background and Introduction • Technologies	Glenn Geers
Costs and Benefits	
Evaluation Methodologies	
Recommendations	
Q&A	

Project Background and Introduction

Introduction to team

Project Team

Austroads
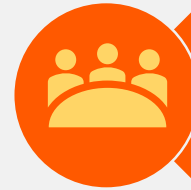Project Manager
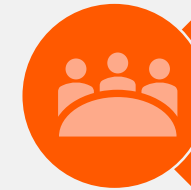Natalie Lockwood

Project Leader, ARRB
Dr Glenn Geers

Team Member, ARRB
Ben Mitchell

Review Team

Austroads
Project Working Group

Stakeholders-
Road and Traffic
Authorities

Austroads Network
Task Force

Austroads Board

The Project Team

Austroads
Project Working Group

Aftab Abro
DIPL NT

John Oppes
DTMR QLD

William Lee
DTMR QLD

Brett Martin
RMS

Mark Beasley
MR WA

Robyn Hawkins
TCCS ACT

Andrew Excell
DPTI SA

Sameem Moslih
VicRoads

Martin Blake
DSG Tas

Glenn Bunting
NZTA

12
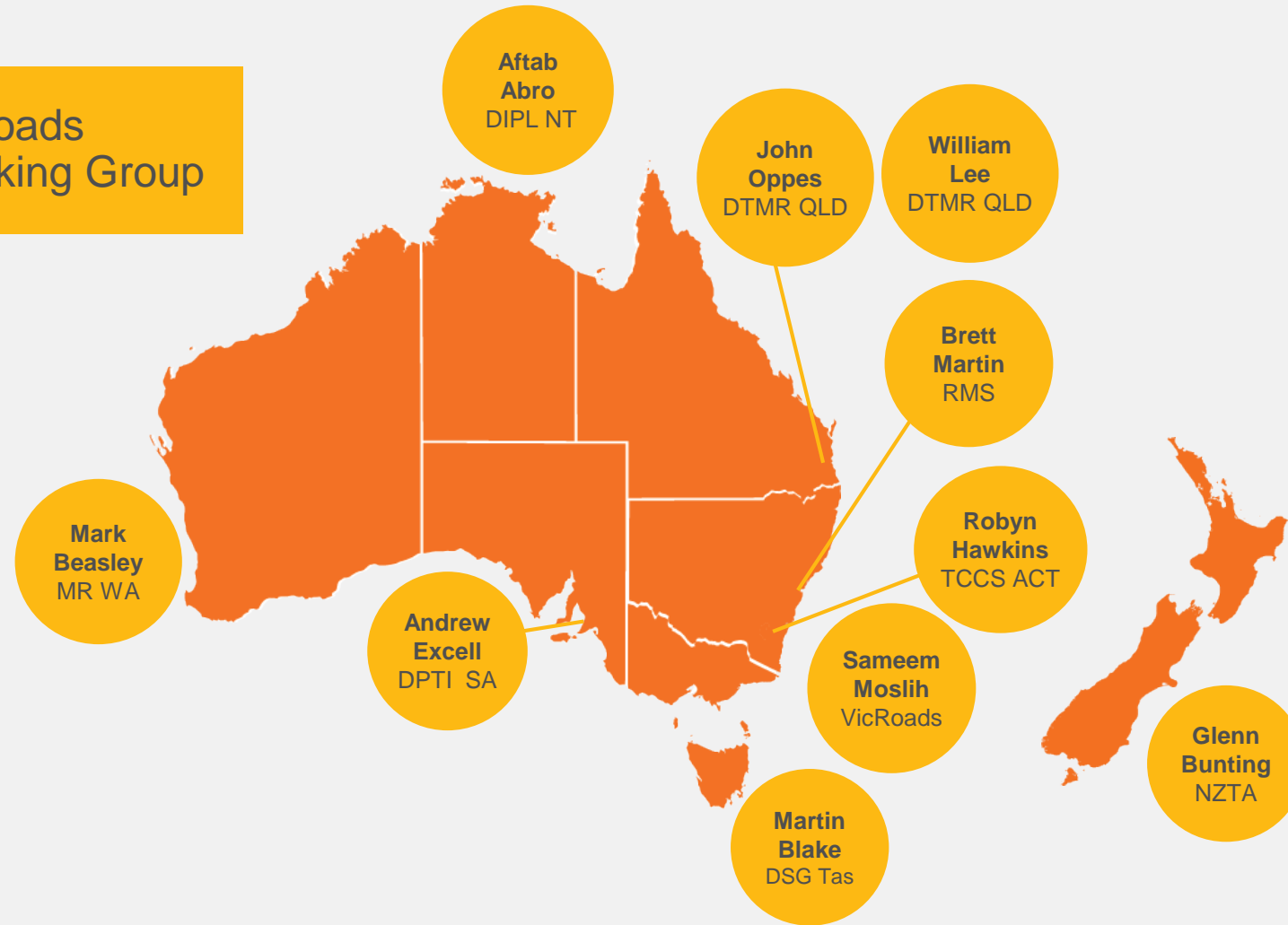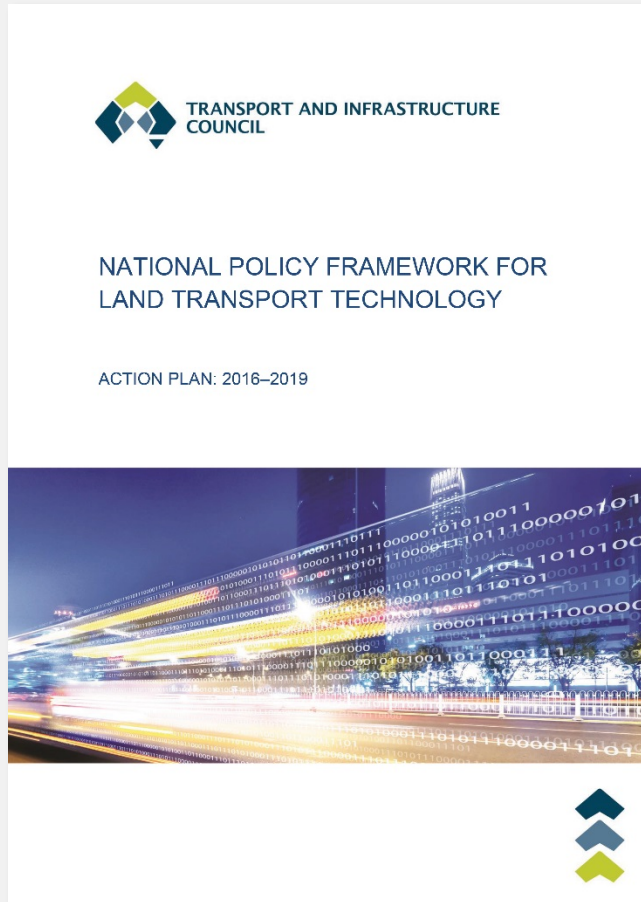
Introduction

Project informs Action Item #14

'*Explore the merits of adopting new safety and traffic management technologies*' of TIC *National Policy Framework for Land Transport Technology*

Introduction

- Many technologies in the ITS space
  - Safety & efficiency
  - BCR

- Limit scope
  - Interesting locally and internationally
  - 'emerging' but on-road trials need to have been carried out

- Evaluation method for reports (39 evaluated)

14

Identifying technologies

- Literature scan

- Questionnaire
  - Local and international

- Refinement
  - High (H): roads agencies directly responsible
  - Medium (M): used by customers
  - Low (L): in-vehicle technologies

15

Technology breakdown

Crossings	Intersection	On-road	Roadside	Mobile/tablet	In-vehicle
• Pedestrians/ cyclists	• Intersection management	• Delineation	• Data collection • Road management • Signs • Weather detection • Speed enforcement	• Driver training • Route guidance	• Emergency response • Fatigue management • Licencing/ interlocks • Speed control • Braking • Collision warning/object detection • Driver assist • Lane change/ departure • Monitoring • Restraints/ airbags • Stability • Vision/visibility • Warning systems

Road and transportation agencies: areas of influence/ involvement	Technology platform	Technology group	Identified technology name	Safe System pillar	Australian and New Zealand evaluations Table 4.2 ID no.	International evaluations Table 4.2 ID no.
High	Crossings	Pedestrians/ cyclists	Pedestrian-activated flashing beacons	Safe roads	–	1
			Pedestrian User-Friendly Intelligent (Puffin) crossings	Safe roads	–	2
	Intersection	Intersection management	Adaptive traffic signal control	Safe roads	3	3
			Rural intersection warning	Safe roads	4	4
	On-road	Delineation	Illuminated pavement markers	Safe roads	5	5
	Roadside	Data collection	Wireless/ Bluetooth data collection	Safe roads	6	6
		Road management	Infrastructure collision warning system	Safe roads	–	7
			Integrated corridor management	Safe roads	–	–
			Lane use management system	Safe roads	–	–
			Ramp metering	Safe roads	10	10
			Smart work zones	Safe roads	–	11
		Signs	Variable message signs	Safe roads	–	12
		Weather detection	Road weather management systems	Safe roads	–	13
		Speed enforcement	Driver feedback signs	Safe speeds	14	14
			Point-to-point speed enforcement	Safe speeds	–	15
			Variable speed limit signs	Safe speeds	16	16

Assessed technologies

1. Pedestrian-activated flashing beacons
2. Pedestrian User-Friendly Intelligent (Puffin) crossings
3. Adaptive traffic signals
4. Rural intersection warning
5. Illuminated pavement markers
6. Wireless/Bluetooth data collection
7. Infrastructure collision warning system
8. Integrated corridor management
9. Lane use management system
10. Ramp metering
11. Smart work zones
12. Variable message signs
13. Road weather management systems
14. Driver feedback signs
15. Point-to-point speed enforcement
16. Variable speed limits
17. Driver training and assessment
18. Safe driving mobile applications

Cost and Benefits

TRAVEL SAFELY
THIS HOLIDAY SEASON
DON'T TEXT & DRIVE

SLOW
DOWN
68

SPEED
LIMIT

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Costs and benefits

| ID no.	Technology	Description	Asset life	Cost indicator	Benefits matrix			Impact area	Owner/ responsibility area
					Safety	Efficiency	BCR estimates available in literature		
1	Pedestrian-activated flashing beacons	Assist pedestrians to cross the road safely at pedestrian crossings by alerting drivers to the pedestrian using flashing beacons.	Software < 10 years Infrastructure > 20 years	Medium	Reduction in crashes involving pedestrians. Reduction in total crashes. Increase in drivers giving way to pedestrians.	None reported	Not available from reviewed studies	Localised	Road Managing Agency
2	Pedestrian User-Friendly Intelligent (Puffin) crossings	Uses active and passive pedestrian detection technology to adjust the length of the pedestrian signal phase.	Software < 10 years Infrastructure > 20 years	Medium	Reduction in crashes involving pedestrians. Reduction in total crashes. Provides longer pedestrian crossing time when needed.	Improved traffic flow during low-pedestrian periods.	Not available from reviewed studies	Localised	Road Managing Agency
3	Adaptive traffic signal control	Dynamic coordination of traffic signals to adapt to changing traffic circumstances.	Software < 10 years Infrastructure > 20 years	High	Crash reduction reported in the literature.	Bus travel time improvement. Mixed results on traffic efficiency compared with time-of-day signal plans reported in the literature.	Yes	Network Level	Road Managing Agency
4	Rural intersection warning	Uses traffic sensing together with VMS or other communication technologies to warn drivers of cross-traffic at intersections.	Software and infrastructure > 20 years	Medium	Reduced speed on main approach.	None reported in reviewed studies.	None reported in reviewed studies.	Localised	Road Managing Agency

Costs and benefits
Adaptive traffic signal control

ID no.	Technology	Description	Asset life	Cost indicator	Benefits matrix		BCR estimates available in literature	Impact area	Owner/ responsibility area
					Safety	Efficiency			
3	Adaptive traffic signal control	Dynamic coordination of traffic signals to adapt to changing traffic circumstances.	Software < 10 years Infrastructure > 20 years	High	Crash reduction reported in the literature.	Bus travel time improvement. Mixed results on traffic efficiency compared with time-of-day signal plans reported in the literature.	Yes	Network Level	Road Managing Agency

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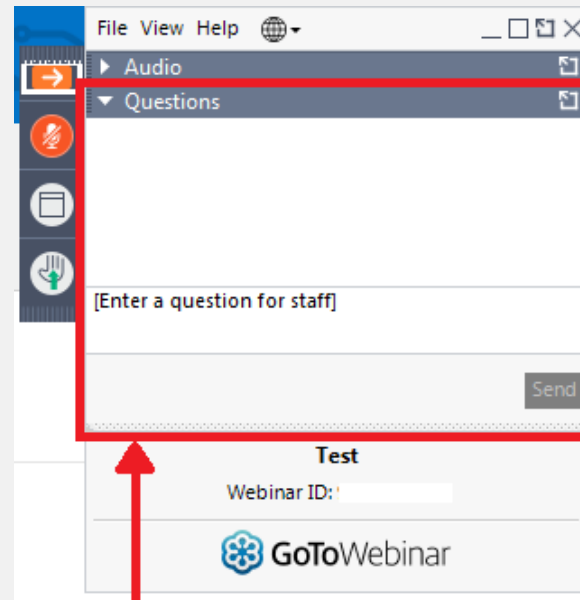
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Evaluation Methodologies

Study evaluations

ID no.	Technology group	Studies				Additional information
		Title	**Location**	**Reference**	**Academic rigour**	
1	Pedestrian-activated flashing beacons	*Safety Effectiveness of the HAWK Pedestrian Crossing Treatment*	Tucson, USA	Federal Highway Administration (2010a)	High (Appendix C.1)	Study reported a 29% reduction in total crashes (statistically significant), a 15% percent reduction in severe crashes (not statistically significant), and a 69 percent reduction in pedestrian crashes (statistically significant).
		Effects of Yellow Rectangular Rapid-flashing Beacons on Yielding at Multilane Uncontrolled Crosswalks	St. Petersburg, Illinois & Washington DC, USA	Federal Highway Administration (2010b)	High (Appendix C.2)	Study reported a statistically significant increase in driver yielding associated with Rectangular Rapid-Flashing Beacons.
2	Pedestrian User-Friendly Intelligent (Puffin) crossings	*Puffin Pedestrian Crossing Accident Study*	50 sites across the UK	Maxwell et al. (2011)	High (Appendix C.3)	Study reported 19%, 24% and 16% statistically significant reductions in personal injury accidents, pedestrian accidents and vehicle accidents respectively for sites upgraded from Pelican to Puffin type crossings.
		The Effect of Newly Installed Puffin Crossings on Collisions	23 sites across the UK	Webster (2006)	High (Appendix C.4)	Study reported reductions of 15% in total collisions and 26% in pedestrian collisions. These reductions were not statistically significant at the 95% confidence level.
		Puffin and Pelican Crossings: Views of Pedestrian Users	London, UK	Outlook Research (2005)	Low (Appendix C.5)	Survey responses suggest that Puffin crossings have two key advantages over Pelican crossing: the sense of there being more time to cross the road before the lights change; and the smaller perceived threat of harassment from cars when pedestrians are still crossing.

Study evaluations

- Eighteen technology groups
  - 39 reports, papers, etc. rigorously evaluated
  - No studies on LUMS or Integrated Corridor Management
- 12 studies in Australia / New Zealand (eight Groups)
  1. Adaptive signals
  2. Ramp metering
  3. Level crossings
  4. Illuminated pavement markers
  5. Bluetooth
  6. Curve speed warning
  7. VSLS
  8. Driver training apps

25

Scientific merit

- Not novelty, utility, etc.

- Robust, reliable and repeatable

Study details

- Technology:

- Benefit type:

- Study location:

- Study period:

- Report name:

- Report number:

- Report date:

- Evaluation method:

- Statistical method:

Validity

Technical validity (Y/N/NA)

1. Are the test variables clearly defined?

2. Is the precise hypothesis being tested clearly defined?

3. Is the relationship between the test variable and the safety/efficiency benefit clear?

Internal validity (Y/N/NA)

4. Is there consistency in the pattern of findings?

5. Is there a clear difference in outcome when a technology is present or not?

Validity

External validity (Y/N/NA)

6. Have study results been replicated in multiple settings?

Statistical conclusion validity (Y/N/NA)

7. Has statistical analysis been undertaken in a valid manner?

8. If a control group was used, has this been undertaken in a valid manner?

Threats to Validity

Changes in traffic flow (Y/N/NA)

9. Has there been any significant changes in traffic flow at a location during the study?

10. Are sites with vastly different traffic flows being grouped together in the analysis?

General trends (Y/N/NA)

11. Are there any long-term trends which may have influenced the evaluation?

12. If yes, was this accounted for by using control sites?

Threats to Validity

Regression to the mean (Y/N/NA)

13. Could RTM impact the validity of the evaluation?

14. If yes, was this accounted for by using control sites?

Performance migration (Y/N/NA)

15. Has the technology installation led to performance changes (e.g. traffic flow, crash risk, etc.) at a nearby location?
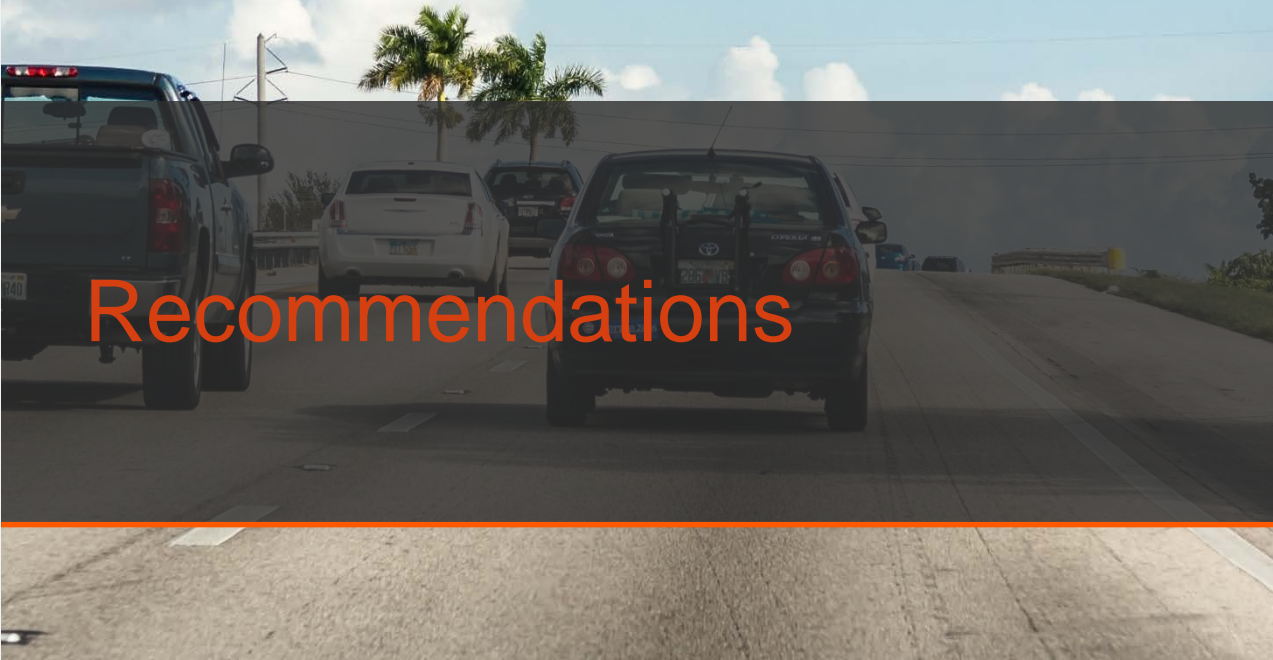
Threats to Validity

Adjustment period/halo effect (Y/N/NA)

16. Is the technology likely to have a halo (geographical or temporal) effect?

17. If yes, has an adjustment period been used in the evaluation?

Recommendations

Recommendations

1. The technology list be updated regularly (perhaps annually) with 'new' technologies added and more mature technologies removed and archived

2. The studies related to the technologies be updated in conjunction with the technology list

3. Application of technologies should be evaluated specifically for the Australian and New Zealand context

Recommendations
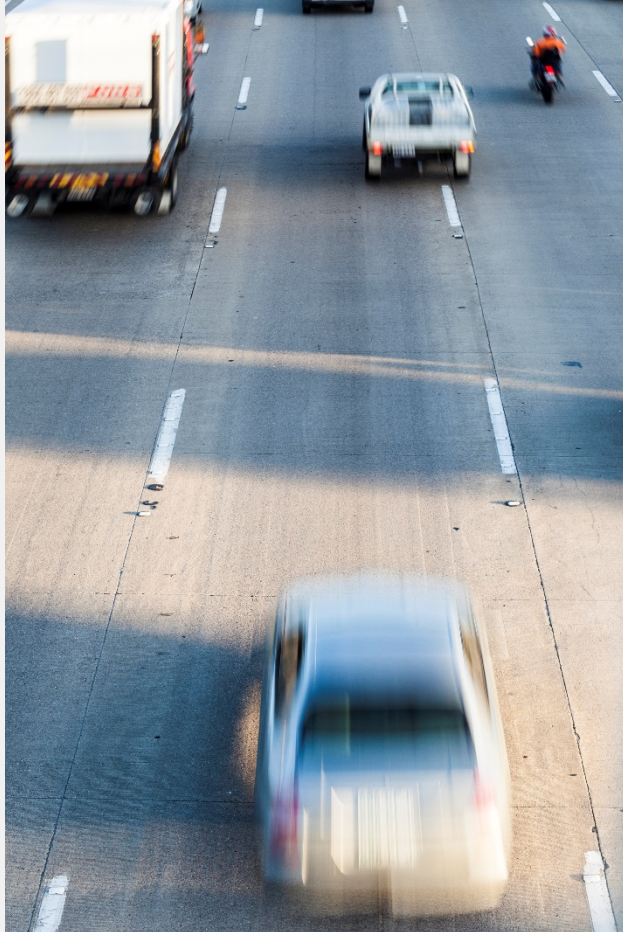
4. A study of the available literature on the benefits or benefits and costs of in-vehicle safety systems is considered

5. Austroads encourages its members to provide published technology studies for inclusion in the web-portal as part of their normal business processes

6. Studies should be evaluated using the methodology developed in this report

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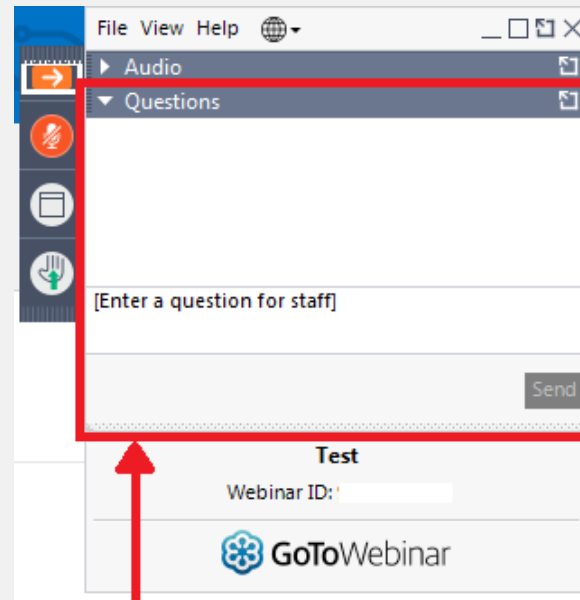
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Questions?

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Upcoming Austroads webinars
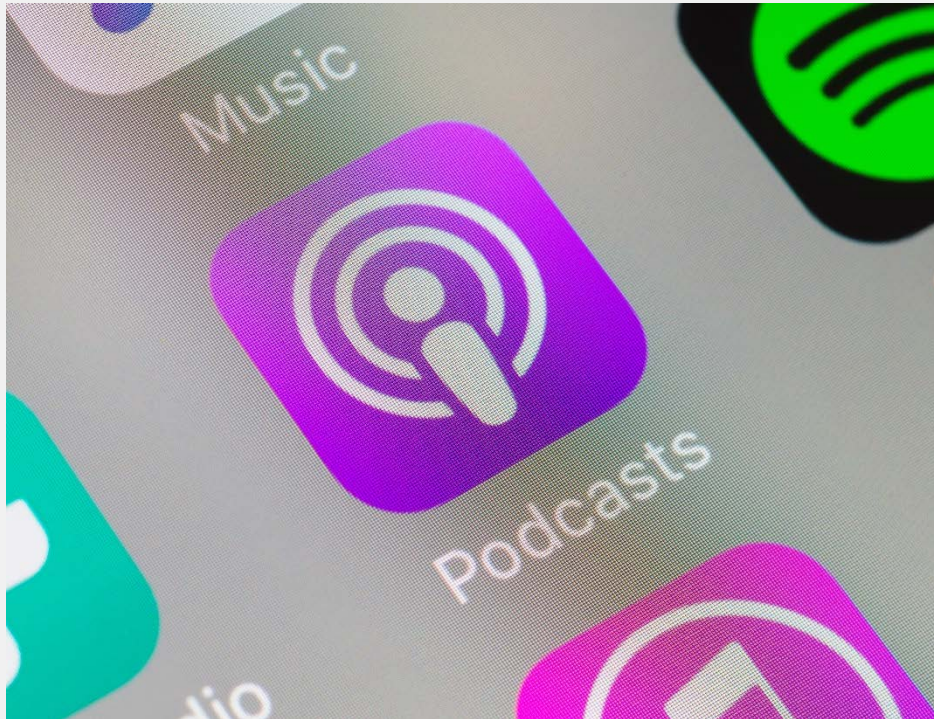
Topic	Date
Guideline for Continual Improvement Processes for Asset Management	28 June
Connected and Automated Vehicle Trials	3 July
Network Performance Indicators	12 July

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