Prioritising On-Road Public Transport

26 September 2017

Austroads

Today’s moderator

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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
- Commonwealth Department of Infrastructure and Regional Development
- Australian Local Government Association
- New Zealand Transport Agency

Housekeeping

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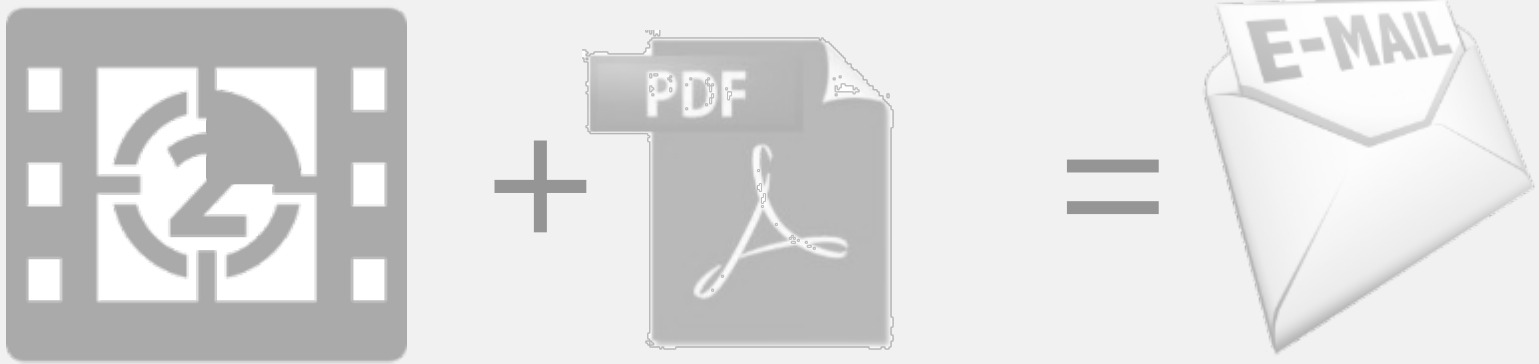
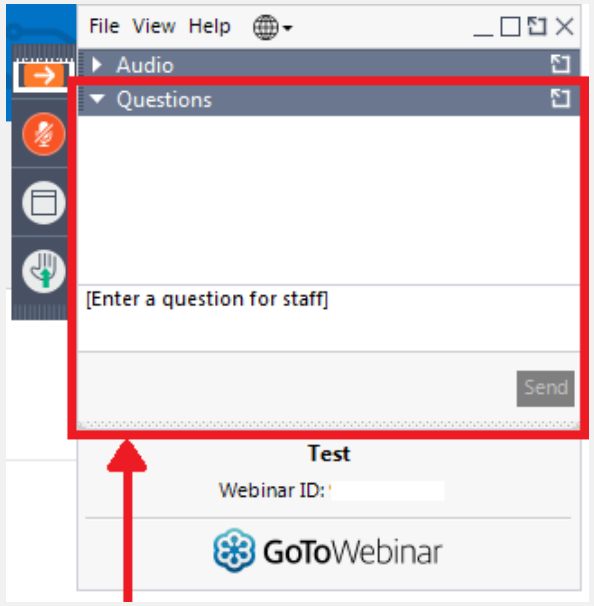
Webinar = 35 mins

Question time = 15 mins

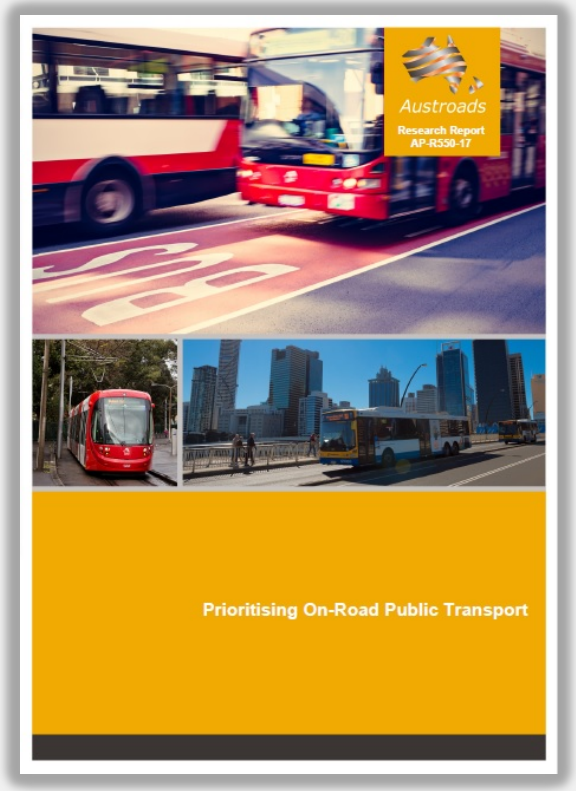


GoToWebinar



Please type your questions here

Austroads report



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Today’s presenters

Alison Lee

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Graham McCabe

Principal Transport Planner and Traffic Engineer

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Agenda

Topic	Presenter
Introduction to team and role of working group	Alison Lee
Project purposes and outcomes	
Background to this study	
Definitions: Focus of project	
Literature Review: Findings	
Best practice case studies	
Considerations for updated to The Guide	
Question time	Alison Lee Graham McCabe

Introduction to the project

Alison Lee

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Introduction to Team and Role of Working Group

Project Team

Austroads Project Manager
- Jeremy Burdan

Project Manager, GHD
- Alison Lee

Project Director, GHD
- Graham McCabe

Review Team

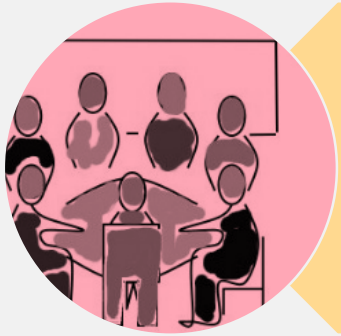
Austroads Working Group

Stakeholders- Road and Traffic Authorities

Austroads Network Taskforce

Austroads Board

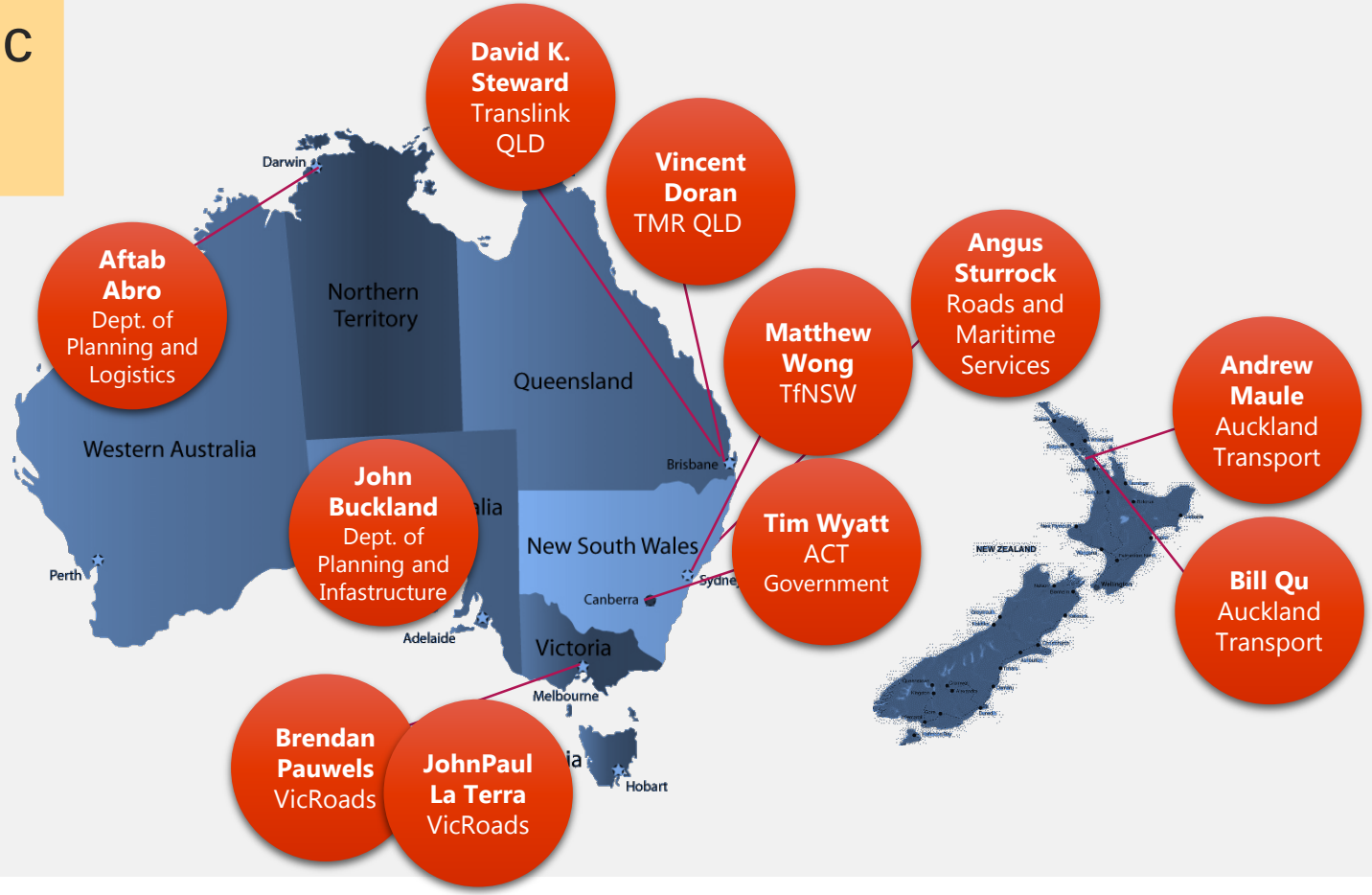
Working Group: Members and Role



Austroads Working Group

Jurisdictional Interviews

Stakeholders- Road and Traffic Authorities



Project Purpose and Outcomes

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Identifying, summarising and sharing information through an update to *The Guide*

See Section 1.1

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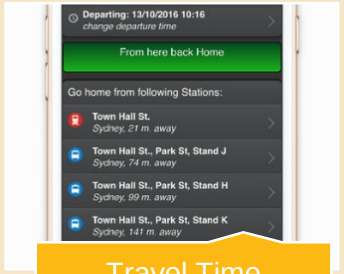
Identifying
- Literature Review
- Stakeholder interviews

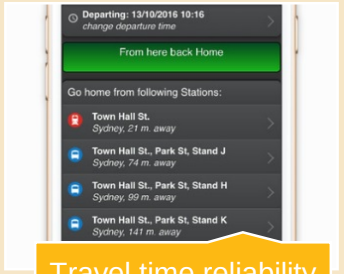
Summarising
- Best practice examples (7)
- Analysis

Sharing
- Recommendations for The Guide

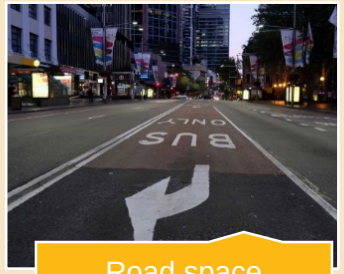
On-road public transport systems



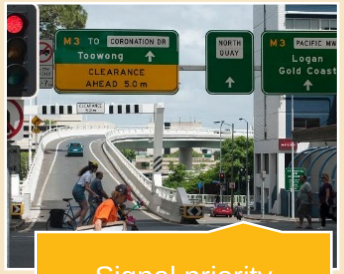
Travel Time improvement



Travel time reliability improvement



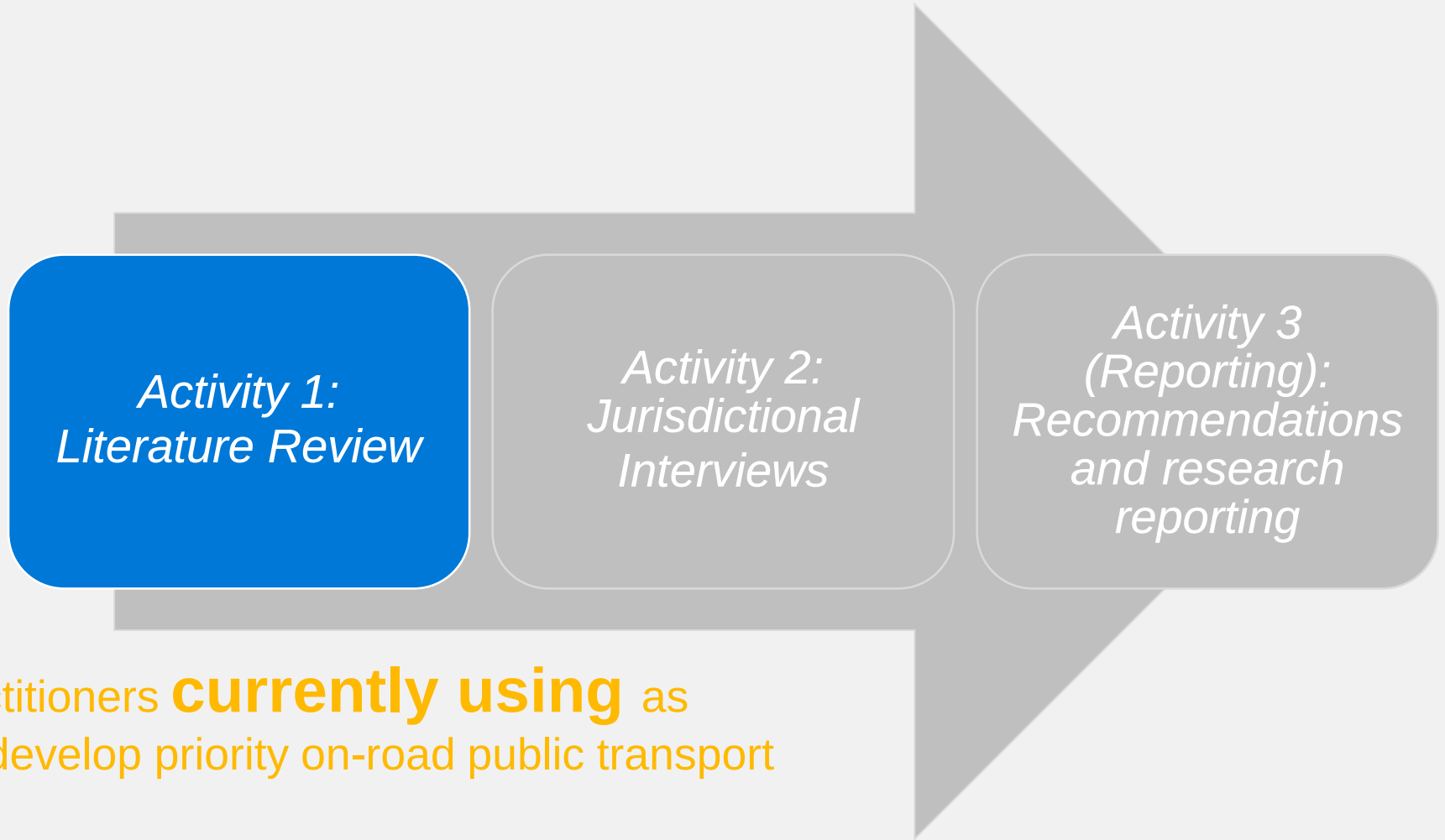
Road space allocation



Signal priority

Stop Placement

The project was undertaken over three stages



What are practitioners **currently using** as guidelines to develop priority on-road public transport schemes?

The project was undertaken over three stages

What do practitioner see as a) **best practice treatments**; and b) **best practice examples**?

The project was undertaken over three stages

Activity 1: Literature Review

Activity 2: Jurisdictional Interviews

Activity 3 (Reporting): Recommendations and research reporting

We put forward recommendations for consideration for **updating The Guide** to include on-roads public transport **priority treatments**

Background to this Study

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By 2050 there will be 23-36% more residents in Australian and New Zealand

See Section 2.1.1

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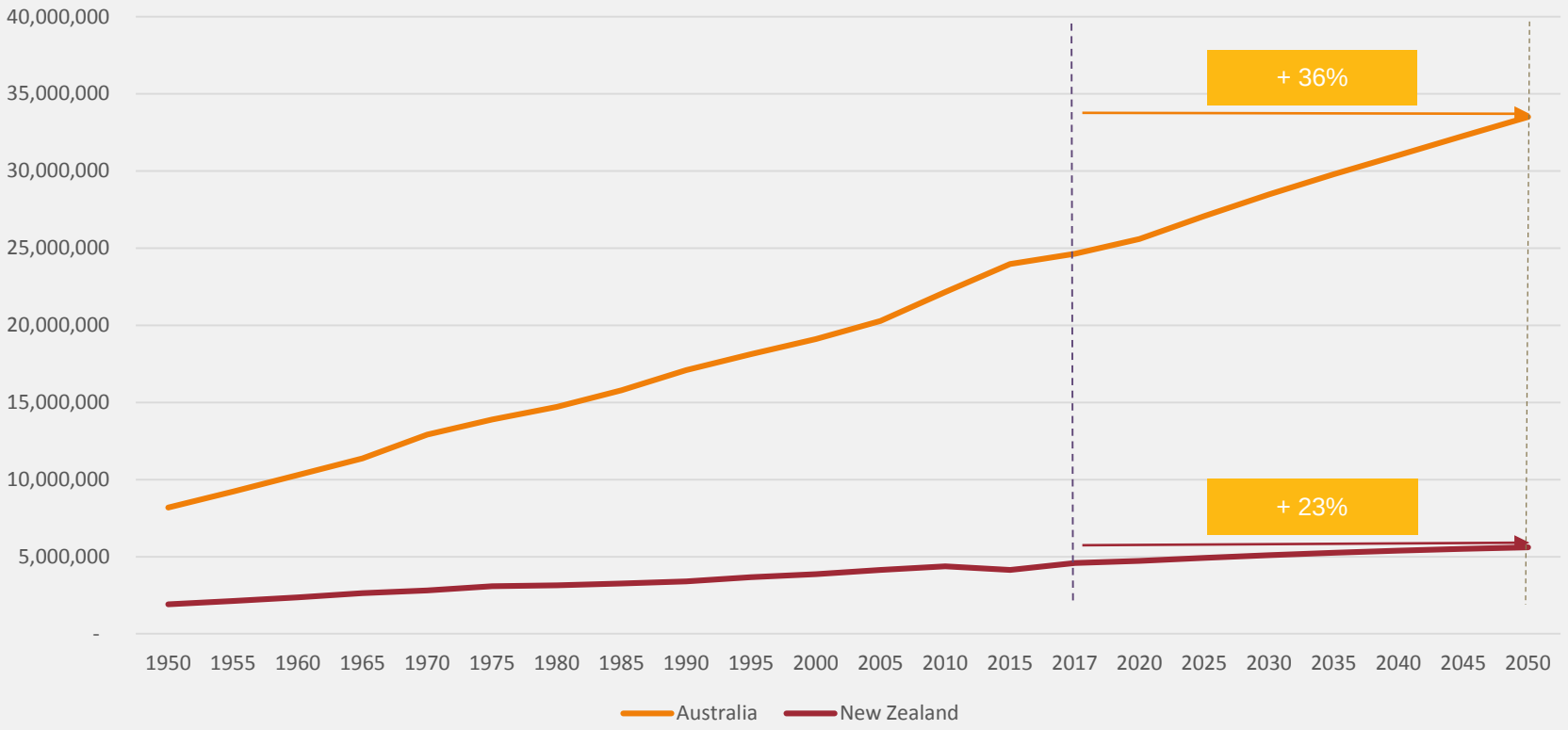
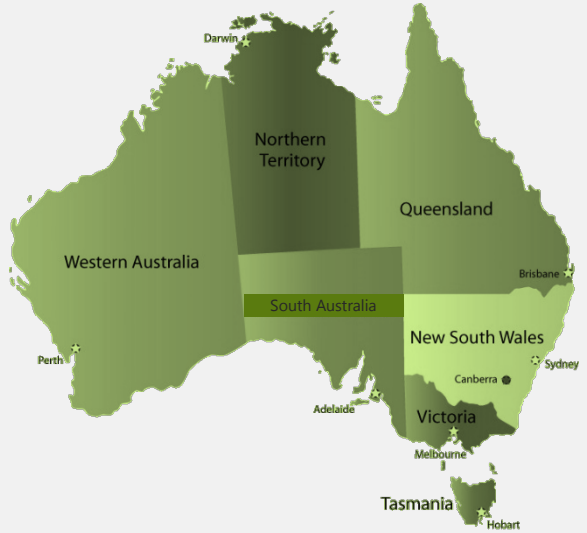
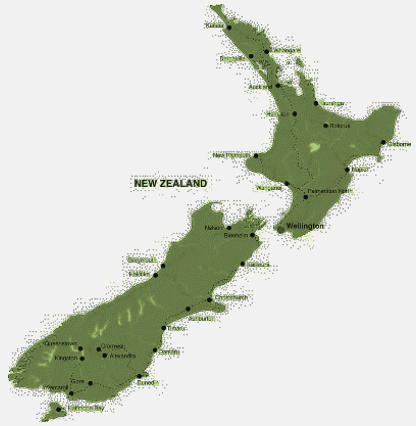
Australia and New Zealand Population growth 1950 to 2050







Source: (World Population Review, 2017)

Most population growth will be in our major cities

See Section 2.1.1

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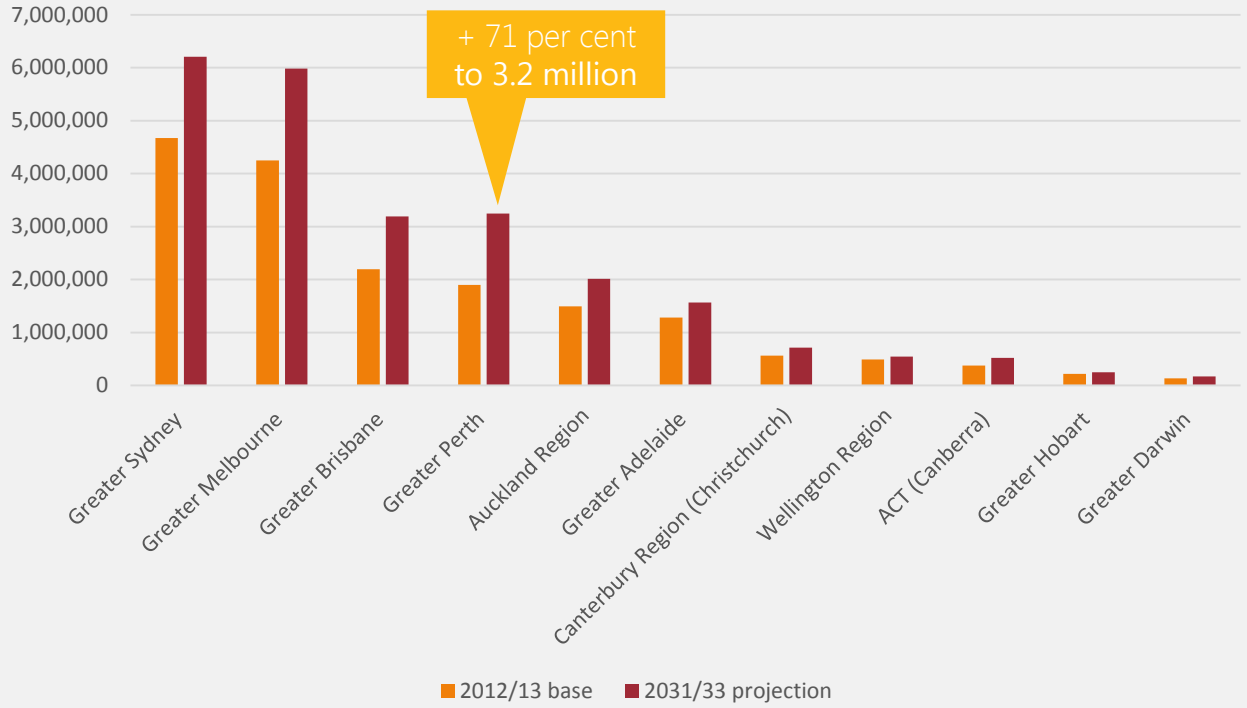
Population growth in major cities Australia 2012-2031 and New Zealand 2013-2033



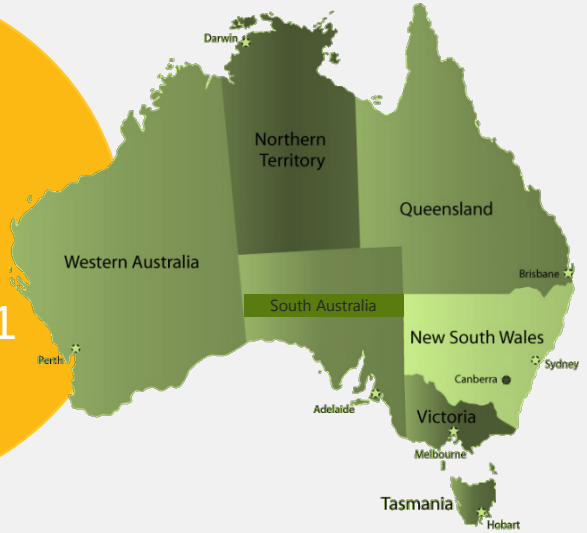
Source: Australian data is based on (Department of Infrastructure and Regional Development, 2015), New Zealand data is based on (Statistics New Zealand, 2017)

Note: Australian data is based on the years 2012 and 2031. New Zealand data is based on the years 2013 and 2033.

Australian Capital Cities Forecast:

37%

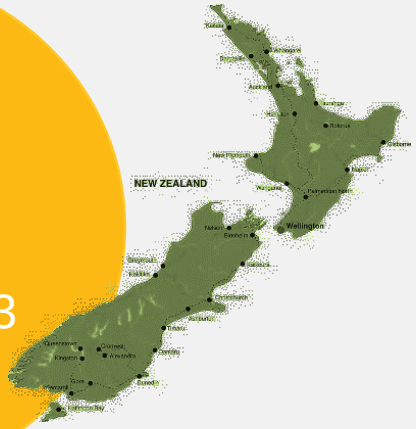
growth to 2031



NZ Capital Cities Forecast:

24%

growth to 2033



Congestion will outstrip population growth around 2026 in Australia

See Section 2.1.2

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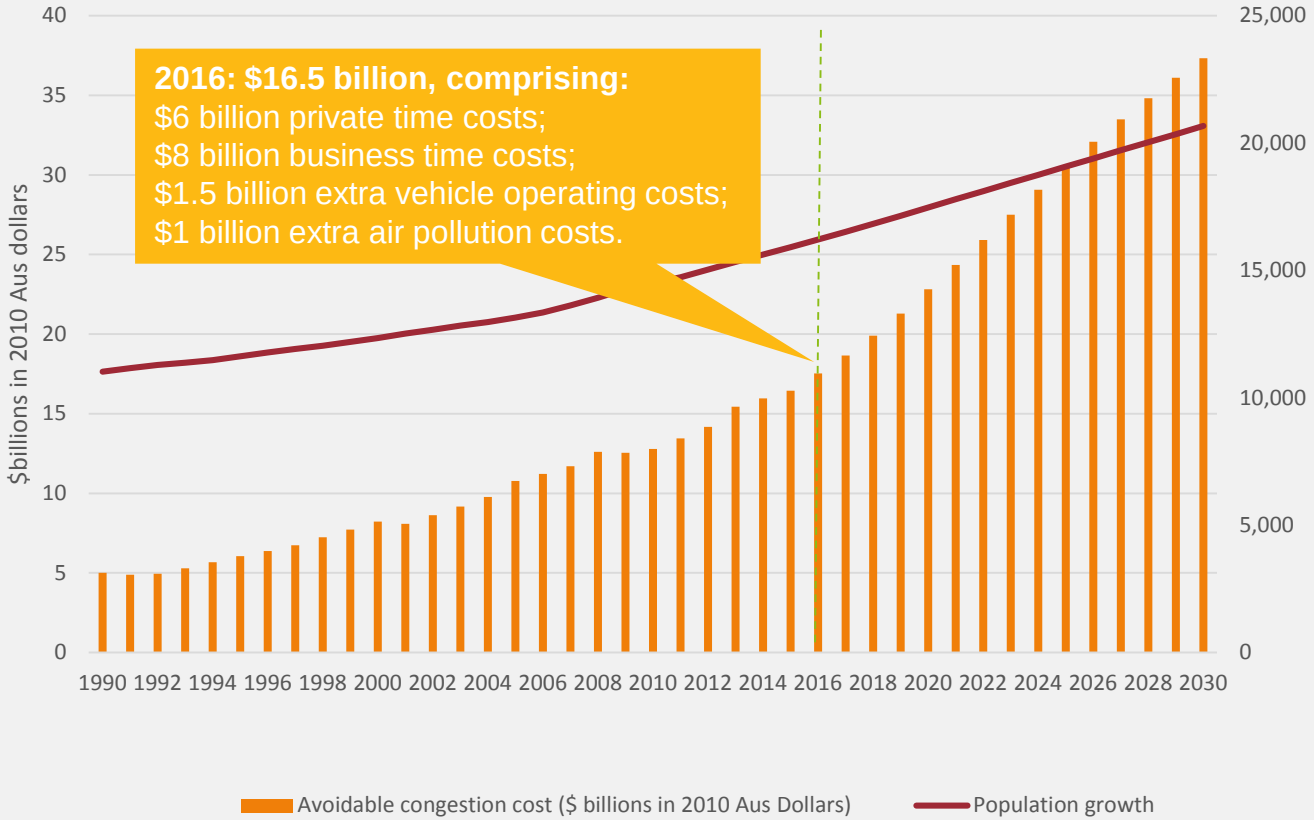
Cost of avoidable congestion in major cities in Australia population growth 1990-2030



Source: (Bureau of Infrastructure, Transport and Regional Economics, 2015)

Public transport, including on-road, is the paradigm of responding to city growth

See Section 2.1.3

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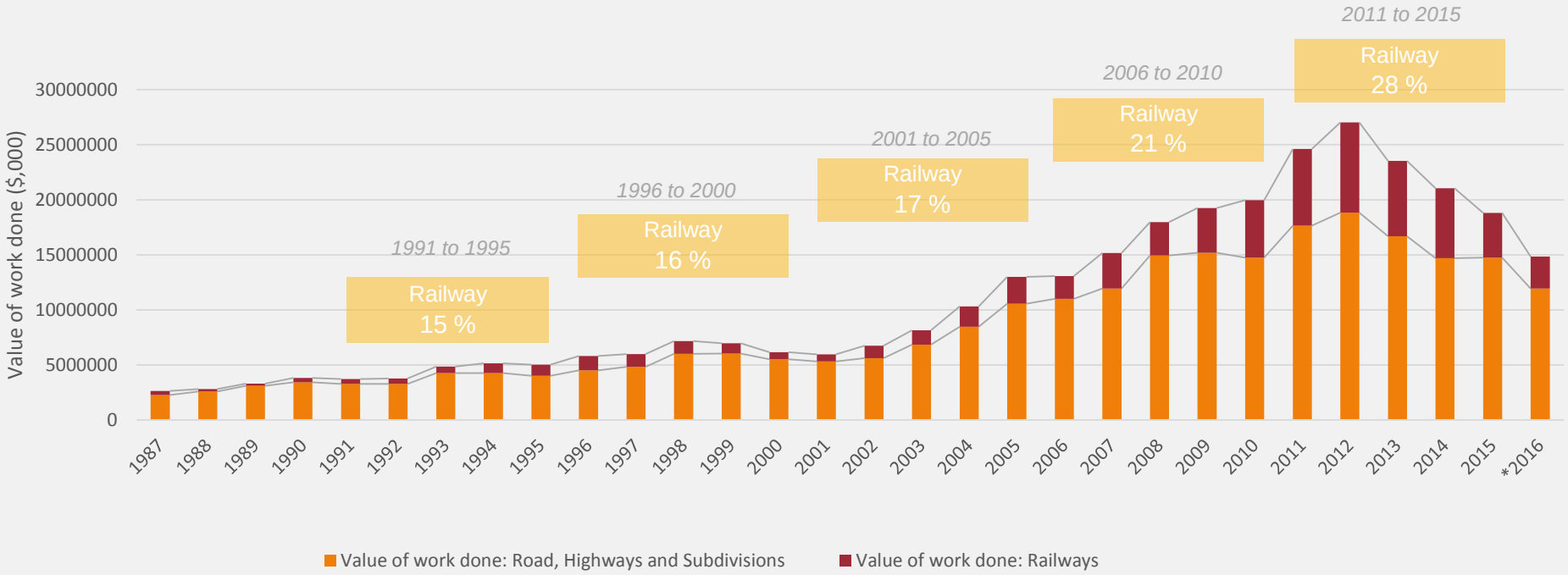
Road and public transport investment



Source: (ABS, 2016). Notes: Excludes bridges; Data for 2016 includes only first three-quarters of the year.

Note: Railways includes tracklaying; overhead power lines and signals; platforms; tramways; tunnels for underground railways; fuel hoppers. It may include non-public transport railways (such as freight lines).

Capital cities are already experiencing increased demand for movement

See Section 2.1.3

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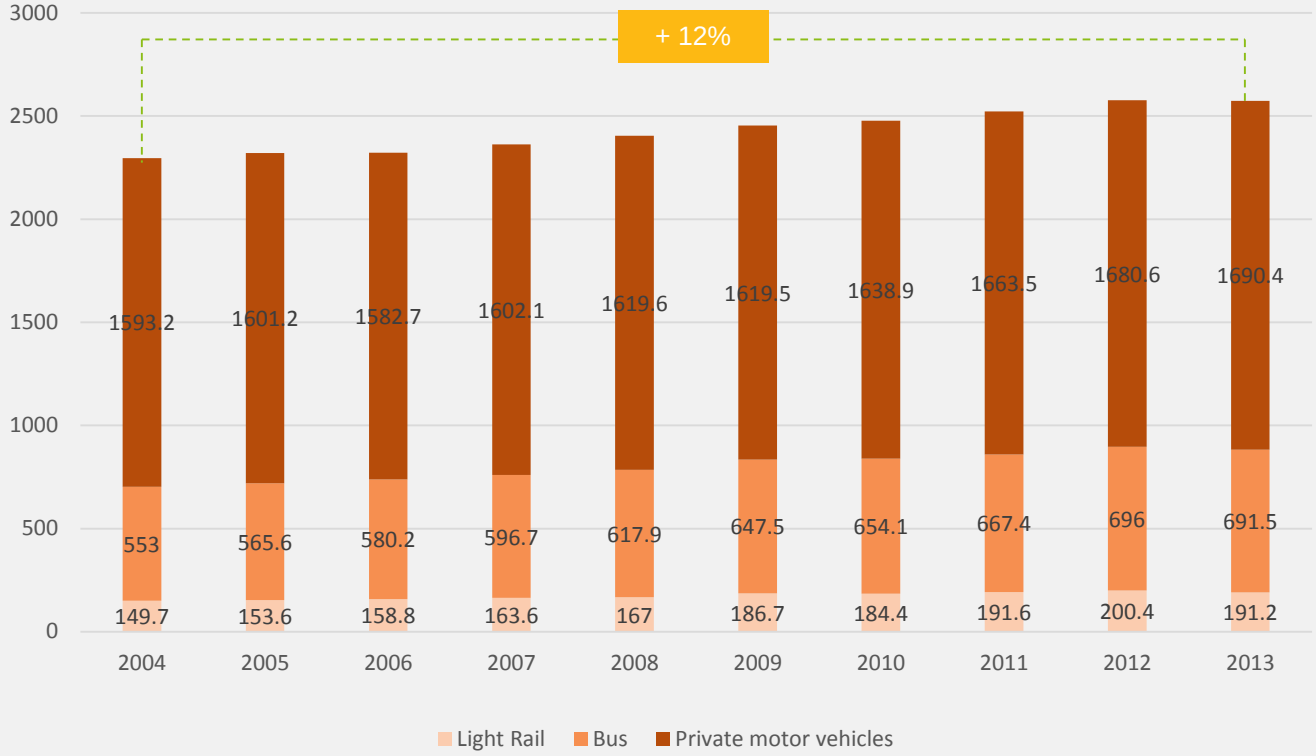
Total passenger task, on-road modes (million pax km) for Australian capital cities, 2004–2013



Source: Adapted from (Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2014)

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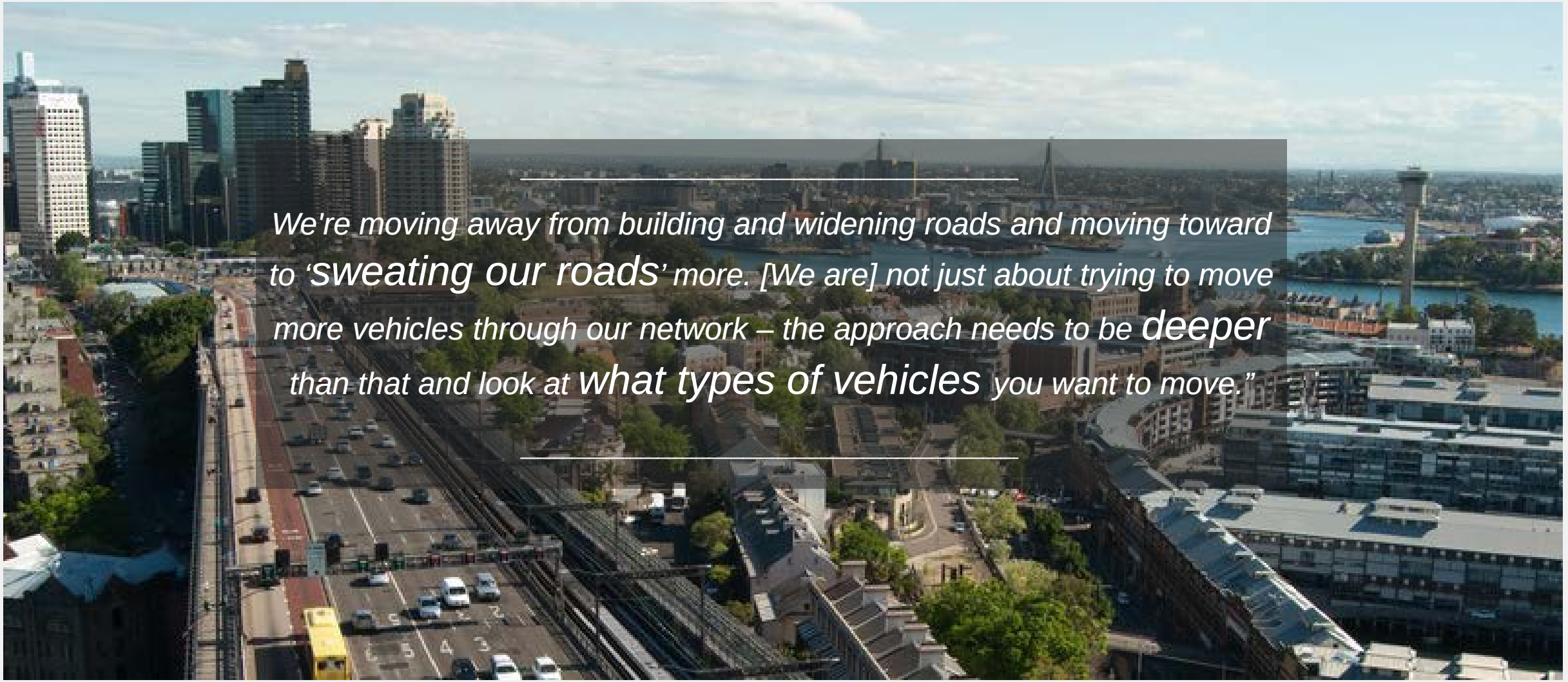
We're moving away from building and widening roads and moving toward to 'sweating our roads' more. [We are] not just about trying to move more vehicles through our network – the approach needs to be deeper than that and look at what types of vehicles you want to move."

Definitions: Focus of Project

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What is on-road public transport?

See Section 2.2

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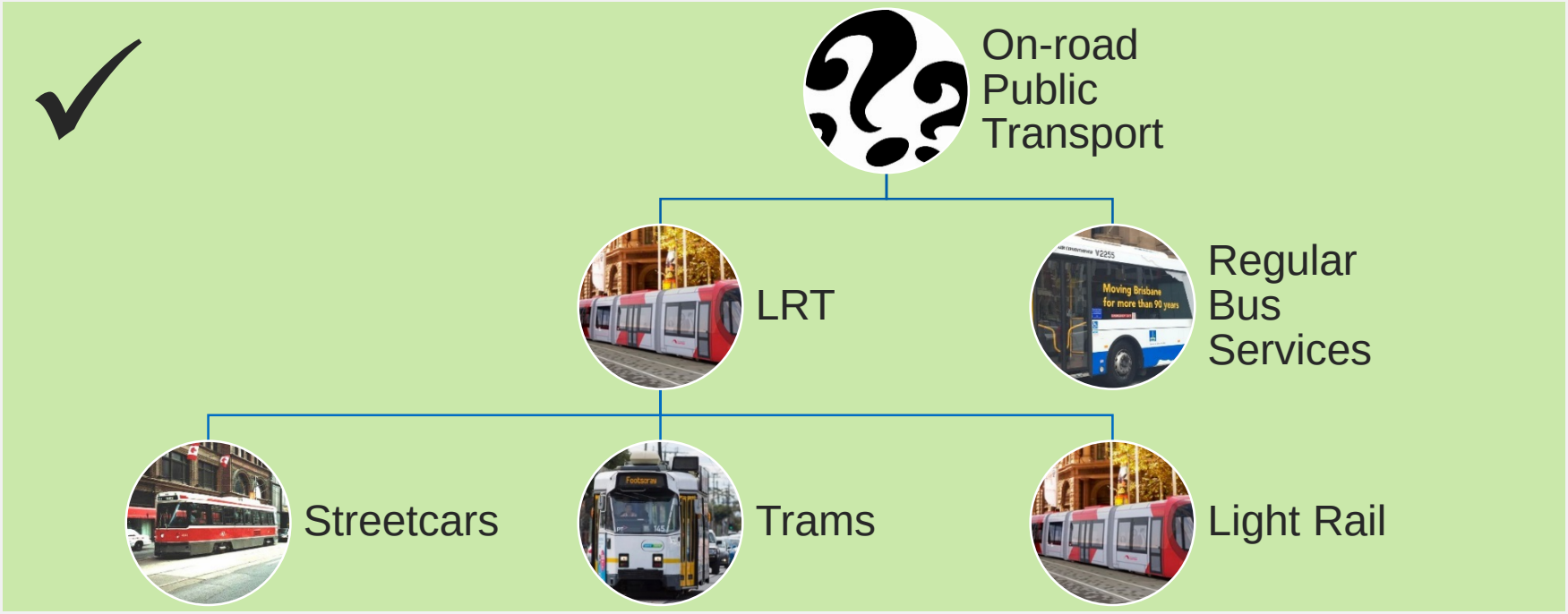

Literature Review: Findings

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What is the literature telling us?

See Section 4

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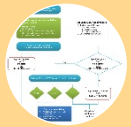
Road Space

Signals

Stops

ADVANCE LEVELS OF PRIORITY



Guidelines/ Advice

Australia/ New Zealand

International

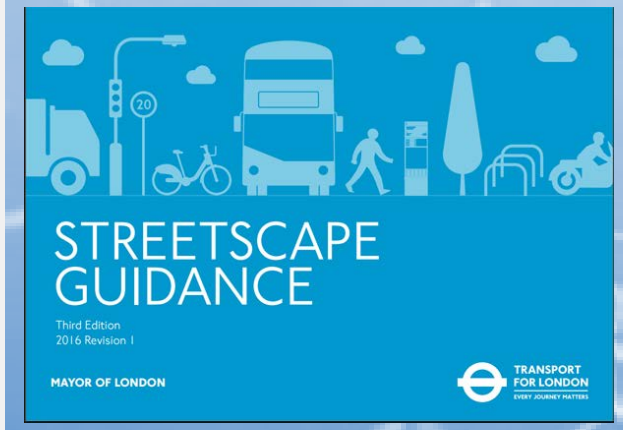
There is a degree of ‘sharing’ amongst jurisdictions

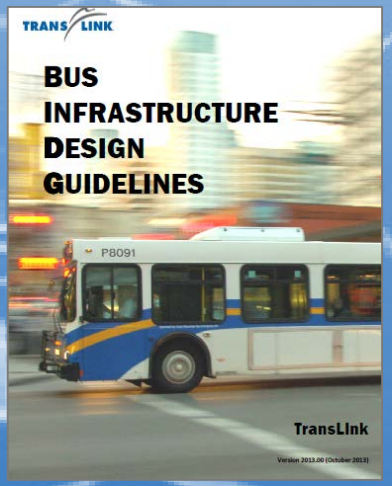
Local

Geographical Area	Road and Transport Authority	Source identified
Tasmania	Department of Infrastructure, Energy and Resources	No
Victoria	VicRoads	Yes
	Department of Transport (formerly Department of Infrastructure)	Yes*
South Australia	Department of Planning, Transport and Infrastructure	No
Australian Capital Territory (ACT)	Transport Canberra	No
	Roads ACT	No
New South Wales	Roads and Maritime Services	Yes*
	Transport for NSW	Yes*
Queensland:	Transport and Main Roads,	Yes
	Brisbane City Council,	No
Western Australia:	Main Roads WA,	No
	Department of Transport,	No
	Public Transport Authority	Yes
Northern Territory:	Department of Transport	No
New Zealand:	Auckland Council,	Yes
	Wellington Council,	No
	NZ Transport Agency	No

*Unpublished practice notes and training courses.

We also looked toward international guidelines





International

Federal Transit Administration (US)

Metropolitan Washington Council of Governments (US)

National Association of City Transportation Officials (NACTO) (US)

Translink (Vancouver Canada)

Transport for London (UK)

*Unpublished practice notes and training courses.

6 common treatments for bus road space priority

See Section 4.2.2

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Literature Review Findings

Also known as Bus Transitways in

NACTO guidelines

1 Dedicated busways

Northern Busway, Auckland, NZ

2 Bus-only streets

Warrigal Road Greenlink, Qld

3 Bus only lane

Bus Only Lane: Argyle Street, Parramatta, NSW

4 Bus lane

5 Peak bus lane

Anzac Highway, Adelaide, SA

6 Queue jump

Fitzgerald St, Mt Lawley, WA

Transit Malls in NACTO guidelines and sometimes referred to as Greenways or

Greenlinks in Australia

6 common treatments for LRT road space priority

See Section 4.2.2

Austroads

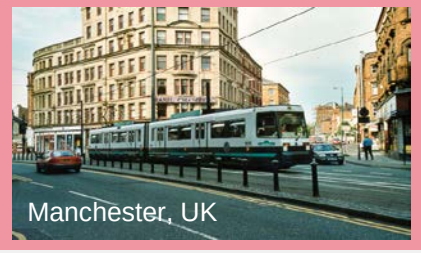
Literature Review Findings

7a Low vertical elements A

7b Low vertical elements B

8 Kerbside Running

9 Bollards



10 Hedges / planter strips

11 Green Transitways or alternative paving

12 Grade separated

Overall, overseas examples for road space priority advice broaden the suite

See Section 4.2.2

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Literature Review Findings

Bus Treatments

LRT Treatments

1 Dedicated busways

Northern Busway, Auckland, NZ

2 Bus-only streets

Warrigal Road Greenlink, Qld

3 Bus only lane

Bus Only Lane: Argyle Street, Parramatta, NSW

4 Bus lane

5 Peak bus lane

Anzac Highway, Adelaide, SA

6 Queue jump

Fitzgerald St, Mt Lawley, WA

7a Low vertical elements A

Nicholson Street, Carlton, Melbourne

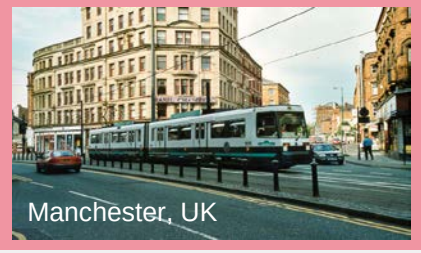
7b Low vertical elements B

Houston Metro

8 Kerbside Running

Swanston Street Melbourne, with cycle lane and no traffic lanes

9 Bollards



Manchester, UK

10 Hedges / planter strips

EXPO Line, LA

11 Green Transitways or alternative paving

Croydon, UK

12 Grade separated

Portland, US

Stop priority treatments aim to minimise dwell time

See Section 4.4

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Literature Review Findings

Bus/LRT Treatments

LRT Treatments

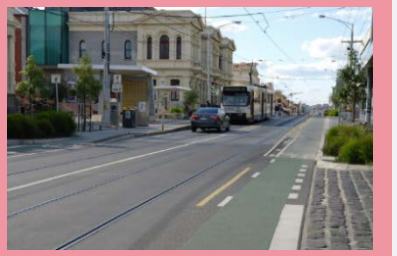
Bus Treatments

1 Trafficable Platform

2 Centre island platform stops, vehicles permitted adjacent

3 Centre island platform stops, no vehicular traffic adjacent

4 Kerb access tram stops, one traffic lane



(Vicroads, 2015)

5 Relocating stops to departure side of intersection

(Department of Infrastructure, 2001)

(Metropolitan Washington Council of Governments, 2011)

6 Stop Consolidation

(Transport for New South Wales, 2014)

(Department of Transport and Main Roads (QLD), 2016)

7 Kerb Bulbs

(Department of Infrastructure, 2001)

(Metropolitan Washington Council of Governments, 2011)

(Transport for New South Wales, 2014)

Local guidelines for LRT are Melbourne-based, but LRT is happening across Australia

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Length of Tram/LRT network (km) in Australia/New Zealand, 2017

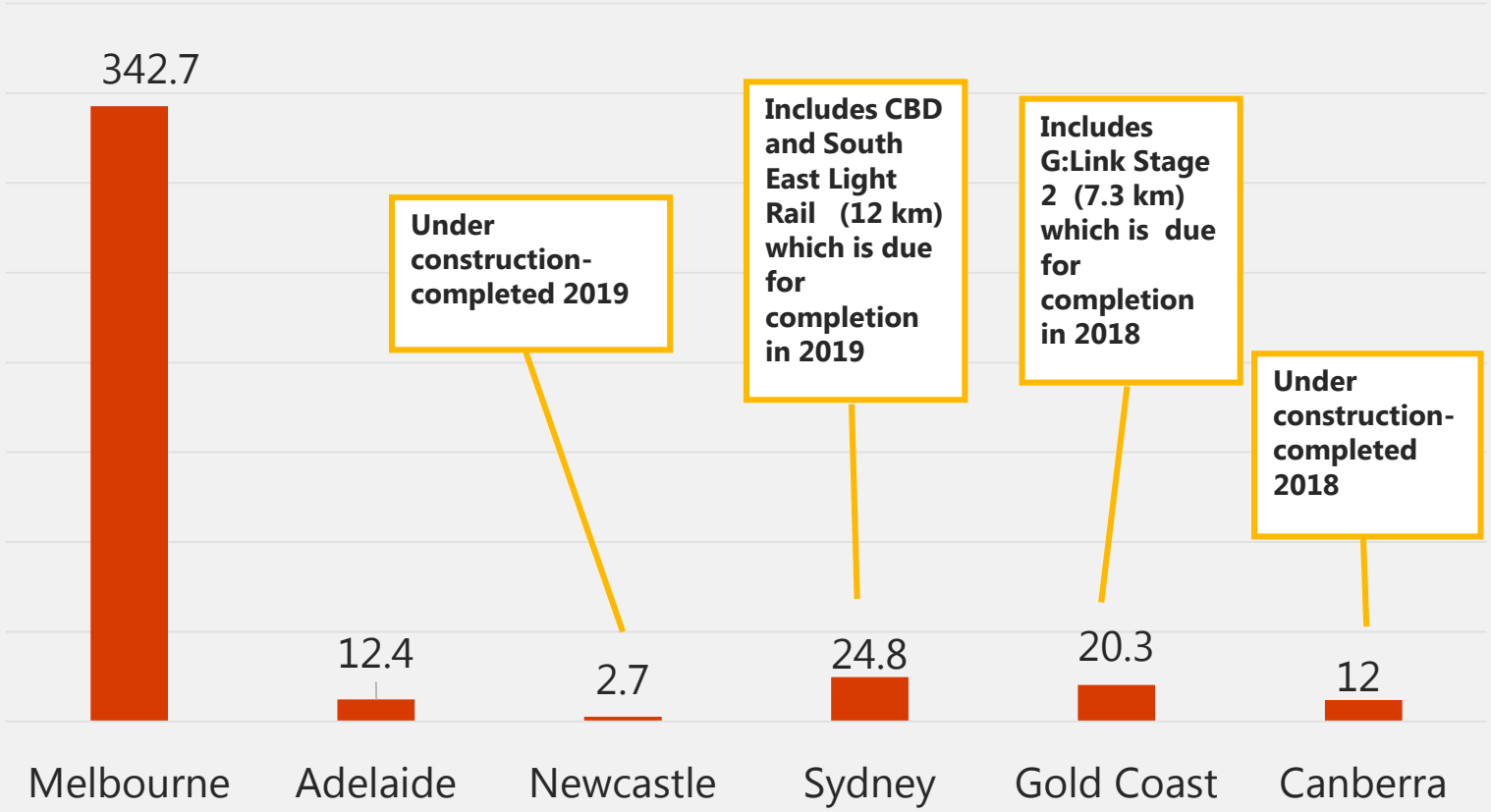

Image Source: Yarra Trams

There is three broad categories of literature on signalling

See Section 4.3

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Literature Review Findings

Loop Detection = **Results in:** Non-conditional signal priority

Loop Detection + SCATS = **Results in:** Adaptive signals based on what's best for the network. Still non-conditional.

Loop Detection + SCATS + On-board Automatic Vehicle Location (AVL) technology = **Results in:** Link between the public transport vehicle and the signal system allows for conditional priority

Best Practice Case Studies

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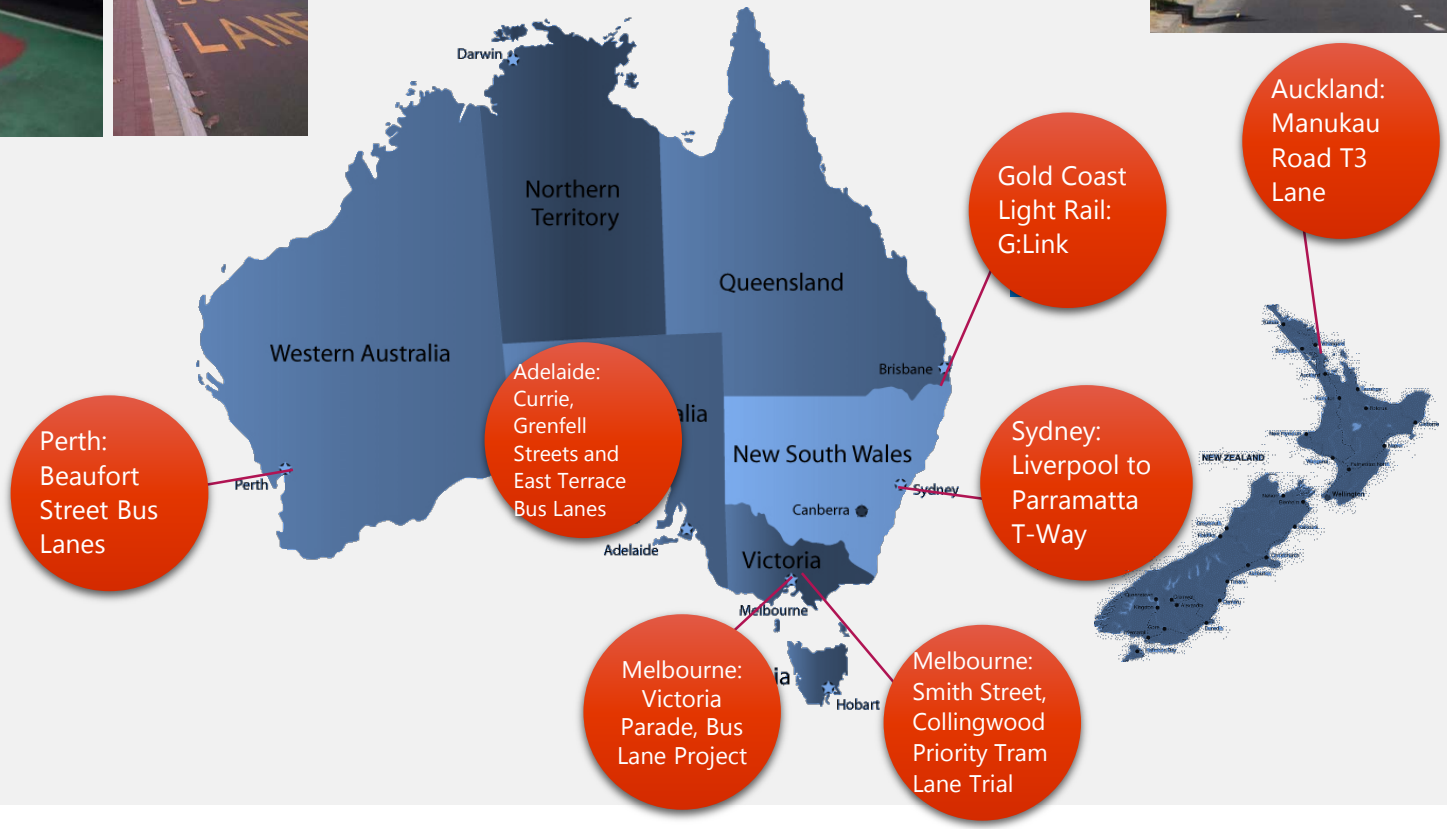
Case studies were identified by undertaking interviews

Stakeholders- Road and Traffic Authorities

Case studies came from right across Australia and New Zealand



Case studies reflect 3 layers of priority

See Section 5.3

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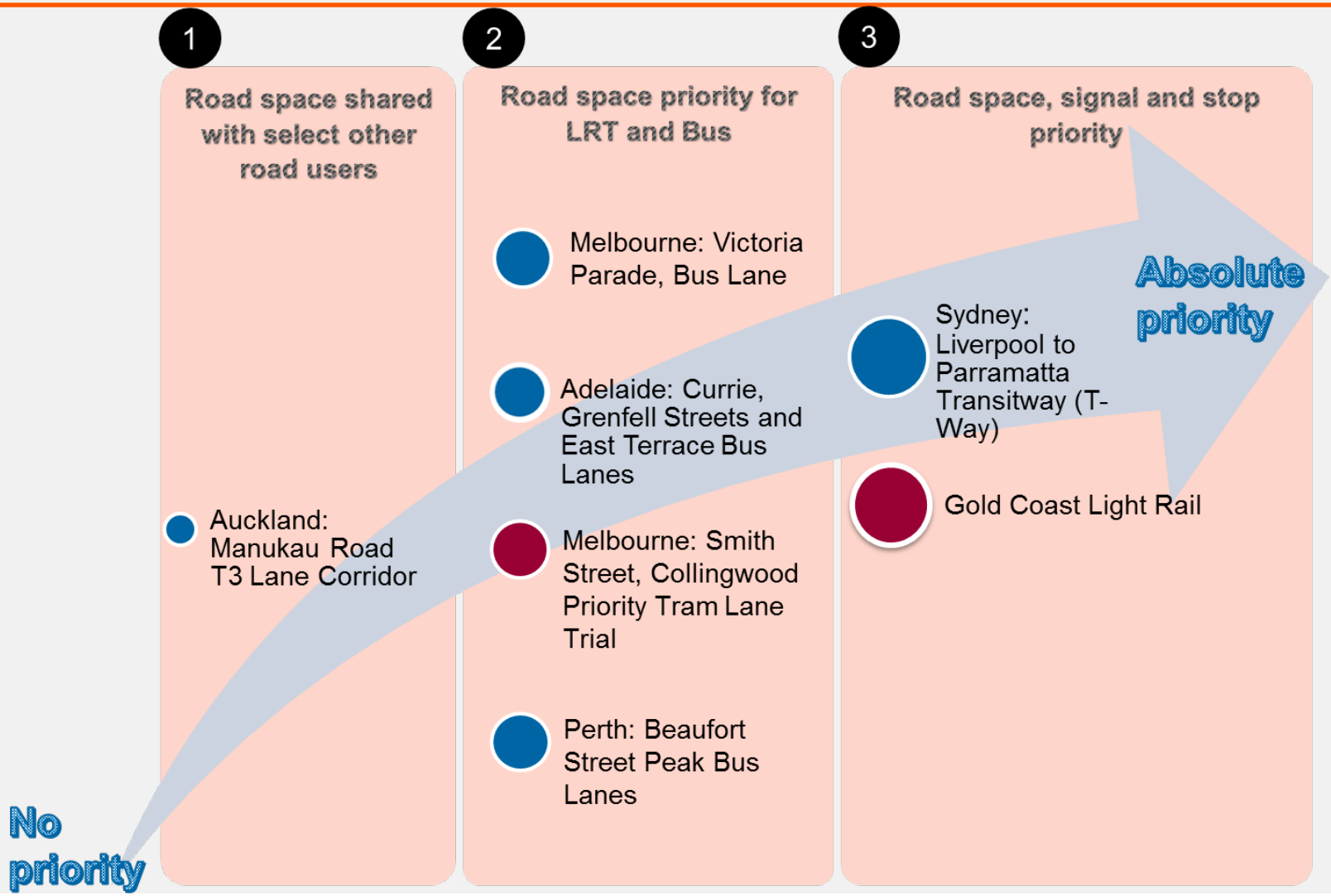

The Manukau Road bus - decreased journey times and mode shifts

See Section 5.2

	Bus/LRT Journey time	Bus/LRT Reliability	Mode Shift	General Traffic
Auckland: Manukau Road T3 Lane Corridor	Inbound: 29 min to 15 minutes Outboand: 3 min savings		Bus Occupancy Up 20%	PM Peak 2-3 Minute delay

Positive impact Negative impact No Data/ Not Yet Assessed

The East Terrace project has produced benefits for passengers but some delay to general traffic…

See Section 5.2

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	Bus/LRT Journey time	Bus/LRT Reliability	Mode Shift	General Traffic
Adelaide: Currie, Grenfell Streets and East Terrace Bus Lanes	AM Peak- 3 to 60 Second improvement PM Peak- 30 to 3 minute 9 second saving	16% improvement		40-56 second delay in Westbound direction

Positive impact Negative impact No Data/ Not Yet Assessed

…similar to the Beaufort Street Peak Bus Lanes, but with some diversion of traffic

See Section 5.2

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	Bus/LRT Journey time	Bus/LRT Reliability	Mode Shift	General Traffic
Perth: Beaufort Street Peak Bus Lanes	AM Peak (Inbound): 1 min and 27 –second saving PM Peak (Outbound): 15-second saving	AM Peak (Inbound): 29% improvement All day (Inbound): 3% improvement PM Peak (Outbound): 35% improvement All day (Outbound): 2% improvement	Bus occupancy of 950 service up 3% in 2015, than the four routes it replaced	Traffic on Beaufort Street fell in 2014 with proportional increased seen on parallel roads. Increase in illegal use of bus lanes

Positive impact Negative impact No Data/ Not Yet Assessed

The Liverpool to Parramatta Transitway has produced very large travel time savings

See Section 5.2

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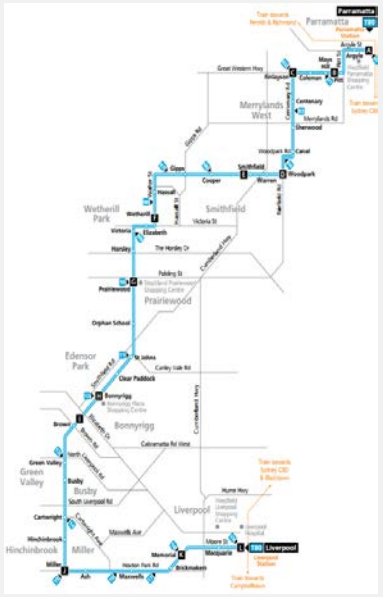
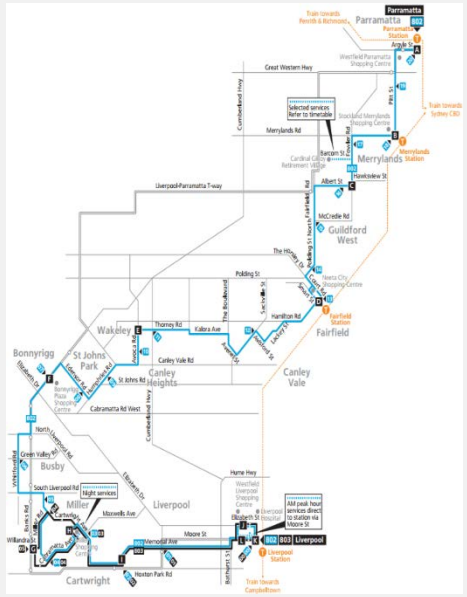
Sydney, Liverpool to Parramatta: T-Way (left), Route 802/3 (right)





	Bus/LRT Journey time	Bus/LRT Reliability	Mode Shift	General Traffic
Sydney: Liverpool to Parramatta Transitway (T-Way)	Eg: West Merrylands to Wetherill Park: 20 min (50 min saving). Bonnyrigg to Miller TAFE: 15 min (40 min saving)			

Positive impact Negative impact No Data/ Not Yet Assessed

The Victoria Parade Bus Lane Project has produced overall journey time savings

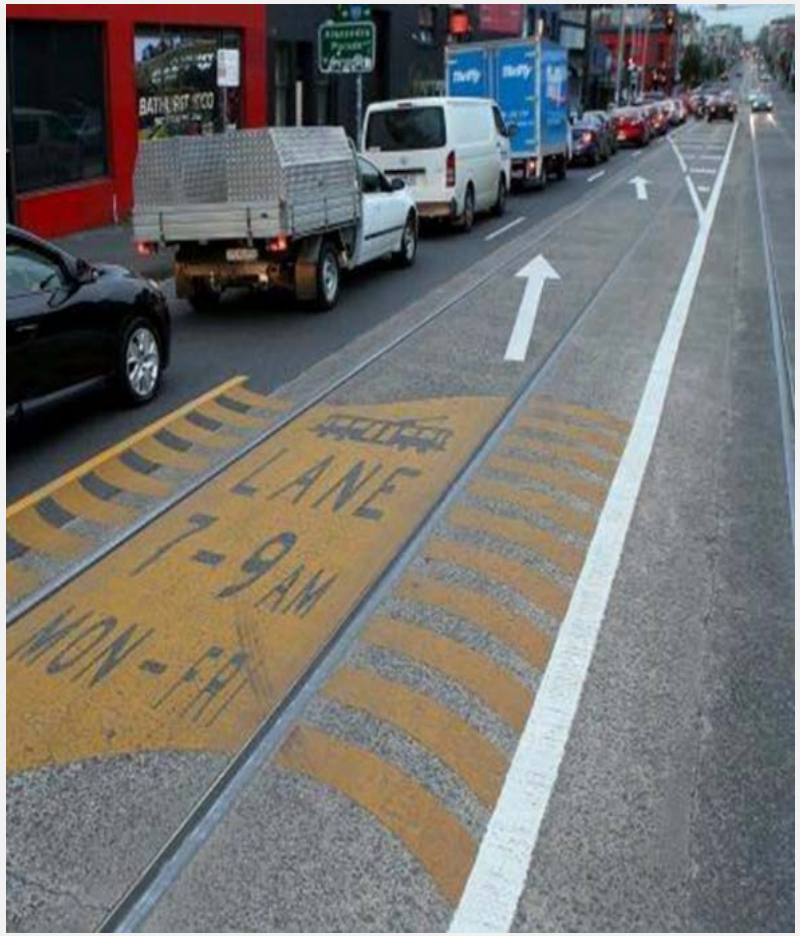
See Section 5.2

	Bus/LRT Journey time	Bus/LRT Reliability	Mode Shift	General Traffic
Melbourne: Victoria Parade, Bus Lane Project	AM Peak (Outbound): 54-second delay AM Peak (Inbound): 168-second saving PM Peak (Outbound): 108-second saving PM Peak (Inbound): 138-second saving			

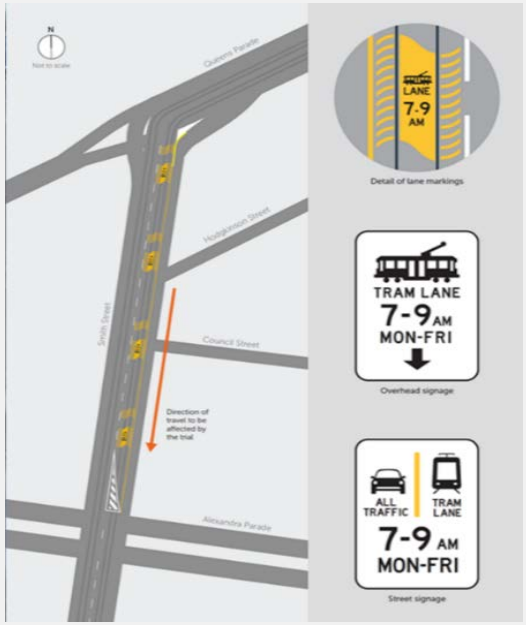
Positive impact Negative impact No Data/ Not Yet Assessed

Smith Street Tram Priority has improved reliability and journey times for passengers

See Section 5.2



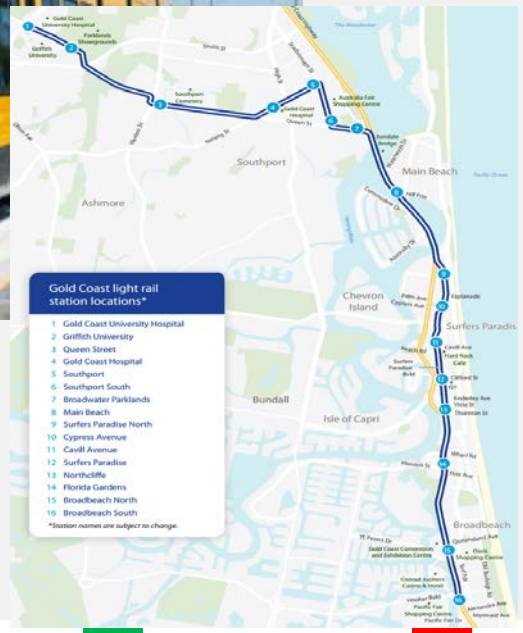
	Bus/LRT Journey time	Bus/LRT Reliability	Mode Shift	General Traffic
Melbourne: Smith Street, Collingwood Priority Tram Lane Trial	AM Peak (City bound): 42-second saving	24% improvement		



Positive impact | Negative impact | No Data/ Not Yet Assessed

G:Link (stage 1) has produced a mode shift benefit whilst generally decreasing traffic

See Section 5.2



	Bus/LRT Journey time	Bus/LRT Reliability	Mode Shift	General Traffic
Gold Coast. G: Link, Light Rail			+15.26% of ave daily trips from 2014/15 to 2015/16	Overall decrease in traffic – with one exception of the Gold Coast Hwy

Positive impact Negative impact No Data/ Not Yet Assessed

Considerations for Updates to The Guide

Alison Lee

Austroads

Four areas to consider when updating The Guide

1. Knowing the problems and cause > to determine the right treatment
2. Having easy ‘ready reckoners’ to quickly/cheaply determine the correct point to intervene;
3. Updating The Guide with a broad array of treatment types which reflect current emphasis of on-road public transport in Australia and New Zealand; and
4. Considering broad array of impacts when implementing

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We recommend structuring guidance based on 'Problem Type'

See Section 6.1

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Problem

- This guidance has categorised the common causes of PT problems as relating to:
  - Reliability
  - Vehicle Speed

Cause

- Common causes of reliability and vehicle speed problems are categorised as:
  - Congestion (traffic, bus and LRT);
  - Demand for movement (both traffic and on-road public transport);
  - Stop placement, design and frequency.

Investigation

Solution

- Solutions are based on the following categories:
  - Road Space
  - Stop
  - Signal
  - Policy

Implementation

- Practical guidance on considering impacts on:
  - Pedestrians
  - Cyclists
  - General traffic including management of: Parking, managing traffic demand, driveways and left turning traffic

The common causes of on-road public transport problems are…

See Section 6.3

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…1. Traffic Congestion and Demand

See Section 6.3

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2. Bus/LRT Congestion

See Section 6.3

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3. Stop Frequency

See Section 6.3

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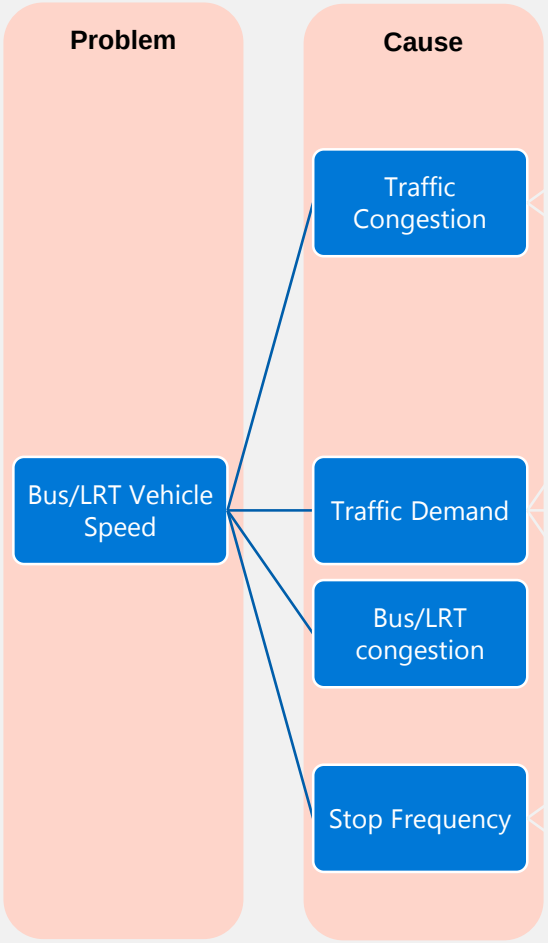
Identifying the problem and cause can narrow down the response…

Bus/LRT Vehicle Speed Problems: Overview of Causes, Investigations and Solutions

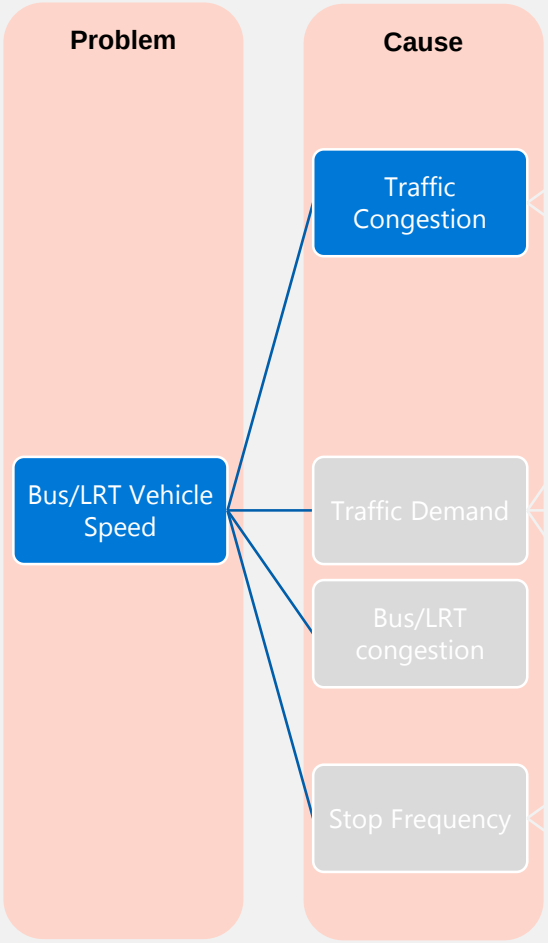
For example



Bus/LRT Vehicle Speed problems, caused by congestion…

Bus/LRT Vehicle Speed Problems: Overview of Causes, Investigations and Solutions

For example



…requires a structured response focussed on signal priority and dedicated road space

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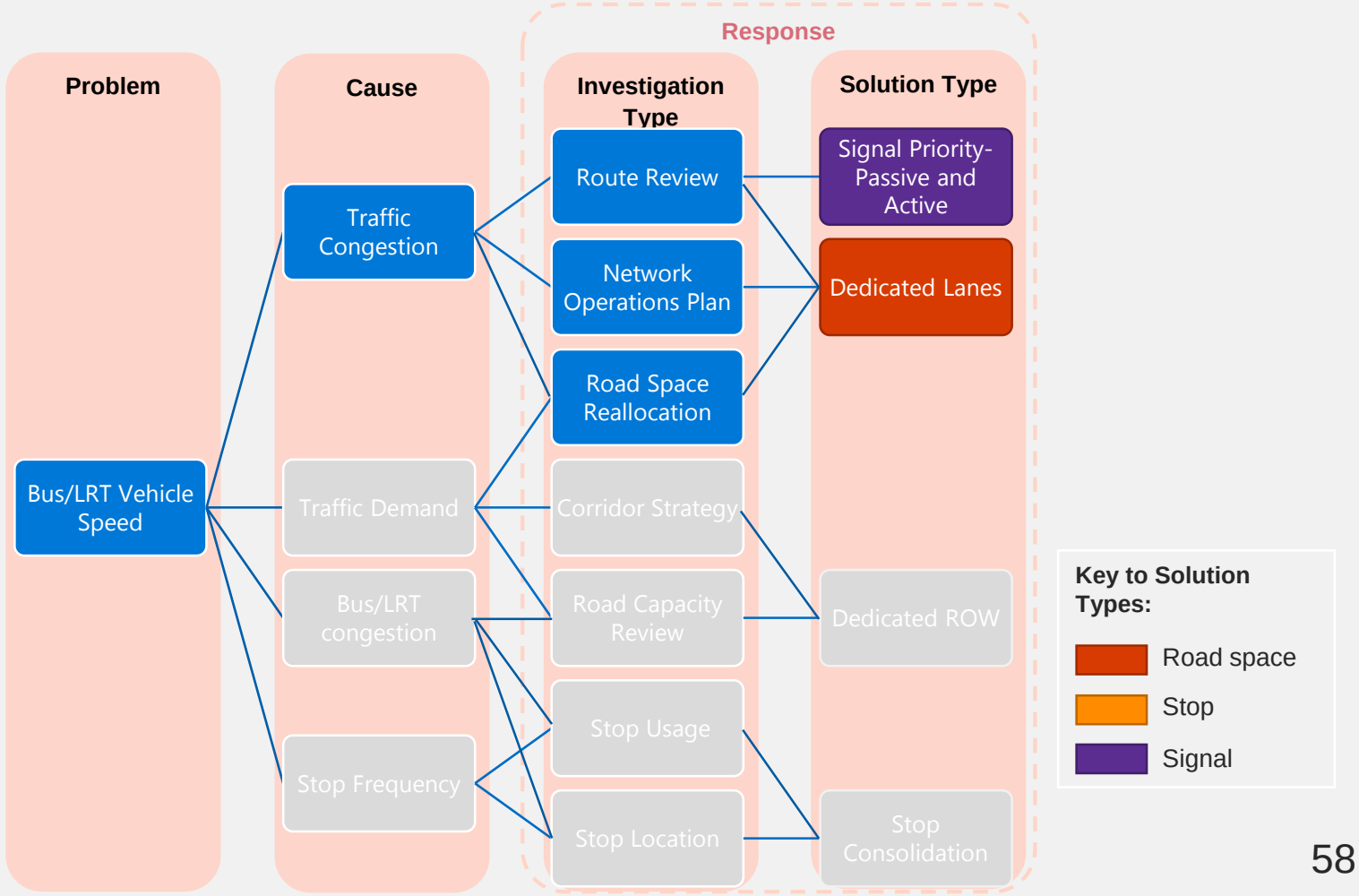
Bus/LRT Vehicle Speed Problems: Overview of Causes, Investigations and Solutions

For example



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5 ‘ready reckoner’ prototypes…

What is the threshold at which bus vehicle speeds are so low, intervention is required?

See Section 6.3.2

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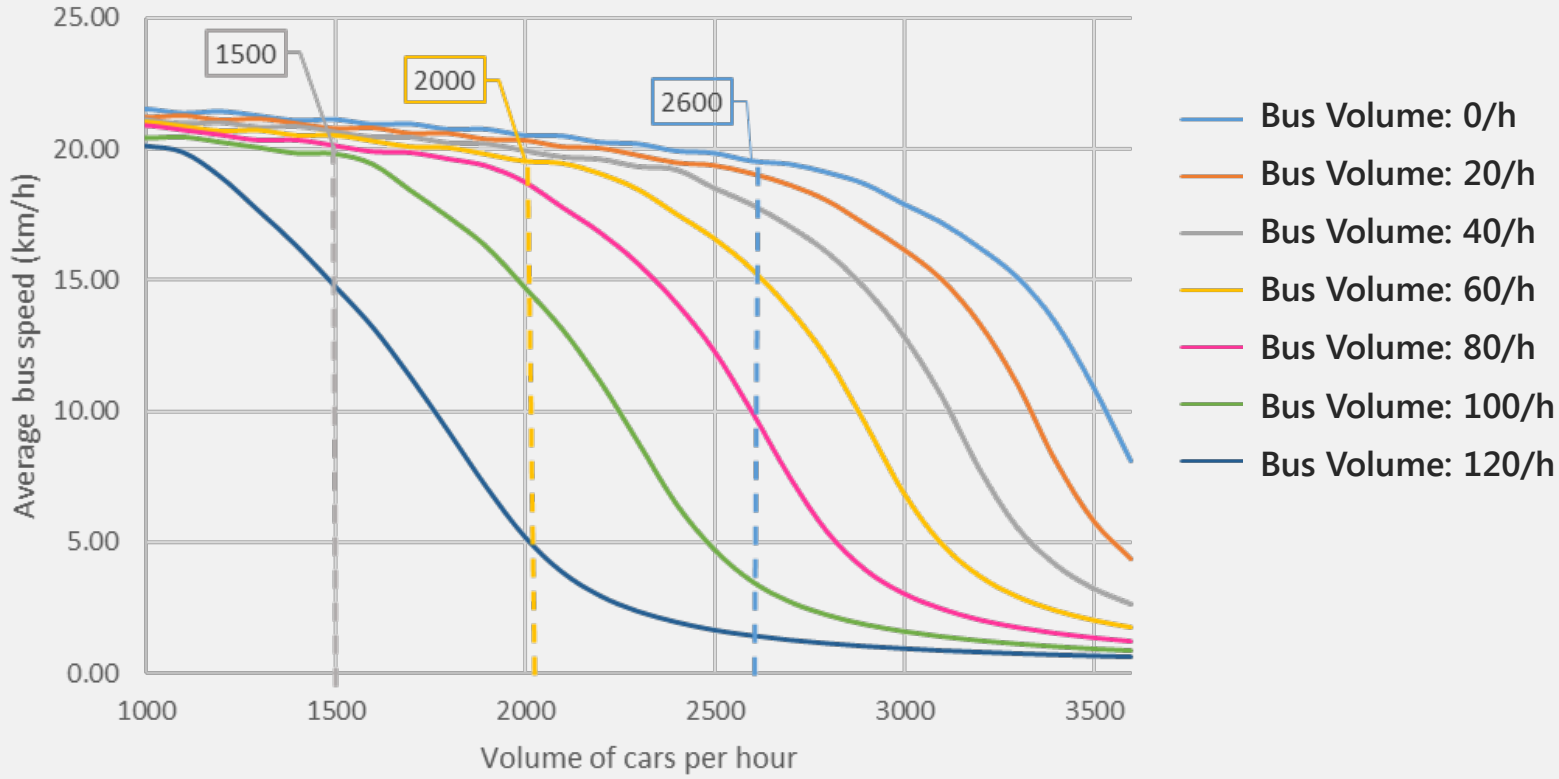
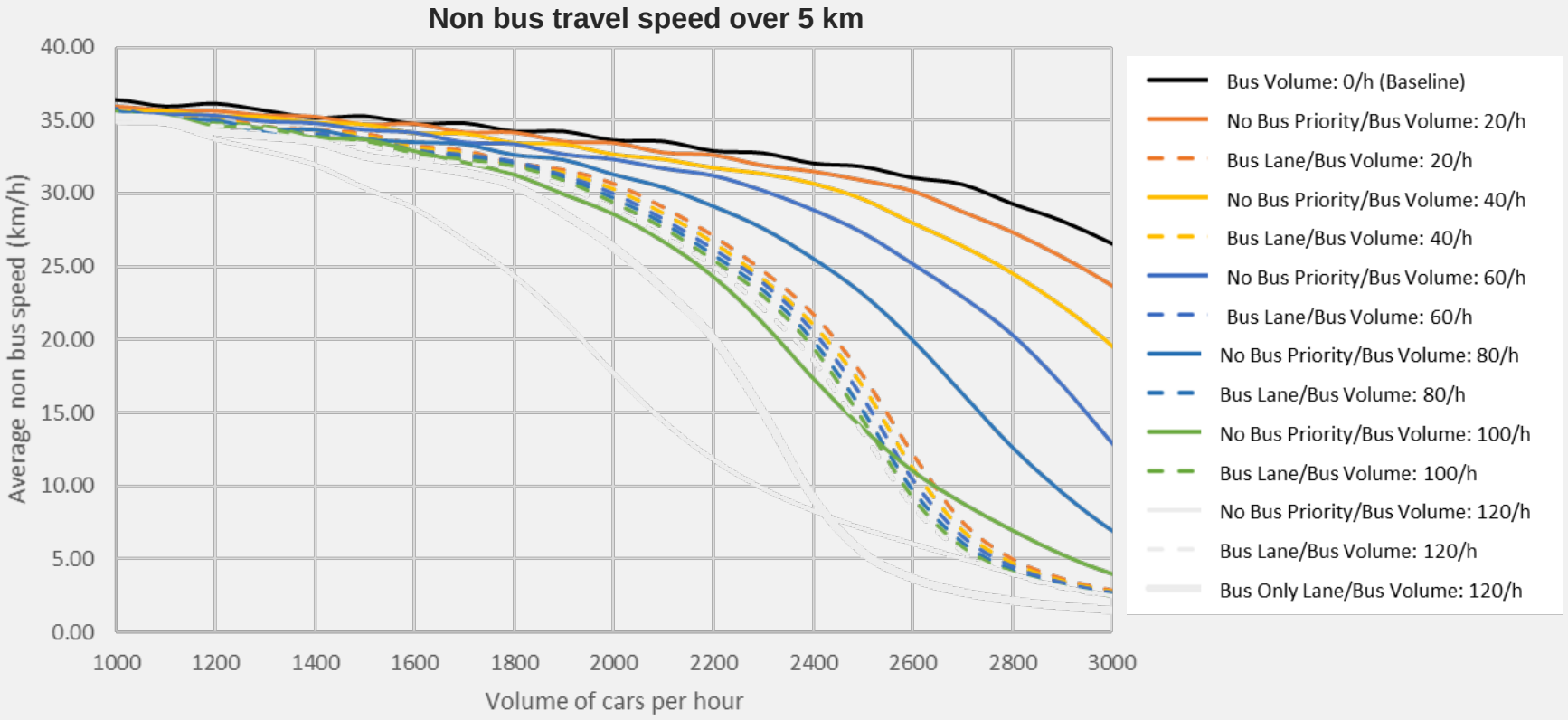
Bus and LRT Vehicle Speed and Traffic Volume, Vehicle Speed over 5 km per hour



Note: Scenarios for a corridor carrying three lanes in one direction, with a speed limit of around 60 km per hour and where traffic signals have a green time ratio of 0.64. Volume delay curves have been developed using ARR123 Traffic Signal Timing, Capacity and Analysis and Transit Capacity and Quality of Service Manual.

What is the threshold at which non-bus vehicle speeds are so low, intervention is required?



What is the threshold at which vehicles are delayed so much, intervention is required?

See Section 6.3.3

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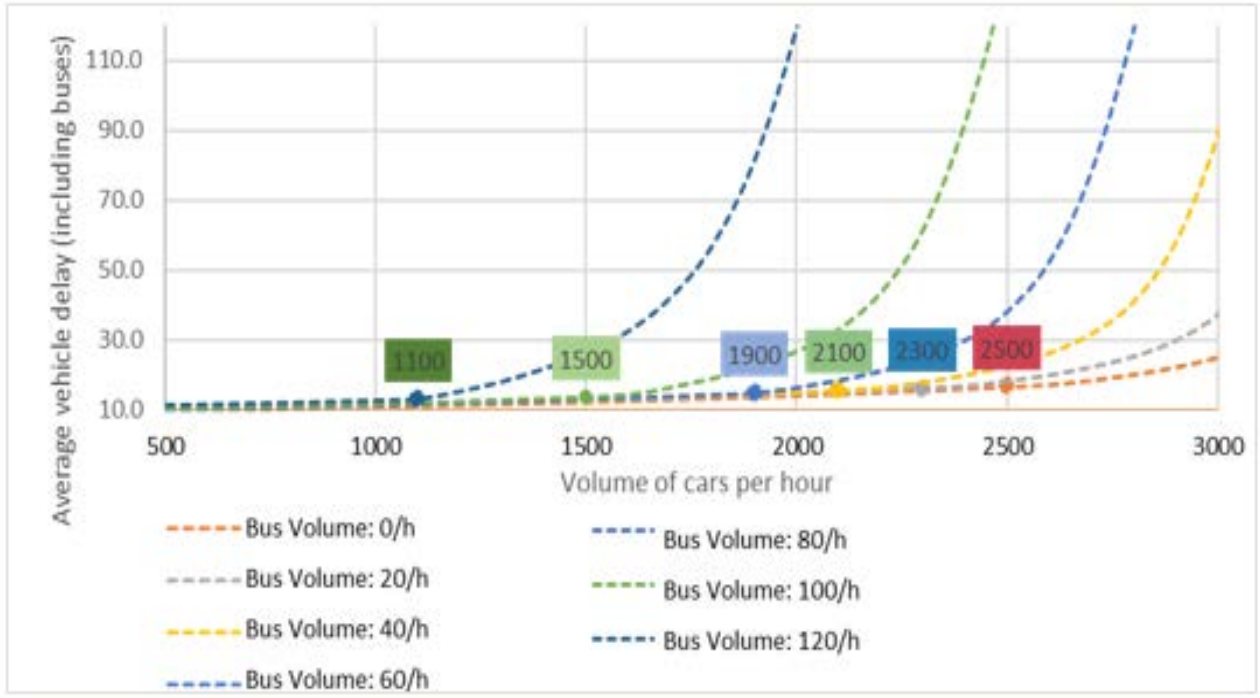

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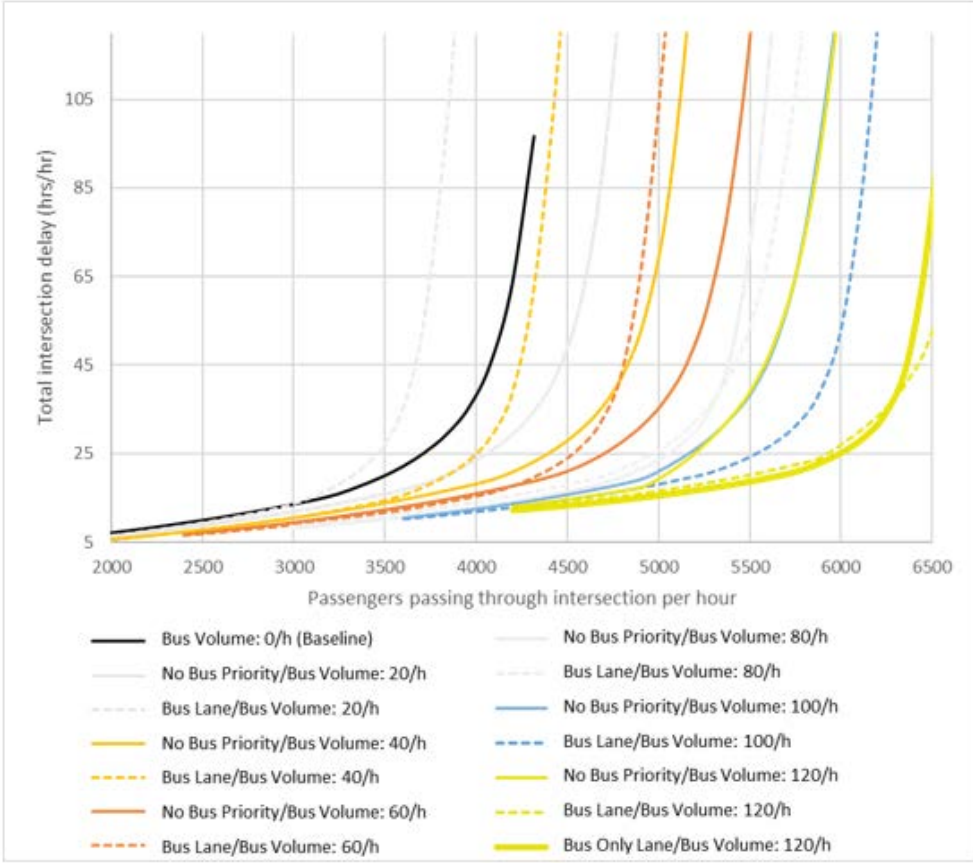
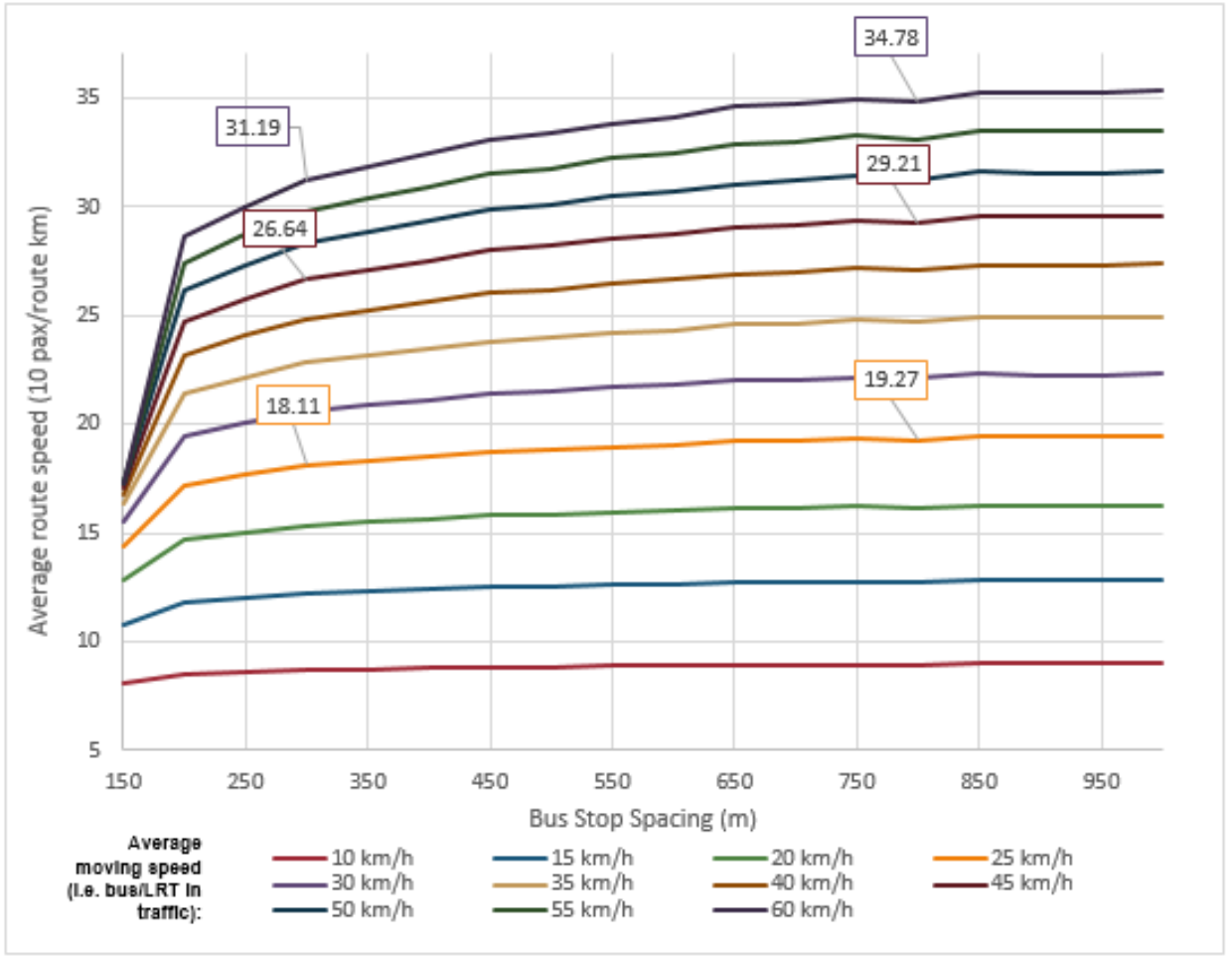


Note: Scenarios for a corridor carrying three lanes in one direction, with a speed limit of around 60 km per hour and where traffic signals have a green time ratio of 0.64. Volume delay curves have been developed using ARR123 Traffic Signal Timing, Capacity and Analysis and Transit Capacity and Quality of Service Manual.
** Refers to a NSW bus lane which can be used also by Taxis/ Hire Cars; Motorcycles; Bicycles; and Emergency vehicles.*

What is the threshold at which bus/LRT route speeds are so low, intervention is required?

See Section 6.3.4

Austroads



Note: Based on Bus Stop Spacing using Transit Capacity and Quality of Service Manual

Four areas to consider when updating The Guide

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4. Considering broad array of impacts when implementing

Guidance *largely* already exists, albeit dispersed

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LRT Dedicated ROWs	LRT Grade separation	LRT High vertical elements– bollards; hedges/planter strips; and green transitways or alternative paving.	LRT Kerbside Running	Dedicated busways	Bus-only streets
Tramways – Line marking denoting where only LRT is permitted to use the road;	LRT: Low vertical elements – kerbs, rubber dividers and low domes;	LRT: Low vertical elements – Green transitways or alternative paving	Bus Only Lanes and Bus Lanes	Peak bus lane	Queue jump
Priority Tram Lane Line Marking	Kerb Outstands	Centre island platform stops, no vehicular traffic adjacent to tram track	Trafficable platform, one traffic lane	Relocating stops to departure side of intersection	Consolidating stops based on whether they are a local or express route.
Loop Detectors (vehicle detectors)	Loop Detectors and SCATS	Loop Detectors, SCATS and STREAMS	Loop Detectors, SCATS and GPS, Optical or Laser (also known as Automatic Vehicle Location (AVL))	B/T Lights: Advanced or extended phases (including Green Wave)	B/T Lights: Bus or LRT only right turn at intersection or other designated movements

Road space: Dedicated ROWs, Dedicated lanes, Infrastructure legibility
Stop: Stop Design, Stop Location, Stop Consolidation
Signal: Passive, Active, Treatment Types

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Before implementation of the responses to the problems, we must consider…

See Section 6.6

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Pedestrians	Cyclists	Public transport users	Stops	Parking
Traffic	Signals	Access to driveways	Amenity	Compliance/enforcement
Infrastructure design	Operations	Capital and operational costs	Maintenance	Policy

Summary

Alison Lee

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We are experiencing a period of increased pressure on our roads

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Urbanisation

85.7 % of New Zealand's population;

88.9 % of Australia's population

Paradigm shifting with value of PT investment increasing since mid 2000s

Prioritising signals
Prioritising stops
Prioritising road space

Population Growth

23-36% more by 2050

Cost of Avoidable Congestion

$16.5b in 2016

City Population Growth

24-37% more by 2031/2033

The literature review revealed extensive array of treatments reflected in guidelines

Austroads

Activity 1: Literature Review

1 Dedicated busways

2 Bus-only streets

3 Bus only lane

4 Bus lane

5 Peak bus lane

6 Queue jump

7a Low vertical elements A

7b Low vertical elements B

8 Kerbside Running

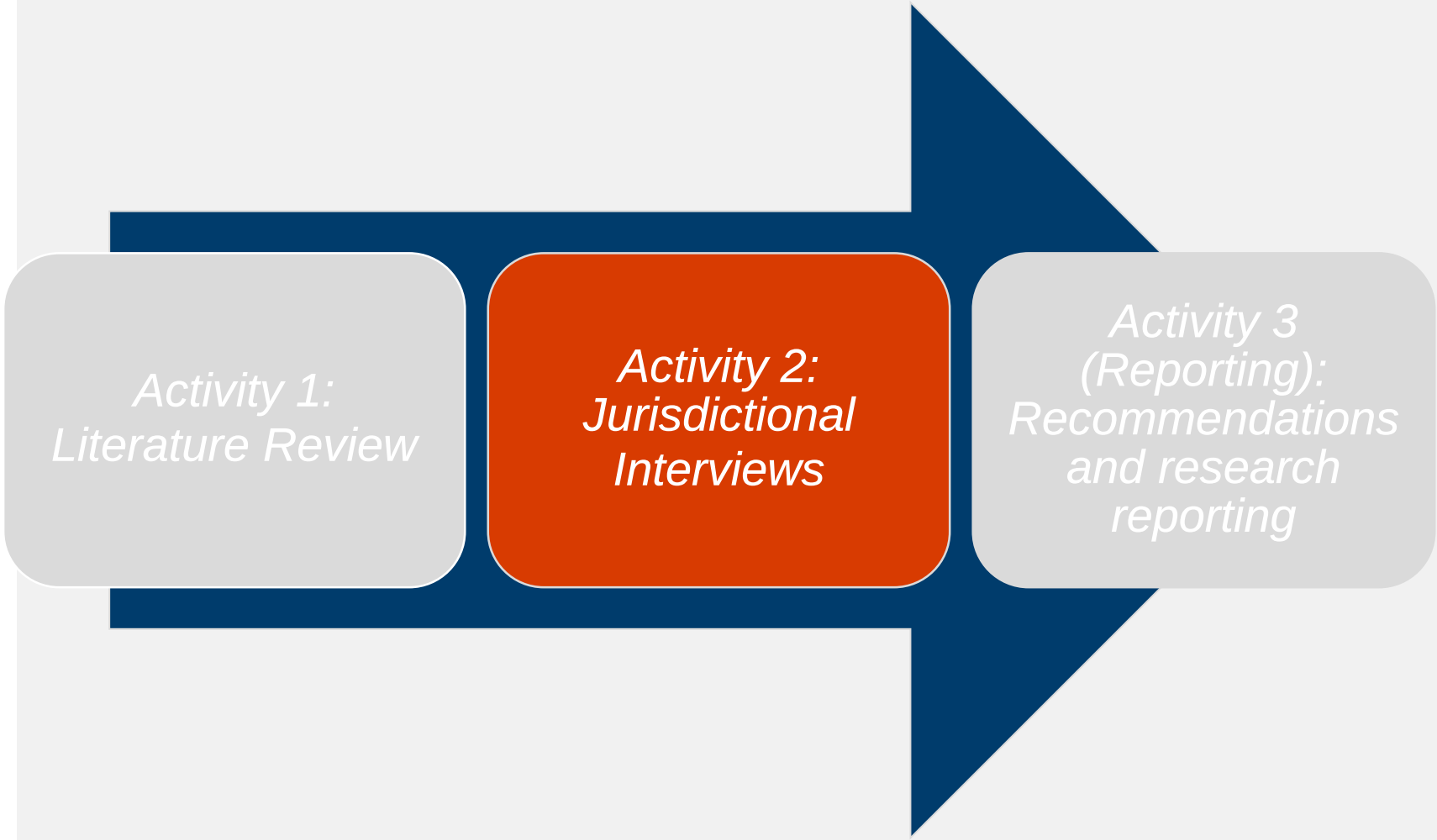
9 Bollards

10 Hedges / planter strips

11 Green Transitways or alternative paving

12 Grade separated

The interviews revealed positive impacts of projects



The interviews revealed positive impacts of projects and invention which isn't always reflected in guidelines

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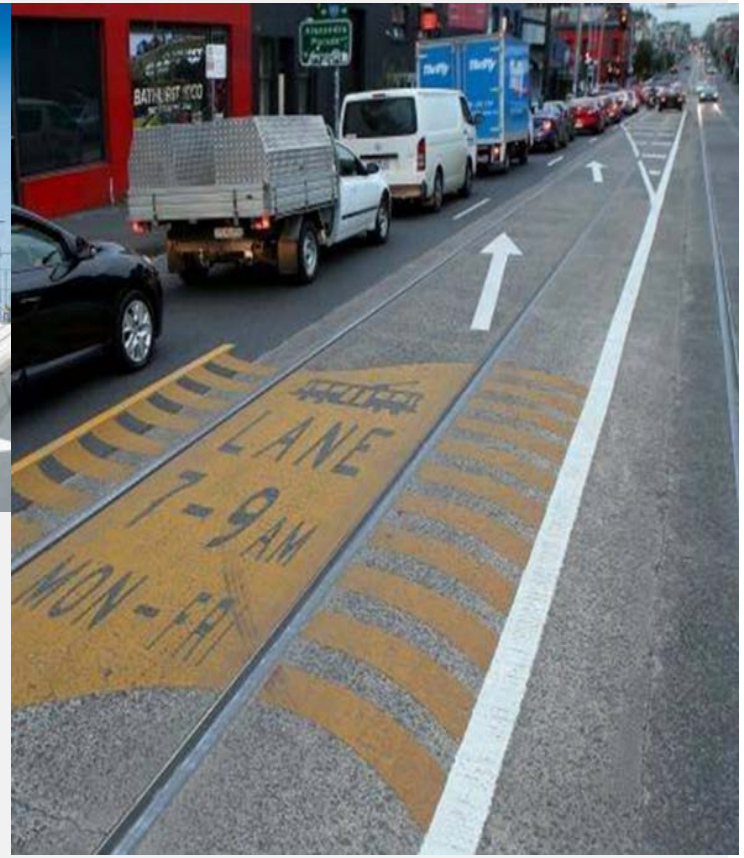
Activity 1: Literature Review

Activity 2: Jurisdictional Interviews



This stage also ‘filled out’ the picture of treatment types

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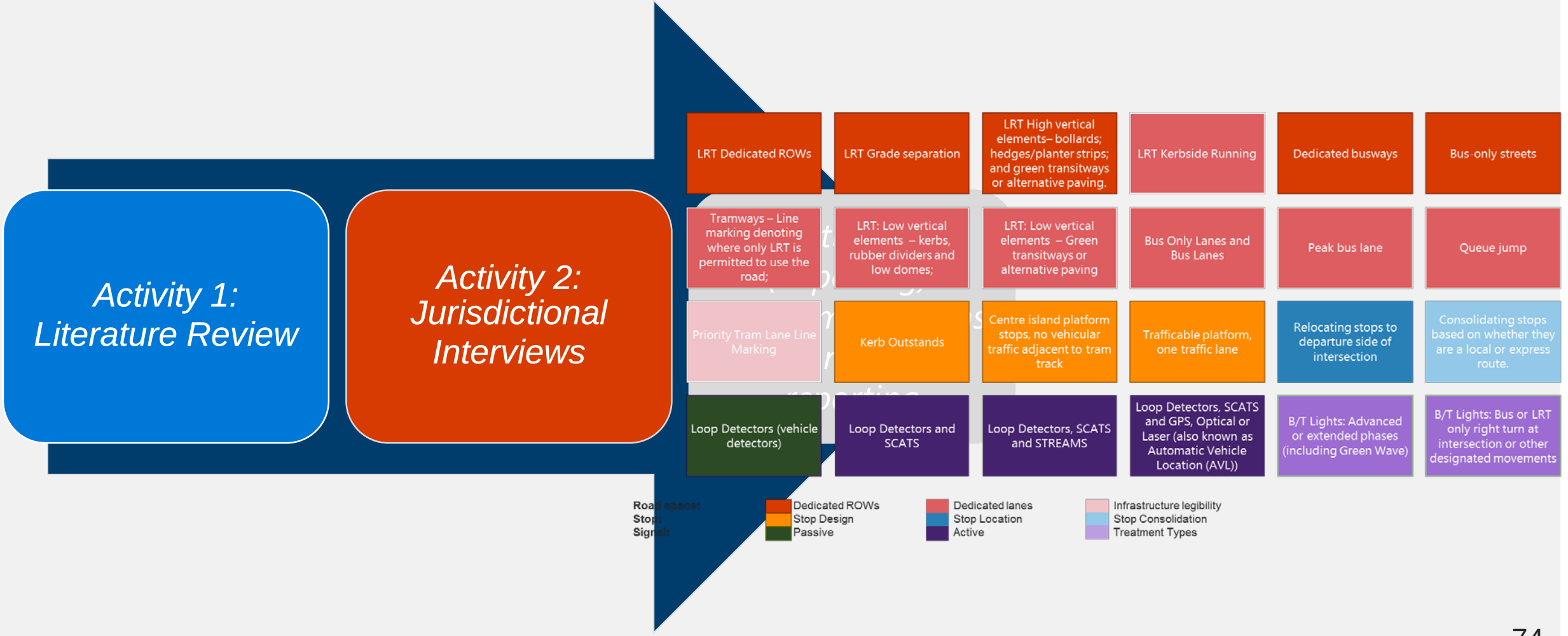
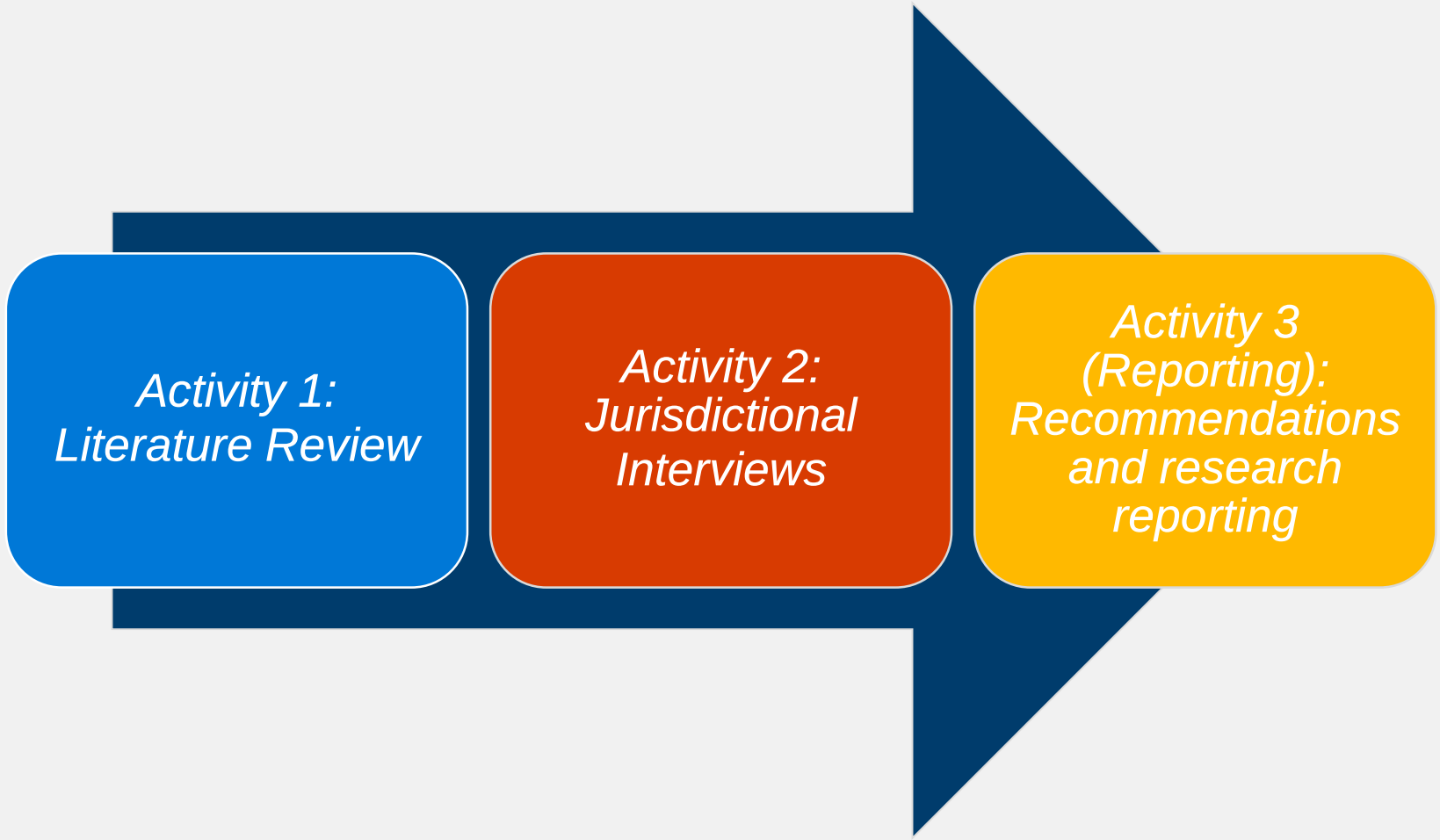


We highlighted a user friendly and comprehensive approach to on-road public transport guidelines



1. Knowing the problems and cause > to determine the **right treatment**
2. Having easy '**ready reckoners**' to quickly/cheaply determine the correct point to intervene;
3. Updating The Guide with a **broad array of treatment types** which reflect current emphasis; and
4. Considering broad array of **impacts** when implementing

Questions?

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Upcoming Austroads webinars

http://www.austroads.com.au/event

October and November

- Road Transport Management Framework and Principles
- Connected and Automated Vehicles
- Guide to Traffic Management Part 6 and Guide to Road Design Part 4
- Guide to Traffic Management Part 13
- Guide to Traffic Management Part 3

Thank you for participating