Melbourne Buses, Performance, Progress and Futures

Metropolitan Transport Forum
Bus Forum,
MAV Offices, Level 11, 60 Collins Street, Melbourne
Tuesday 31st October 2017

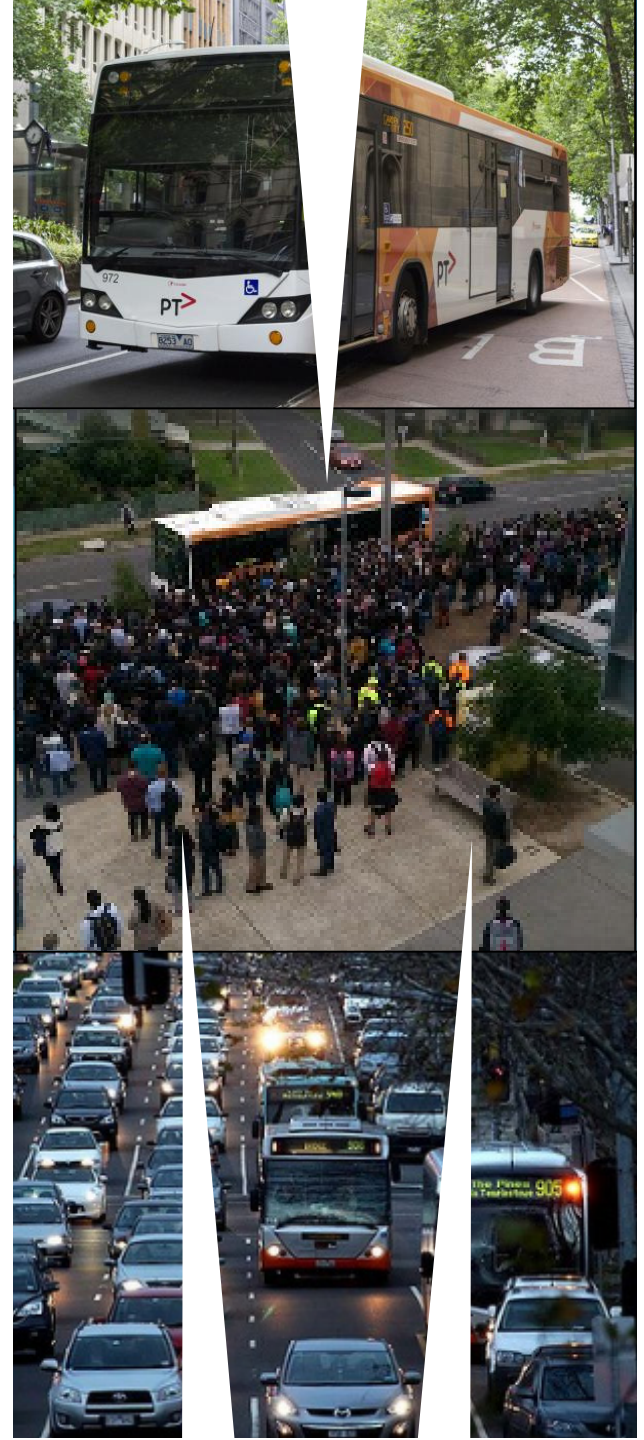Prof Graham Currie
Director
Public Transport Research Group
Institute of Transport Studies
Monash University

Institute of Transport Studies (Mona
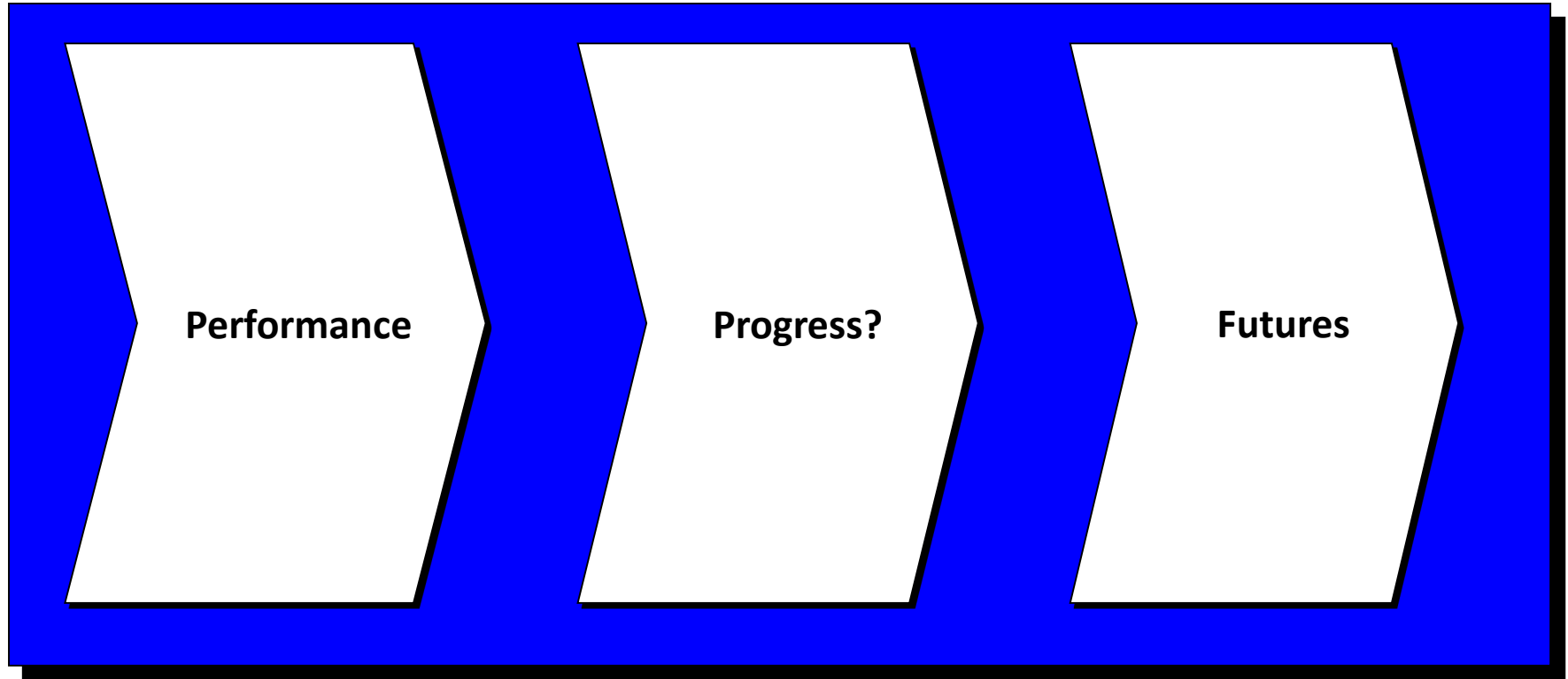The Australian Research Council Key Centre in Transport

Introduction

Performance

Progress

Futures

This paper looks at Melbourne bus performance, progress and futures

Performance

**Progress?**

Futures

Introduction
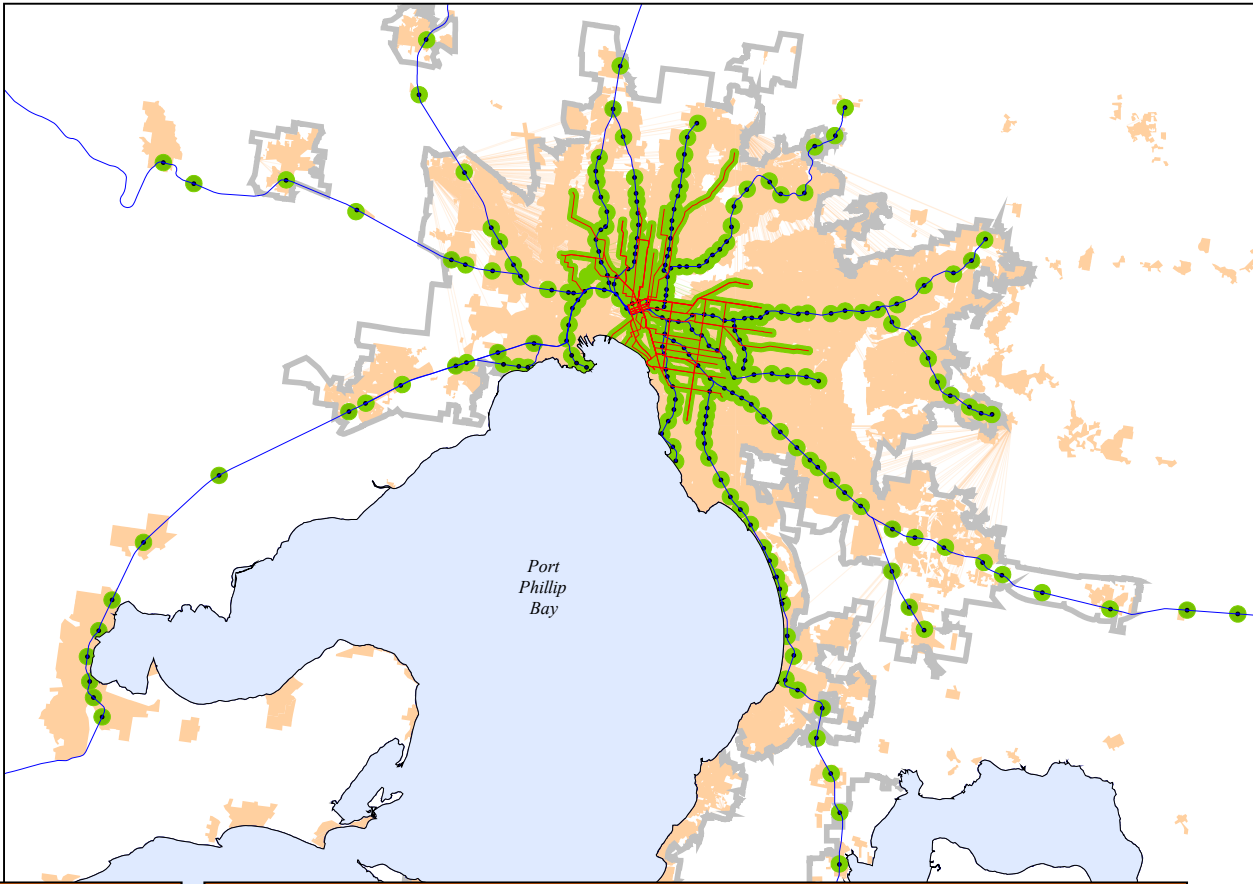
Performance

Progress

Futures

Buses ARE Melbourne's public transport for most residents, which is a problem….

- **Over two thirds of Melbourne can only be serviced by bus services since rail and tram services lie considerable distances from where people live or where they want to travel to**

- **In 1996 the Metropolitan strategy team identified that 2.16M Melbournians lived In areas where buses were bus was the only means of access to public transport. 0.98M lived within access distance of rail services**
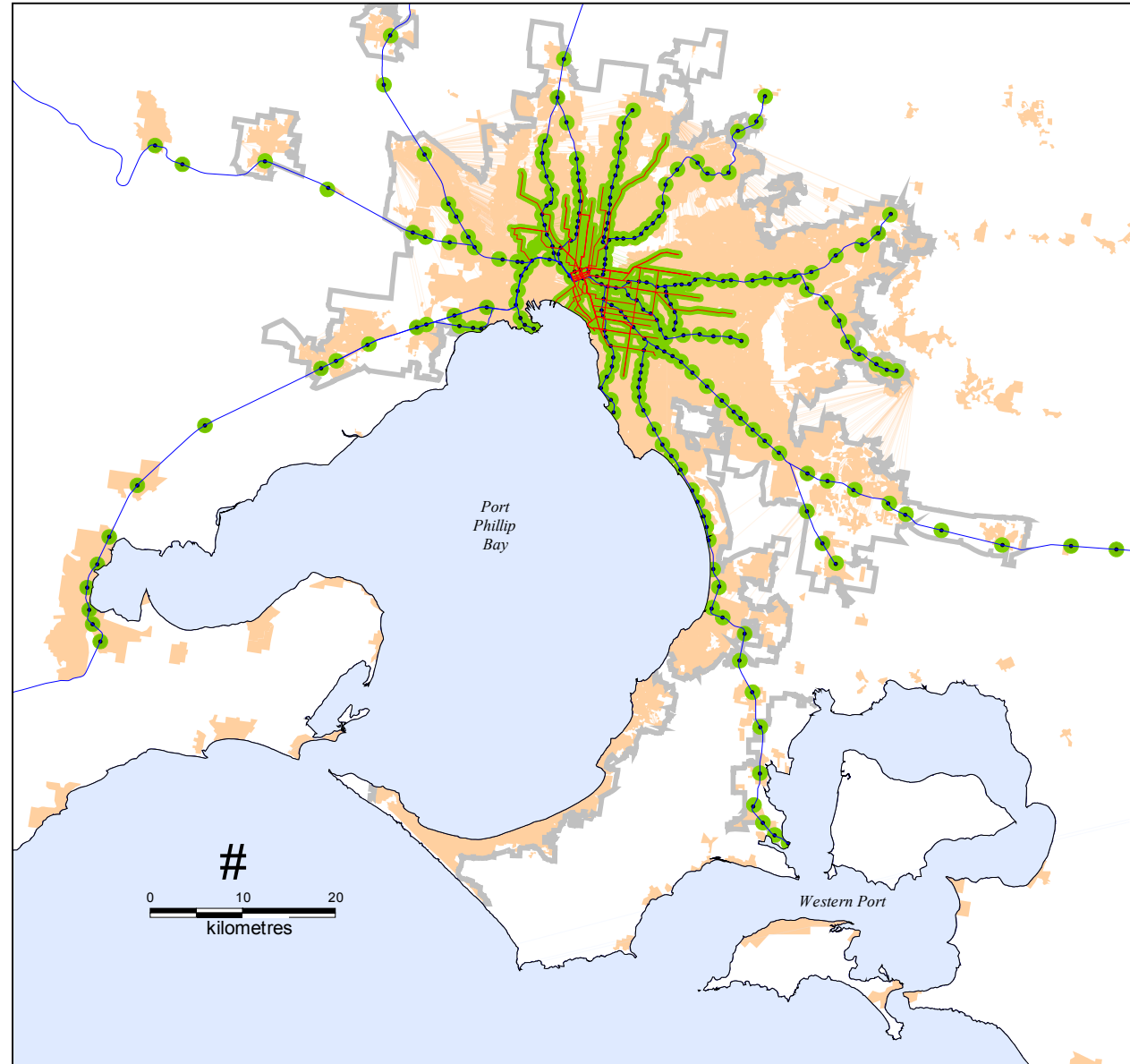
…because there arent many

- **Over two thirds of Melbourne can only be serviced by bus services since rail and tram services lie considerable distances from where people live or where they want to travel to**

- **In 1996 the Metropolitan strategy team identified that 2.16M Melbournians lived In areas where buses were bus was the only means of access to public transport. 0.98M**

Port Phillip Bay

Weekday Service Frequency (2006)		
	Peak	Off Peak
AV. MELBOURNE	40m	50m

Weekday Service Span	
	Weekday
AV. MELBOURNE	06:46-18:53

The bus network on weekdays...

Weekday
Bus Services
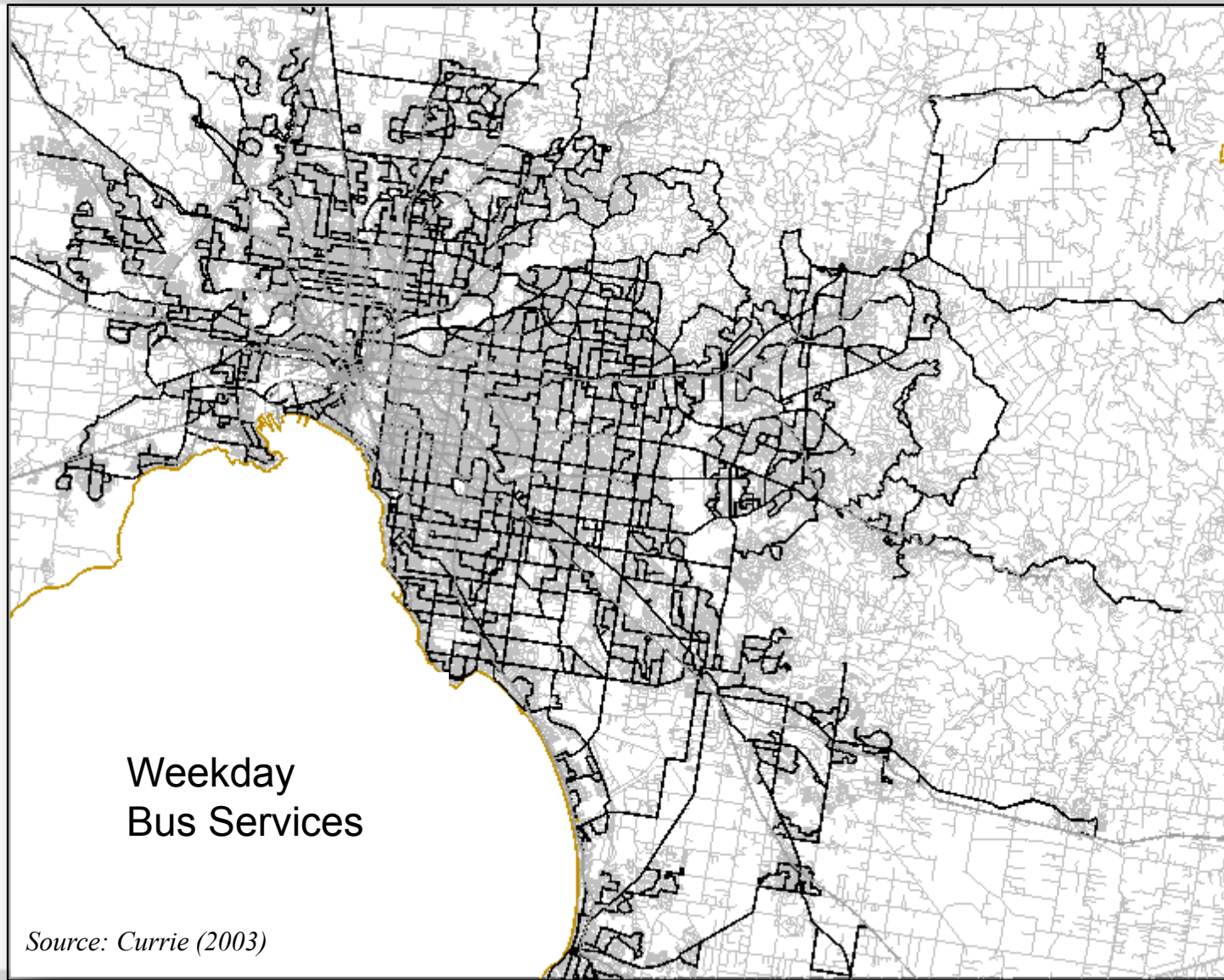
Source: Currie (2003)

…contrasts somewhat with weekends

Sunday
Bus Services
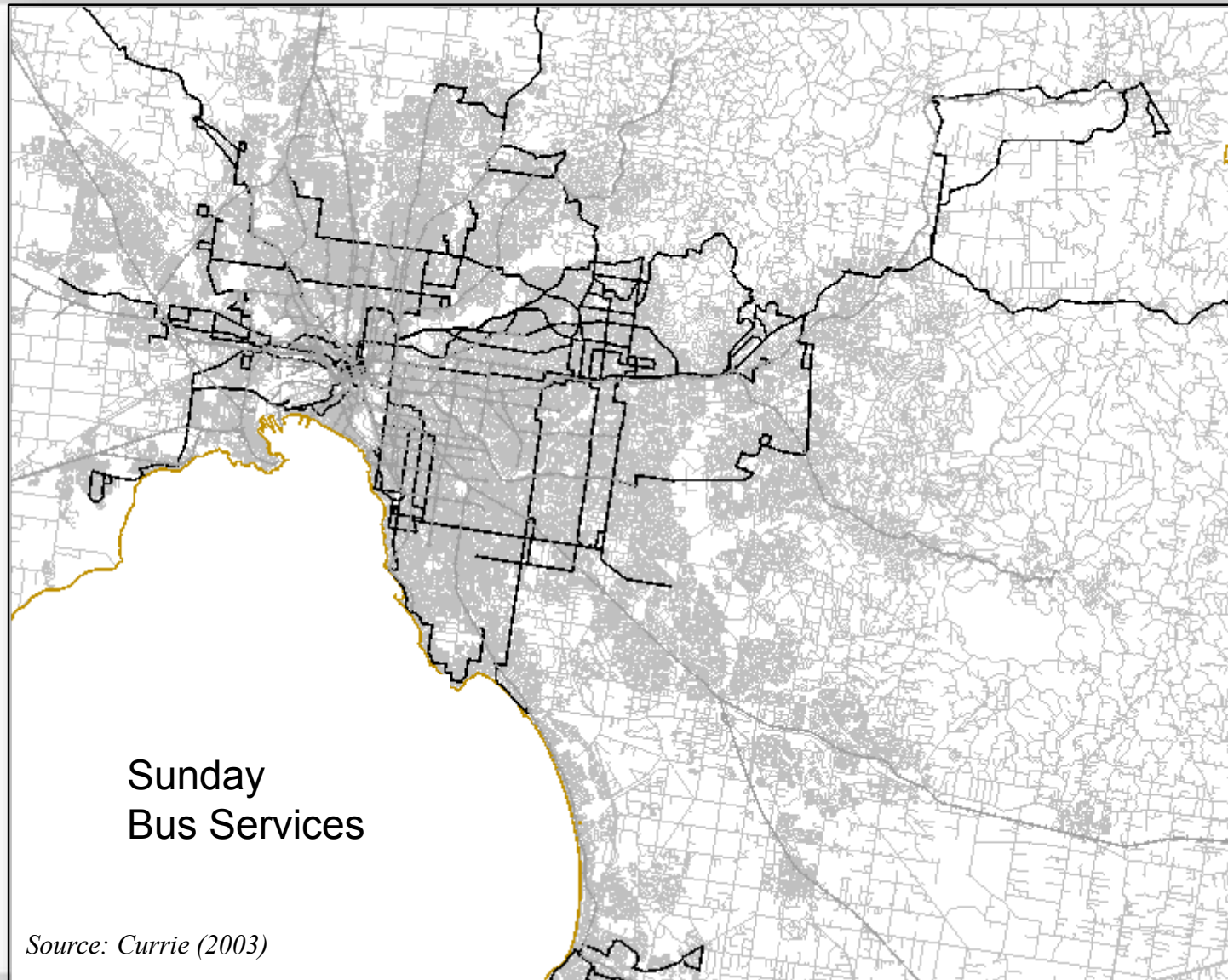
Source: Currie (2003)

Frequency drives Australian ridership performance
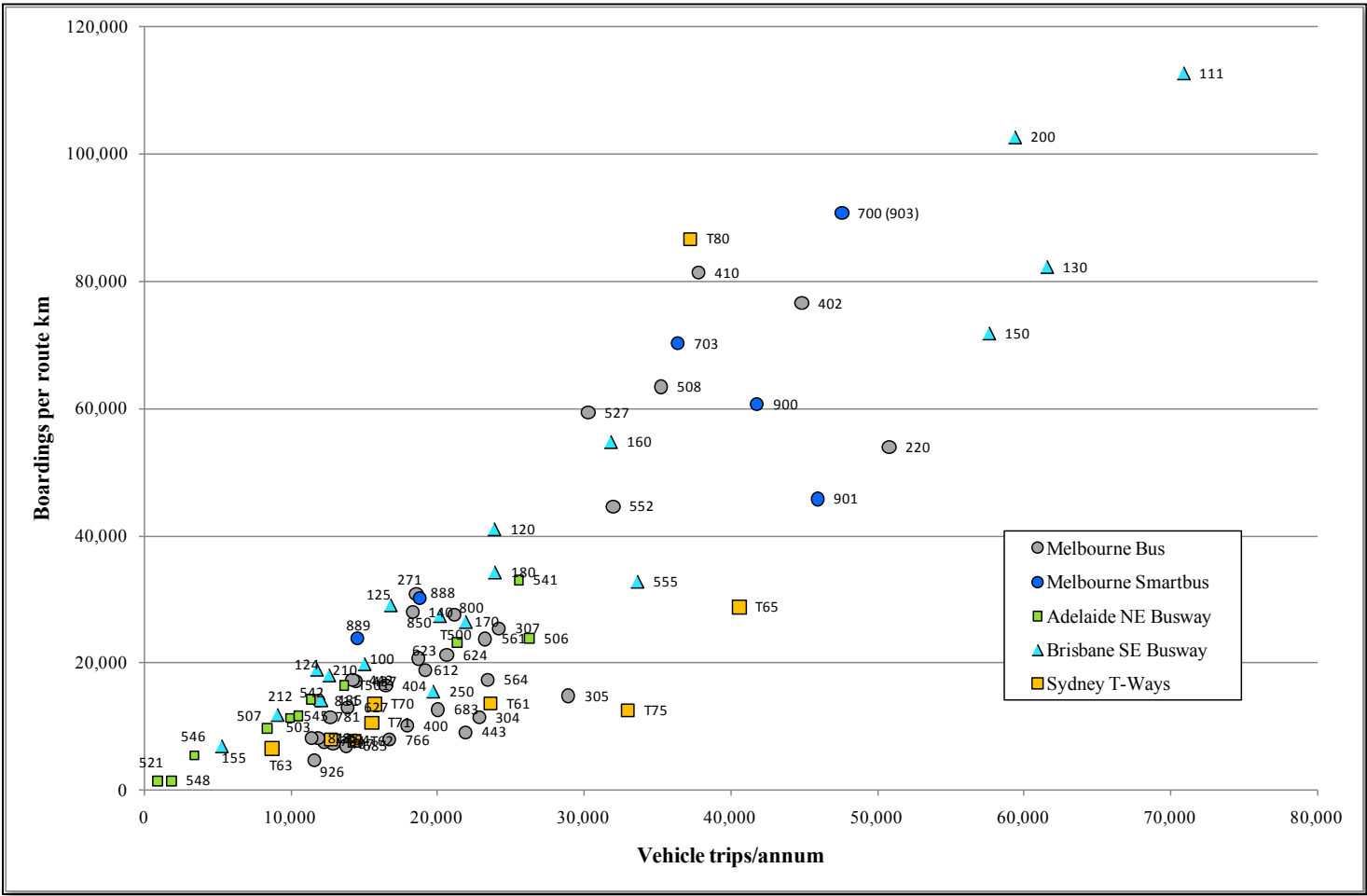
Source: Currie, G. and Delbosc A (2011) 'Understanding bus rapid transit route ridership drivers: An empirical study of Australian BRT systems' TRANSPORT POLICY Volume 18, Issue 5, September 2011, Pages 755-764

In general our bus service level is poor compared to world practice

$$y = 0.0006x - 0.0508$$
$$R^2 = 0.70477$$
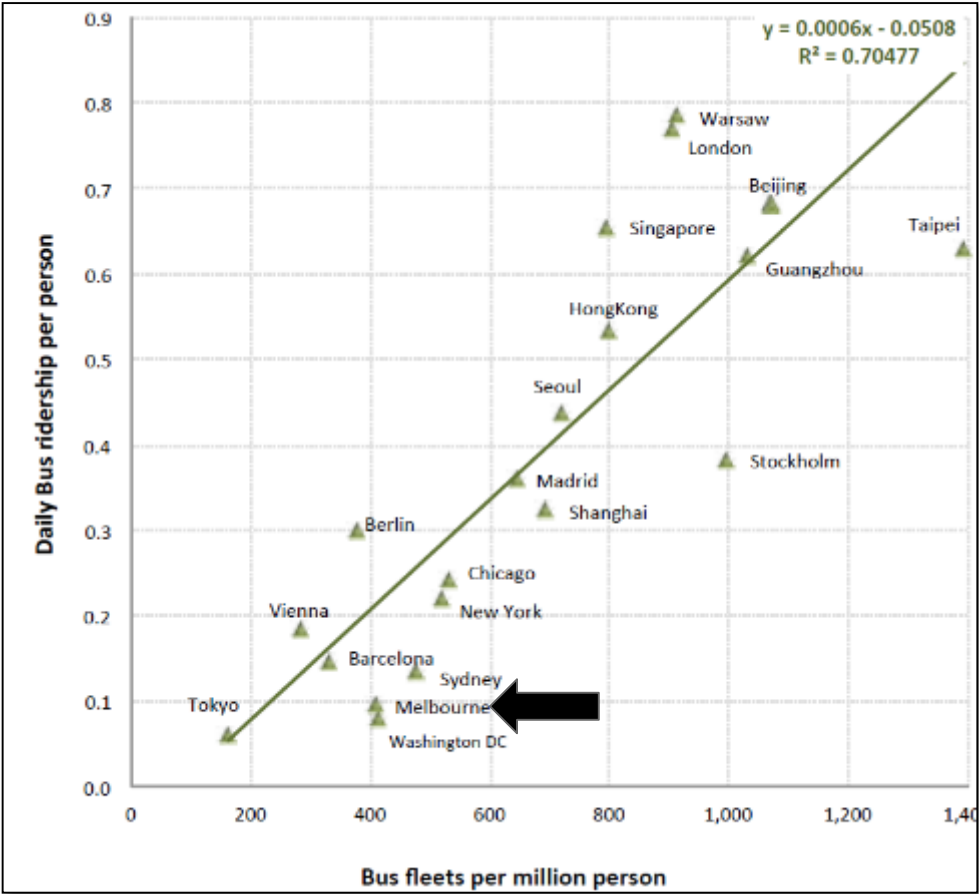
Source: Pan D (2013) 'Key Transport Statistics of World Cities' Journeys Sept 2013

So what do passengers think about these issues?
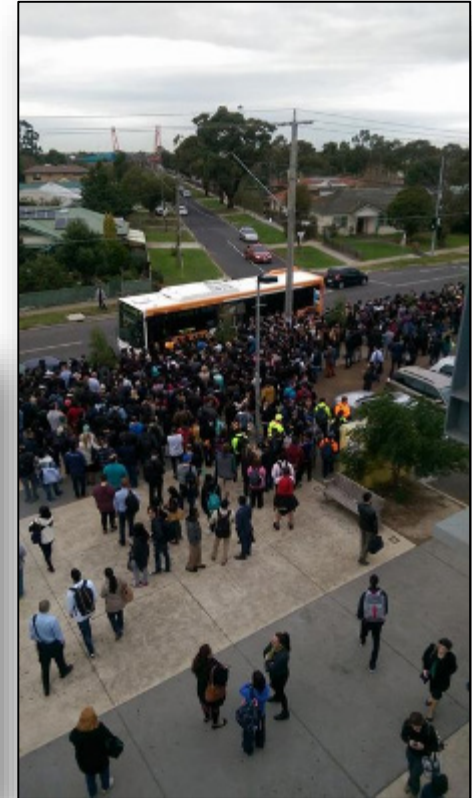
PERFORMANCE MINUS IMPORTANCE RATINGS SPIRAL PLOT

Highest Importance

Lowest Importance

Safe at night
Reliability
Frequency
Safe during day
PT available where and when needed
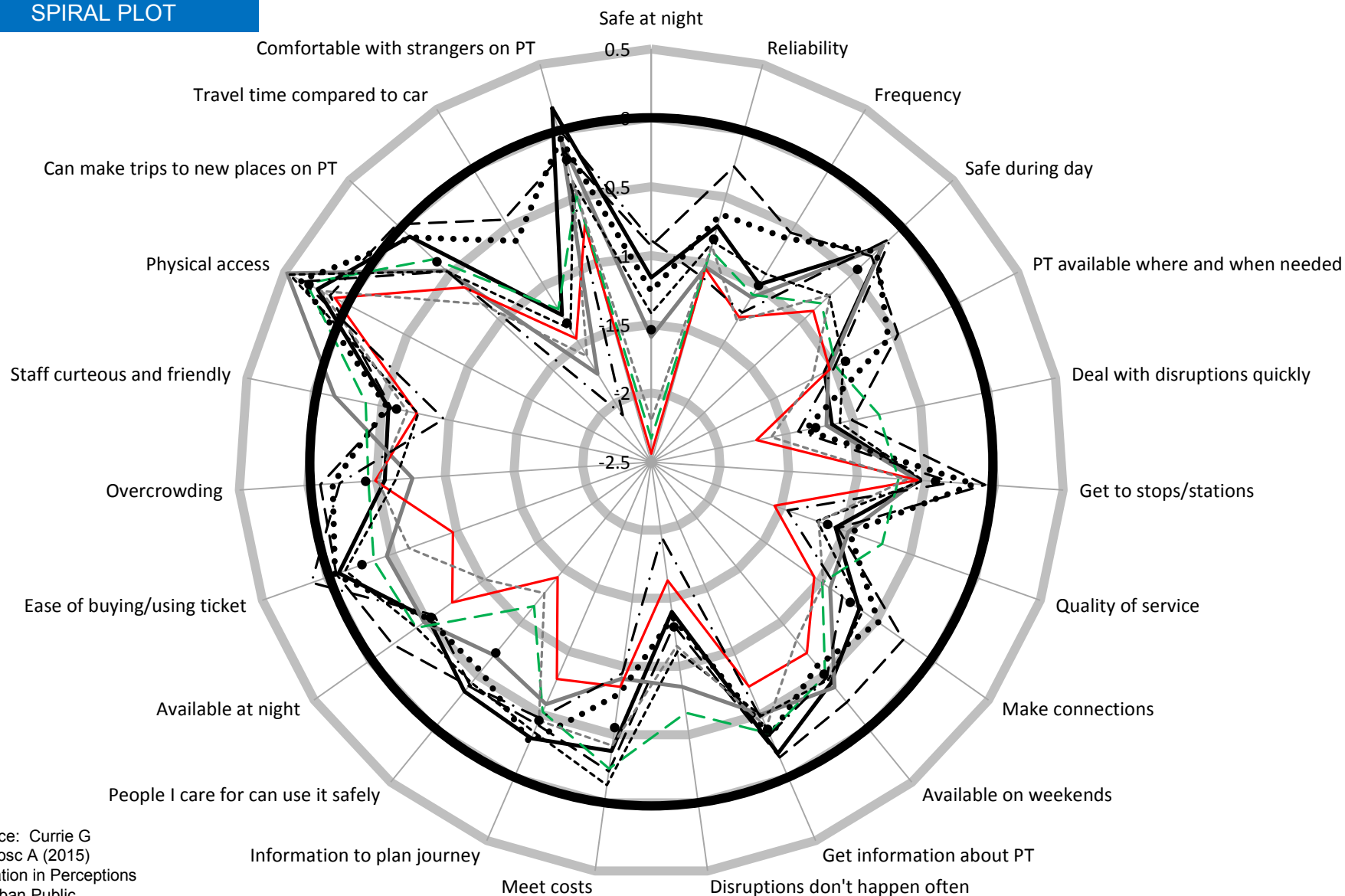Deal with disruptions quickly
Get to stops/stations
Quality of service
Make connections
Available on weekends
Get information about PT
Disruptions don't happen often
Meet costs
Information to plan journey
People I care for can use it safely
Available at night
Ease of buying/using ticket
Overcrowding
Staff curteous and friendly
Physical access
Can make trips to new places on PT
Travel time compared to car
Comfortable with strangers on PT

0.5
0.5
1
1.5
2
2.5

Source: Currie G Delbosc A (2015) Variation in Perceptions of Urban Public Transport Performance Between International Cities Using Spiral Plot Analysis' TRANSPORTATION RESEARCH RECORD No. 2538 on pages 54-

Legend: Boston — Brisbane — London ••••• Melbourne — New York — — Perth — — San Francisco ----- Sydney ----- Toronto — · — Average •

Bus Passenger Views of Improvements – Reliability, Coverage, Frequency

Bus Passenger Opinions on Bus Improvement Priorities

	Improvement Options	Individual Score	Average Score
Reliability	Buses arriving and departing on time	6.22	6.16
	Buses connecting well with other transport services	6.10	
Temporal Service Coverage	Weekend services provided	5.93	5.71
	Buses operating until late at night on weekends	5.49	
Frequency	Buses running more often in peak hours	5.23	5.23
Information	Improved bus service information at stops	5.27	4.90
	Customer information buttons at stops	4.52	
Safety	Safer pedestrian crossings at bus stops	4.85	4.64
	Lighting and video surveillance at bus stops	4.43	
Comfort	Improved shelter and seating at stops	5.06	4.55
	Making it easier to get on and off buses	4.04	
Speed/TT	Bus trips take less time	4.11	4.11
Spatial Service Coverage	Bus services operating closer to home	4.14	3.71
	Buses operating to new destinations	3.27	

Notes: Scores range from 1 to 7

Source: Smart Bus project. Passenger and local community reseearch (YCHM, Nov. 1999)
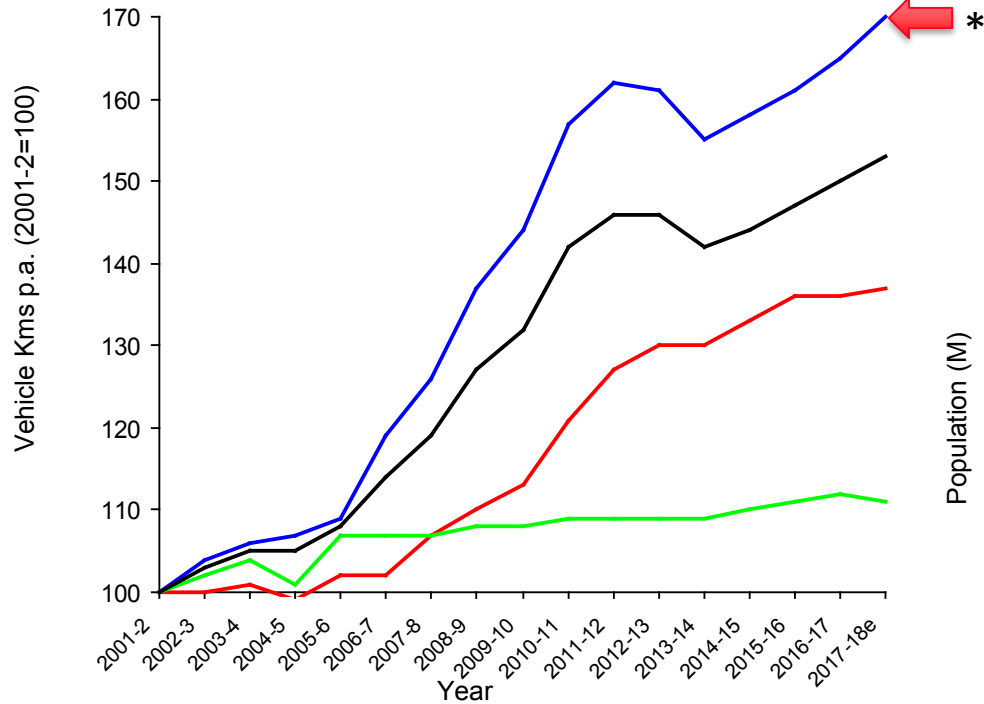
Introduction
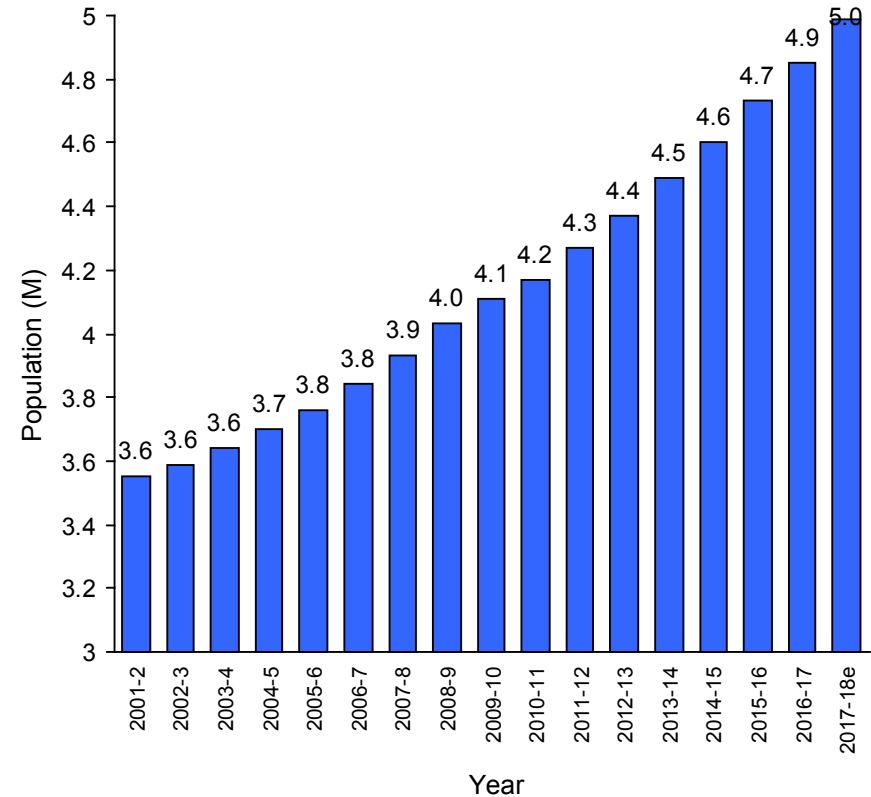
Performance

Progress

Futures

[NEW] Since 2001 PT service increased 67% (70% bus/ 37% rail, 11% tram) but - but population growth continues at a faster pace…

Index of Public Transport Service Kms p.a (2001-2=100)
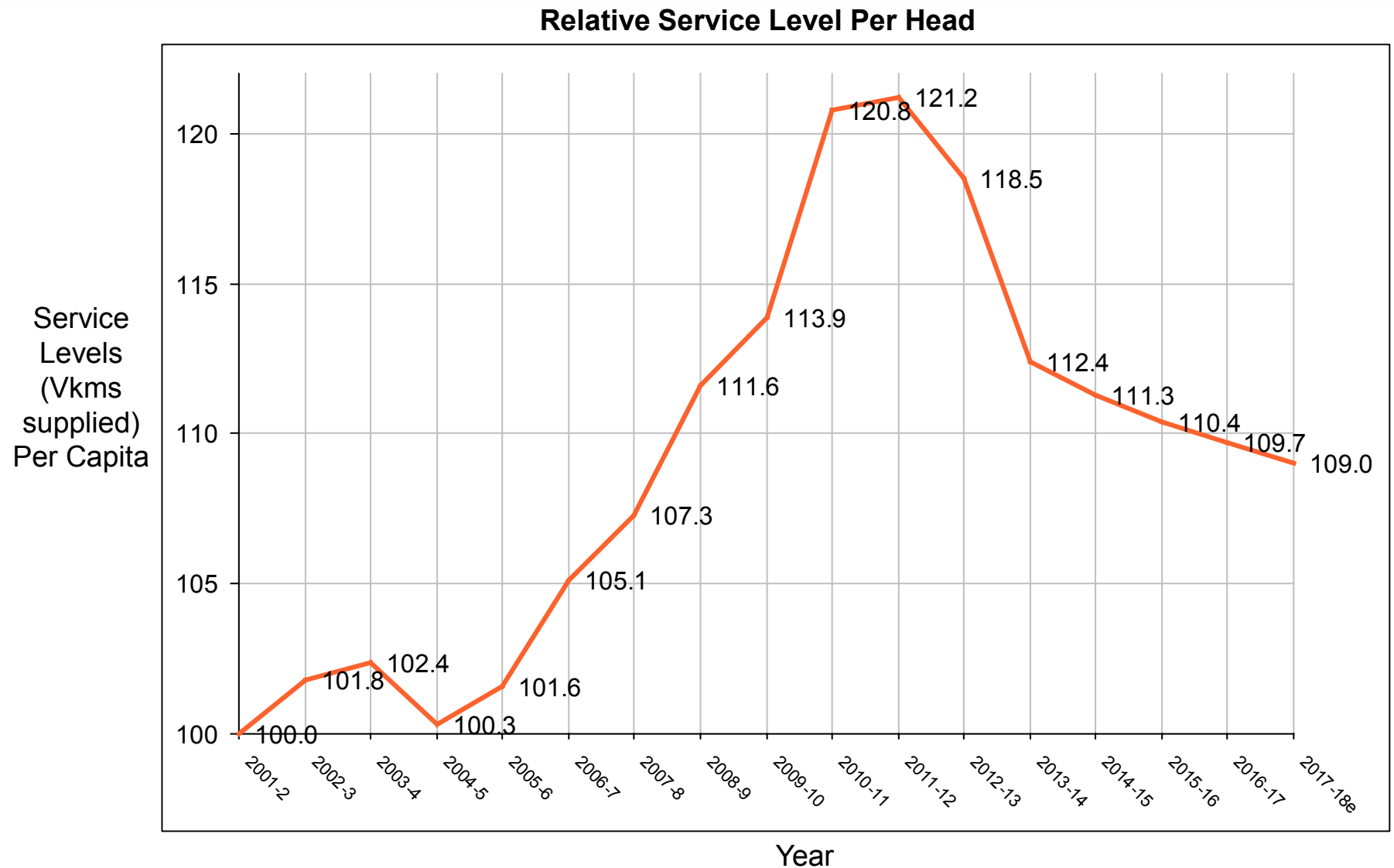
Population Growth (M)

Source: Department of Transport/ Public Transport Victoria Annual Reports

Note: * More bus services sooner initiative (~$2.5M 2016-2020); New bus services initiative ($.3M-$9Mp.a. 2015-2020)

[NEW]..in last 10 years, per person service increased 21% then declined since 2011 (we have declined by 12% points or 10% in real terms)

Relative Service Level Per Head

Service Levels (Vkms supplied) Per Capita

100.0 · 101.8 · 102.4 · 100.3 · 101.6 · 105.1 · 107.3 · 111.6 · 113.9 · 120.8 · 121.2 · 118.5 · 112.4 · 111.3 · 110.4 · 109.7 · 109.0

Year

Source: Department of Transport/ Public Transport Victoria Annual Reports and ABS

Melbourne has BIG inequity in PT service– many high need areas with no service areas on the urban fringe; bus is a big part of this

Service Supplied by Population

Equity

Population (G=.68)

Population + Employment (G=.62)
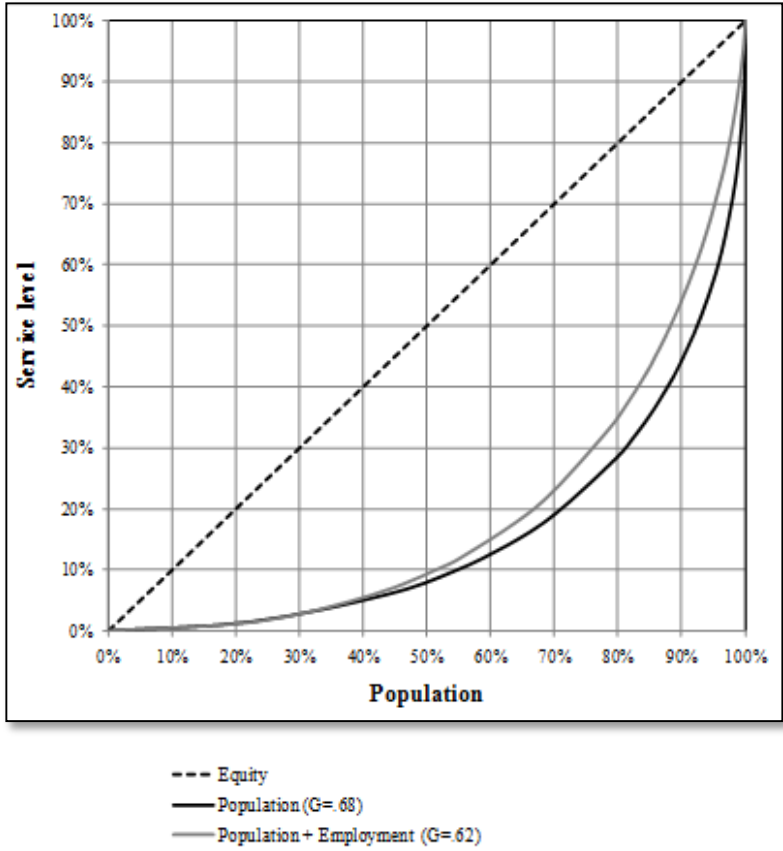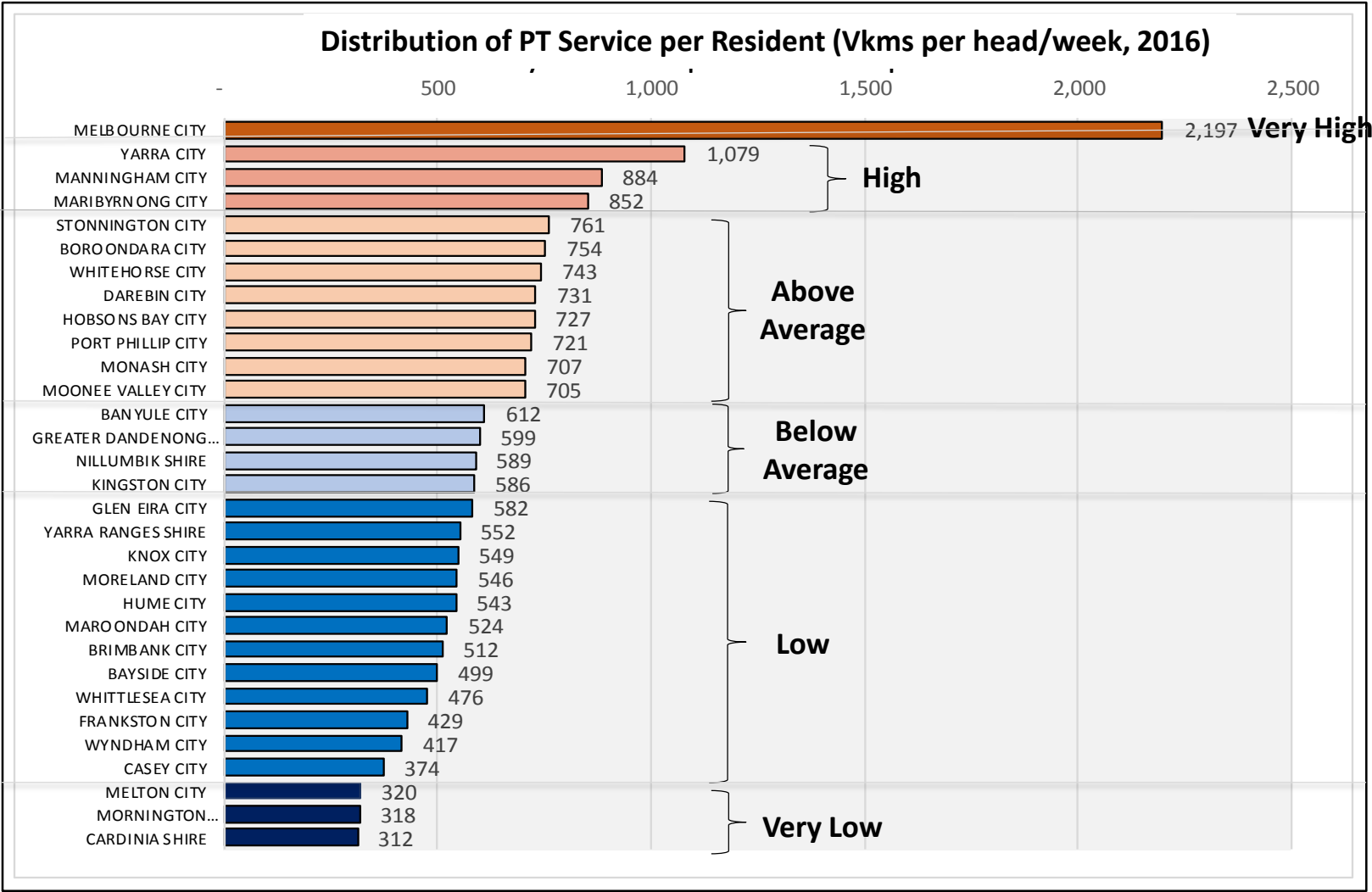
Source: Delbosc A and Currie, G. (2011) 'Using Lorenz Curves to Assess Public Transport Equity' JOURNAL OF TRANSPORT GEOGRAPHY Volume 19, Issue 6, November 2011, Pages 1252-1259

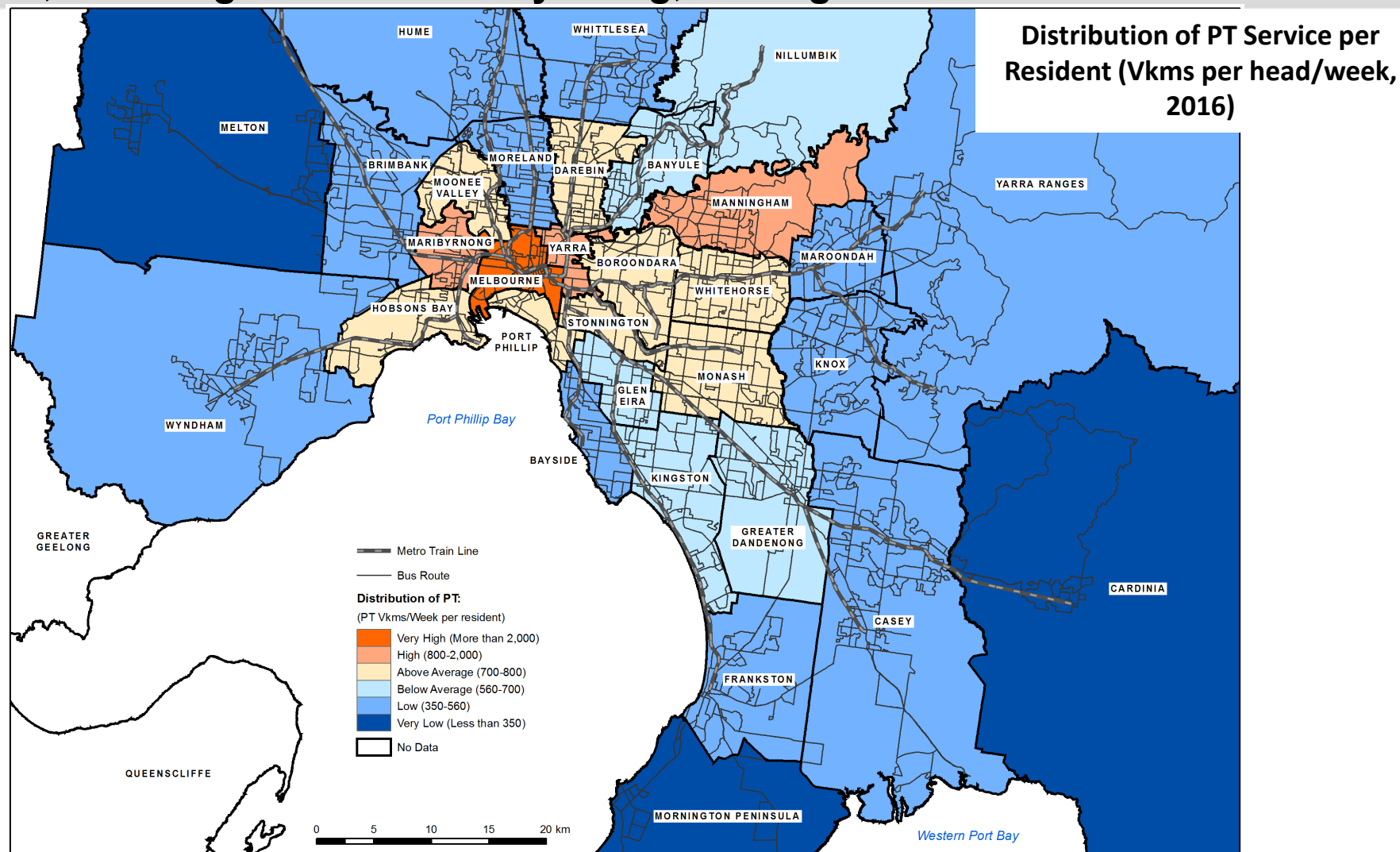**Service Supplied (Green) – Highest Social Need Areas (Red)**
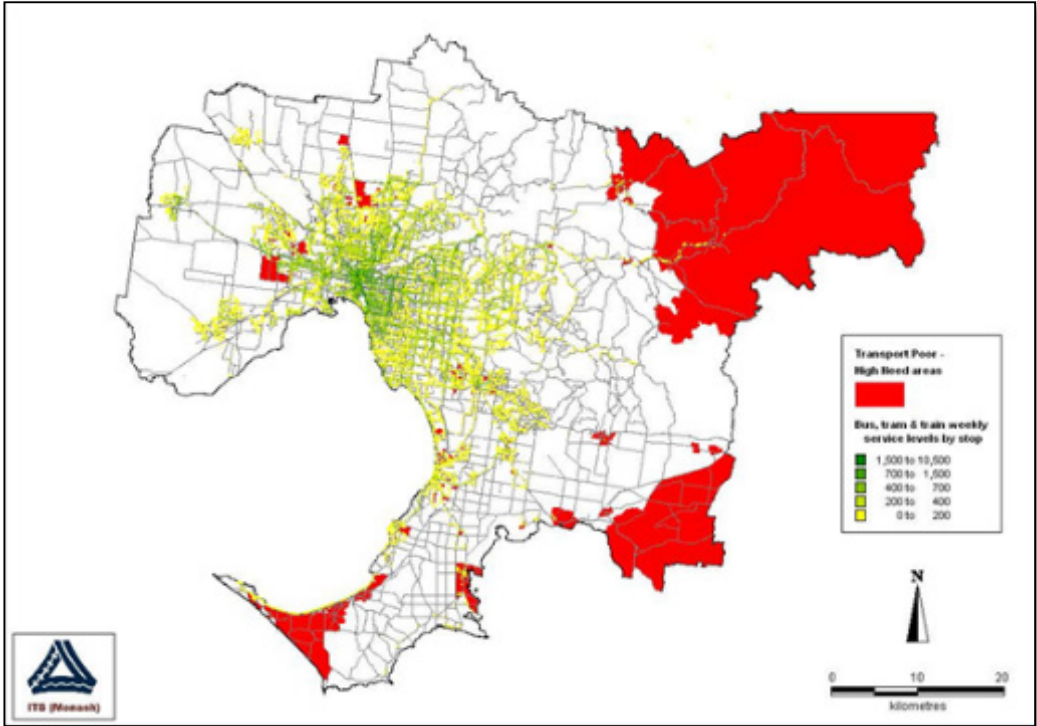
Source: Currie, G. (2010) Quantifying spatial gaps in public transport supply based on social needs, JOURNAL OF TRANSPORT GEOGRAPHY 18 (2010) 31–41

In 2016, 18 of our 30 LGA's have below average service per resident…

Distribution of PT Service per Resident (Vkms per head/week, 2016)

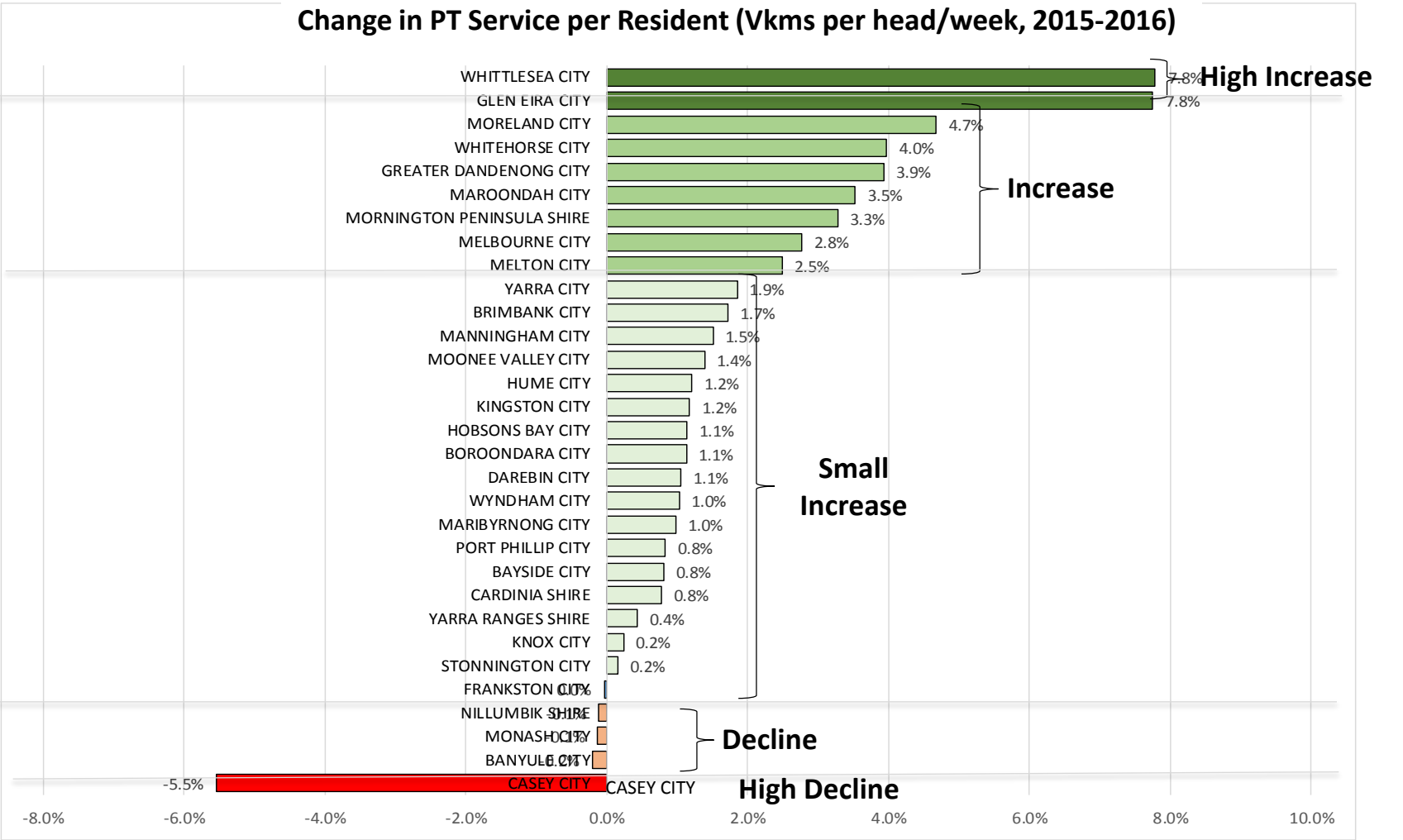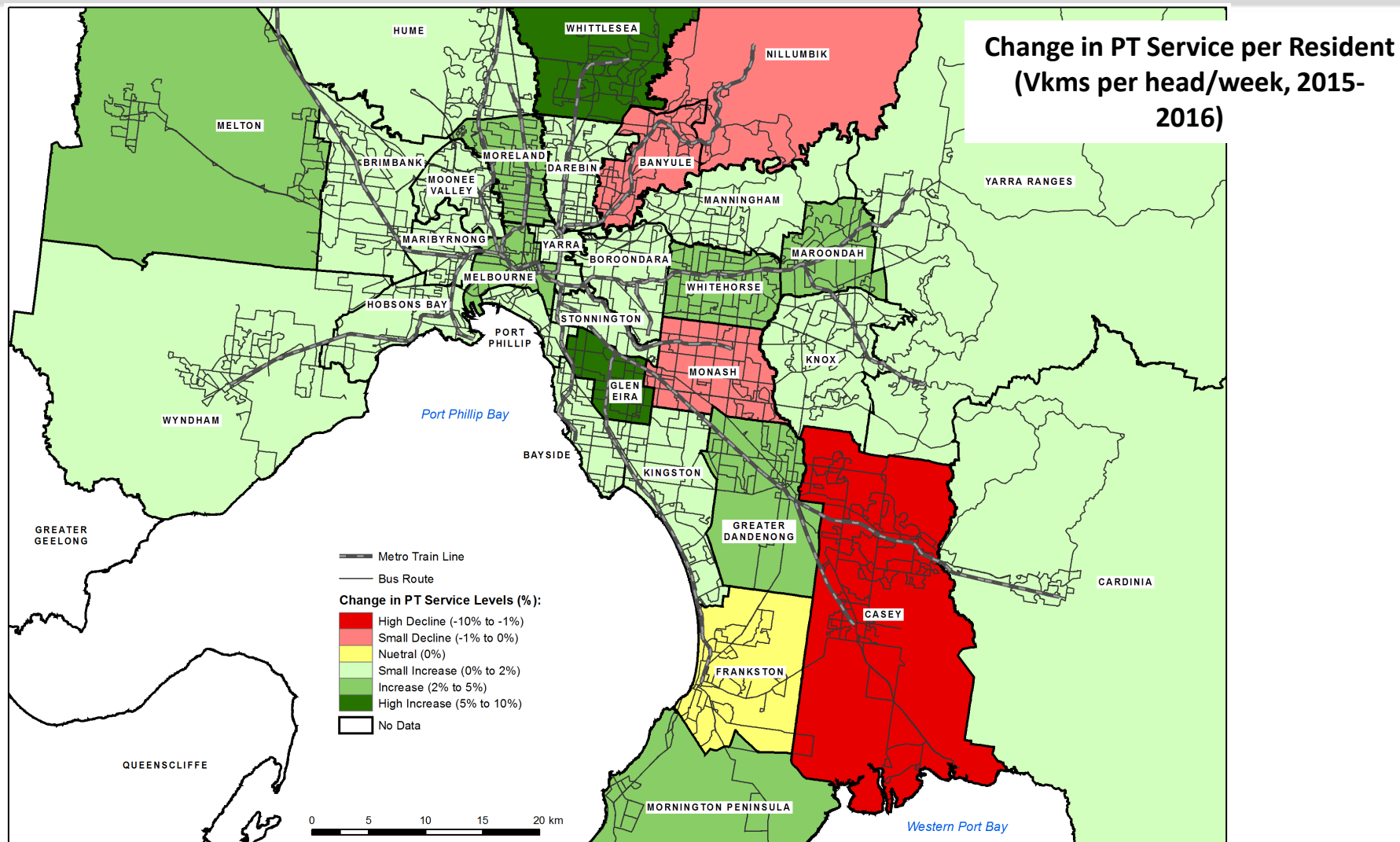| LGA	Value	Category
MELBOURNE CITY	2,197	**Very High**
YARRA CITY	1,079	**High**
MANNINGHAM CITY	884	**High**
MARIBYRNONG CITY	852	**High**
STONNINGTON CITY	761	**Above Average**
BOROONDARA CITY	754	**Above Average**
WHITEHORSE CITY	743	**Above Average**
DAREBIN CITY	731	**Above Average**
HOBSONS BAY CITY	727	**Above Average**
PORT PHILLIP CITY	721	**Above Average**
MONASH CITY	707	**Above Average**
MOONEE VALLEY CITY	705	**Above Average**
BANYULE CITY	612	**Below Average**
GREATER DANDENONG…	599	**Below Average**
NILLUMBIK SHIRE	589	**Below Average**
KINGSTON CITY	586	**Below Average**
GLEN EIRA CITY	582	**Low**
YARRA RANGES SHIRE	552	**Low**
KNOX CITY	549	**Low**
MORELAND CITY	546	**Low**
HUME CITY	543	**Low**
MAROONDAH CITY	524	**Low**
BRIMBANK CITY	512	**Low**
BAYSIDE CITY	499	**Low**
WHITTLESEA CITY	476	**Low**
FRANKSTON CITY	429	**Low**
WYNDHAM CITY	417	**Low**
CASEY CITY	374	**Low**
MELTON CITY	320	**Very Low**
MORNINGTON…	318	**Very Low**
CARDINIA SHIRE	312	**Very Low**

Source: PTRG analysis of the GTFS file data for Melbourne. Includes bus, rail and tram. Weekly data extracted for the week 19th- 25th Sept 2016. Data production undertaken by Phillip Boyles and Associates

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Cardinia, Mornington & Melton have lowest service/head; Melbourne, Yarra, Manningham and Maribyrnong, the highest

Distribution of PT Service per Resident (Vkms per head/week, 2016)

Distribution of PT:
(PT Vkms/Week per resident)

- Very High (More than 2,000)
- High (800-2,000)
- Above Average (700-800)
- Below Average (560-700)
- Low (350-560)
- Very Low (Less than 350)
- No Data

Metro Train Line
Bus Route

Source: PTRG analysis of the GTFS file data for Melbourne. Includes bus, rail and tram. Weekly data extracted for the week 19th- 25th Sept 2016. Data production undertaken by Phillip Boyles and Associates

Change in service is also uneven; some decline occurred 2015-2016…

Change in PT Service per Resident (Vkms per head/week, 2015-2016)

Municipality	Change	Category
WHITTLESEA CITY	7.8%	**High Increase**
GLEN EIRA CITY	7.8%	
MORELAND CITY	4.7%	**Increase**
WHITEHORSE CITY	4.0%	
GREATER DANDENONG CITY	3.9%	
MAROONDAH CITY	3.5%	
MORNINGTON PENINSULA SHIRE	3.3%	
MELBOURNE CITY	2.8%	
MELTON CITY	2.5%	
YARRA CITY	1.9%	**Small Increase**
BRIMBANK CITY	1.7%	
MANNINGHAM CITY	1.5%	
MOONEE VALLEY CITY	1.4%	
HUME CITY	1.2%	
KINGSTON CITY	1.2%	
HOBSONS BAY CITY	1.1%	
BOROONDARA CITY	1.1%	
DAREBIN CITY	1.1%	
WYNDHAM CITY	1.0%	
MARIBYRNONG CITY	1.0%	
PORT PHILLIP CITY	0.8%	
BAYSIDE CITY	0.8%	
CARDINIA SHIRE	0.8%	
YARRA RANGES SHIRE	0.4%	
KNOX CITY	0.2%	
STONNINGTON CITY	0.2%	
FRANKSTON CITY	0.0%	
NILLUMBIK SHIRE	-0.1%	**Decline**
MONASH CITY	-0.1%	
BANYULE CITY	-0.2%	
CASEY CITY	-5.5%	**High Decline**

Source: PTRG analysis of the GTFS file data for Melbourne. Includes bus, rail and tram. Weekly data extracted for the week 19th- 25th Sept 2016. Data production undertaken by Phillip Boyles and Associates

…Notably in Casey, Banyule, Nillumbik and Monash.

Change in PT Service per Resident (Vkms per head/week, 2015-2016)

Legend — Change in PT Service Levels (%):
- High Decline (-10% to -1%)
- Small Decline (-1% to 0%)
- Nuetral (0%)
- Small Increase (0% to 2%)
- Increase (2% to 5%)
- High Increase (5% to 10%)
- No Data

Metro Train Line
Bus Route

Source: PTRG analysis of the GTFS file data for Melbourne. Includes bus, rail and tram. Weekly data extracted for the week 19th- 25th Sept 2016. Data production undertaken by Phillip Boyles and Associates

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PTRG WEBSITE
PTRG.INFO

PTRG WEBSITE PTRG.INFO

Introduction
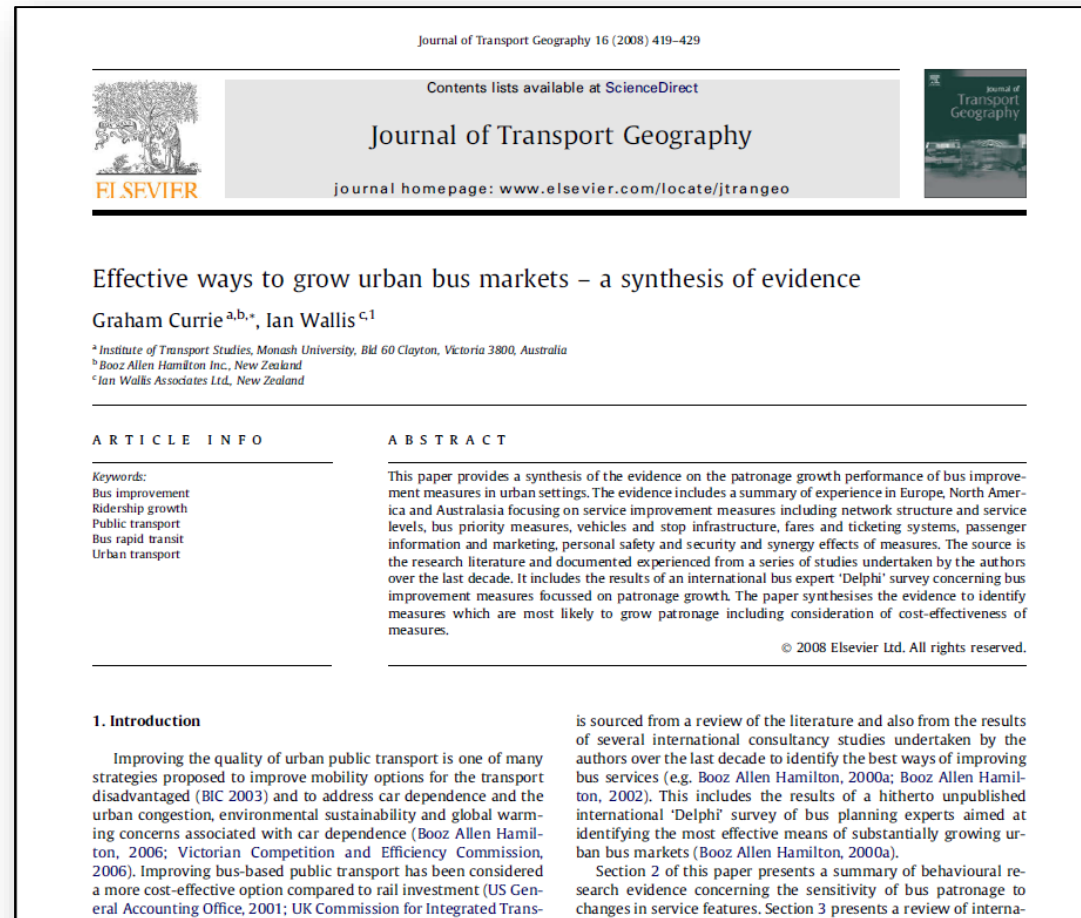
Performance

Progress

Futures

Bus Ridership Growth...we did a world review of methods of substantially increasing bus ridership - here are the findings

Issues Covered

- Behavioural studies (elasticity of demand)

- Bus Improvement Experience

- International Expert Delphi Study

Journal of Transport Geography 16 (2008) 419–429

Contents lists available at ScienceDirect

Journal of Transport Geography

journal homepage: www.elsevier.com/locate/jtrangeo

Effective ways to grow urban bus markets – a synthesis of evidence

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[b] Booz Allen Hamilton Inc., New Zealand
[c] Ian Wallis Associates Ltd., New Zealand

A R T I C L E   I N F O

Keywords:
Bus improvement
Ridership growth
Public transport
Bus rapid transit
Urban transport

A B S T R A C T

This paper provides a synthesis of the evidence on the patronage growth performance of bus improvement measures in urban settings. The evidence includes a summary of experience in Europe, North America and Australasia focusing on service improvement measures including network structure and service levels, bus priority measures, vehicles and stop infrastructure, fares and ticketing systems, passenger information and marketing, personal safety and security and synergy effects of measures. The source is the research literature and documented experienced from a series of studies undertaken by the authors over the last decade. It includes the results of an international bus expert 'Delphi' survey concerning bus improvement measures focussed on patronage growth. The paper synthesises the evidence to identify measures which are most likely to grow patronage including consideration of cost-effectiveness of measures.

1. Introduction

Improving the quality of urban public transport is one of many strategies proposed to improve mobility options for the transport disadvantaged (BIC 2003) and to address car dependence and the urban congestion, environmental sustainability and global warming concerns associated with car dependence (Booz Allen Hamilton, 2006; Victorian Competition and Efficiency Commission, 2006). Improving bus-based public transport has been considered a more cost-effective option compared to rail investment (US General Accounting Office, 2001; UK Commission for Integrated Trans-

is sourced from a review of the literature and also from the results of several international consultancy studies undertaken by the authors over the last decade to identify the best ways of improving bus services (e.g. Booz Allen Hamilton, 2000a; Booz Allen Hamilton, 2002). This includes the results of a hitherto unpublished international 'Delphi' survey of bus planning experts aimed at identifying the most effective means of substantially growing urban bus markets (Booz Allen Hamilton, 2000a).

Section 2 of this paper presents a summary of behavioural research evidence concerning the sensitivity of bus patronage to changes in service features. Section 3 presents a review of interna-

Source: Currie, G. and Wallis, I. (2008) , Effective ways to grow urban bus markets – a synthesis of evidence, JOURNAL OF TRANSPORT GEOGRAPHY 16 (2008) 419–429

Behavioural evidence identifies a rank for improvement measures based on maximum possible impact

- Rank based on higher patronage growth impacts:
  1. Service Level Improvement (200% plus)
  2. Free fares (<=40%)
  3. Reliability (<20%)
  4. Travel Time (<15%)
  5. BRT (alone) (<10%)
  6. Soft Factors (<2-5 %)

Bus improvement experience (Australia) suggests major BRT revisions, network restructuring and free CBD services (tram in Melbourne)

- Ranking of measures based on patronage impacts:
    1. Bus Rapid Transit Systems (market growth in the order of 20% - 70% at a corridor level)
    2. (Free) CBD Distributors (market growth around 50% - 200% affecting CBDs)
    3. Bus Network Area Restructuring (network-wide market growth around 10-30%)
    4. Express Bus (market growth around 15% - 30% but only affecting route catchments)
    5. Increased Frequencies/Minibus (market growth 10% - 40% at mainly a route level)
    6. Bus Priority Measures (10% - 50% at a route group/corridor level)
    7. Bus Marketing/Passenger Information, including TravelSmart (up to 20% at an area level).

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A UK study (TAS) identified network simplicity as THE most cost effective pax growth measure
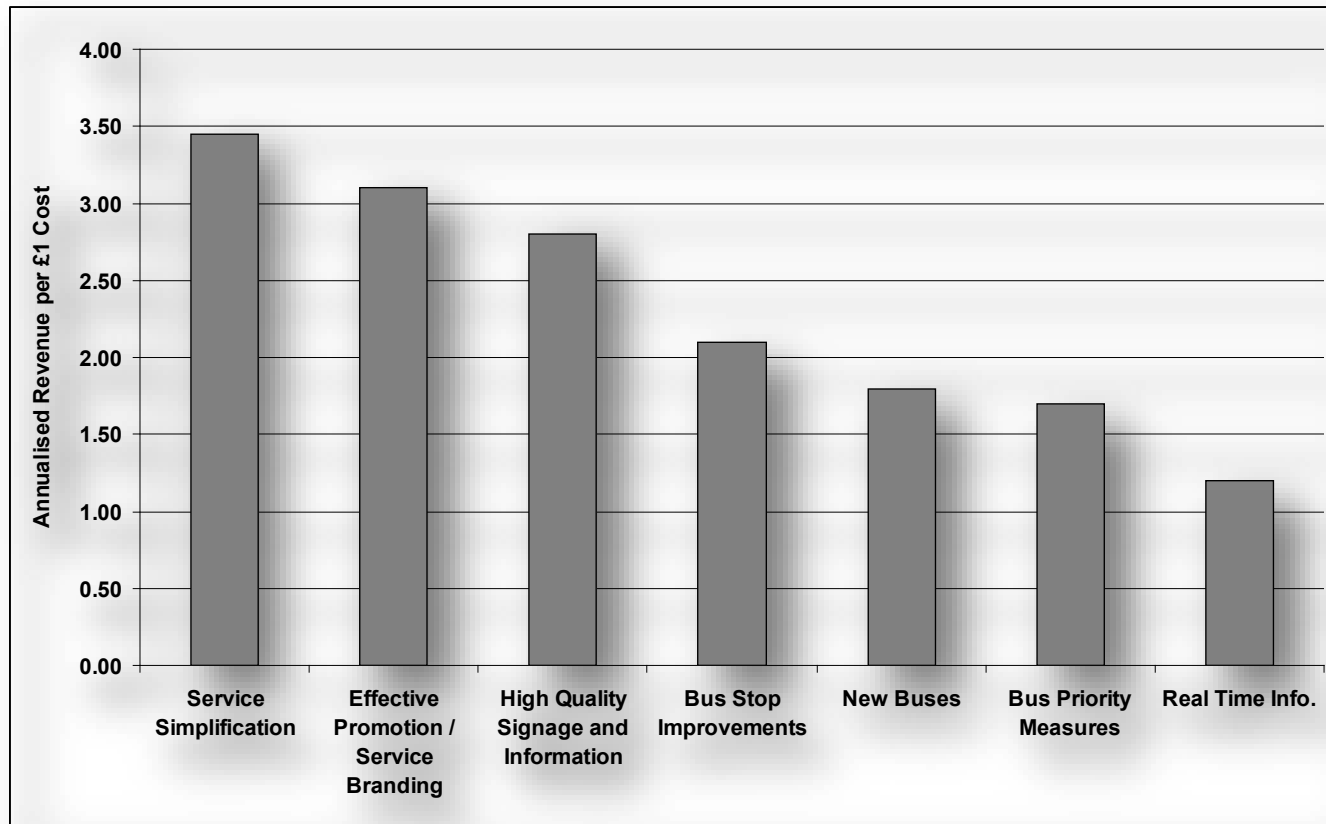
Figure 1 : Cost Effectiveness of Bus Improvements – *UK*
**Source :** (*TAS Partnership ,2002*)

Source: Currie, G. and Wallis, I. (2008) , Effective ways to grow urban bus markets – a synthesis of evidence, JOURNAL OF TRANSPORT GEOGRAPHY 16 (2008) 419–429

The EU Jupiter project identified priorities in terms of effectiveness and cost effectiveness

JUPITER Rank for Highest Patronage Impacts

1. Service reliability based measures (busways, bus lanes, junction priority
2. Frequency of service
3. Passenger information based measures

JUPITER Rank for Highest Cost Effective Patronage Impacts

1. Low floor buses
2. Bus priority at traffic signals
3. New interchanges replacing inadequate facilities; and
4. Real time passenger information.

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The research identified many commonalities between alternative avenues of investigation

Synthesis of Factors to Effectively Grow Bus Markets

Behavioral Evidence
1. Service Level Improvement (200% plus at low service level)
2. Free fares (<=40%)
3. Reliability (<20%) (where reliability poor)
4. Travel Time (<15%)
5. Intrinsic BRT factors (<10%)
6. Soft Factors (<2 % - as a package <%10)

International Expert Survey
1. Service Level Increases (frequencies)
2. Bus reliability Factors (like BRT ROW)
3. Spatial coverage
Best Practice Systems
BRT systems due to high service level, reliability/ ROW segregation, simple marketing image

Bus Improvement Experience
Australia/Elsewhere
• Bus Rapid Transit Systems
• Increased Service Levels
• Bus Priority
• CBD Free Bus Systems

Cost Effectiveness
1. Service Simplification
2. Promotion/Branding
3. New Low Floor Buses
4. Bus traffic signal priority
5. Real time information systems

Source: Currie, G. and Wallis, I. (2008) , Effective ways to grow urban bus markets – a synthesis of evidence, JOURNAL OF TRANSPORT GEOGRAPHY 16 (2008) 419–429

So what do I think we should do with buses?

We have to invest ; not to keep up, but to EXCEED growth…

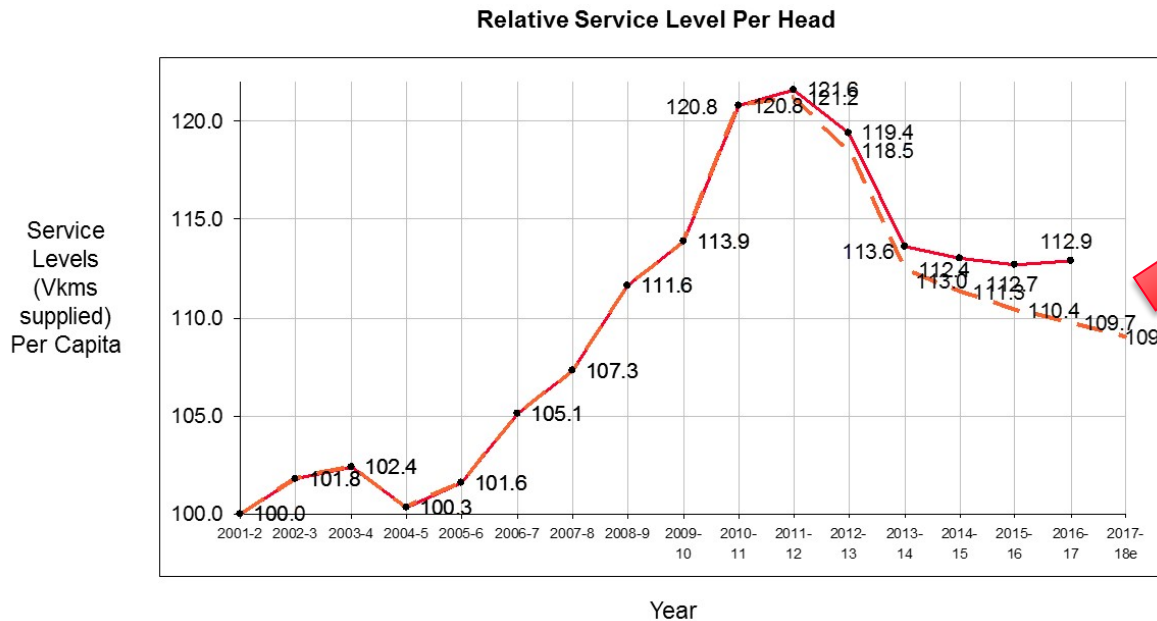

Index of Public Transport Service Kms p.a (2001-2=100)
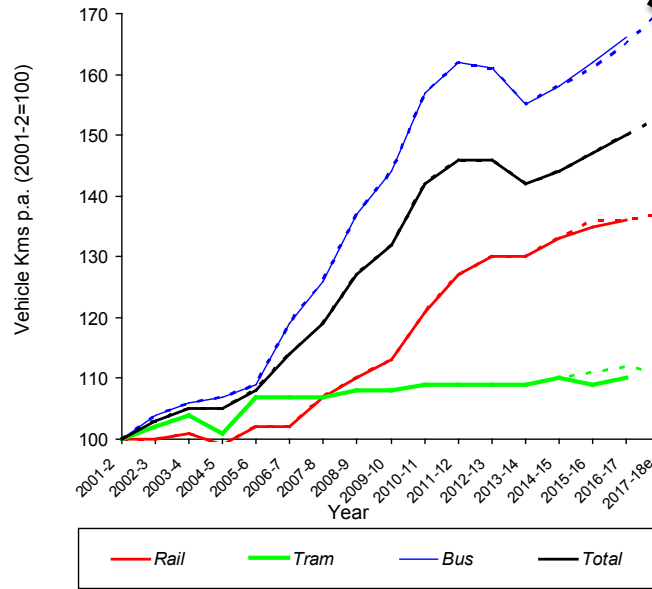
Population Growth (M)
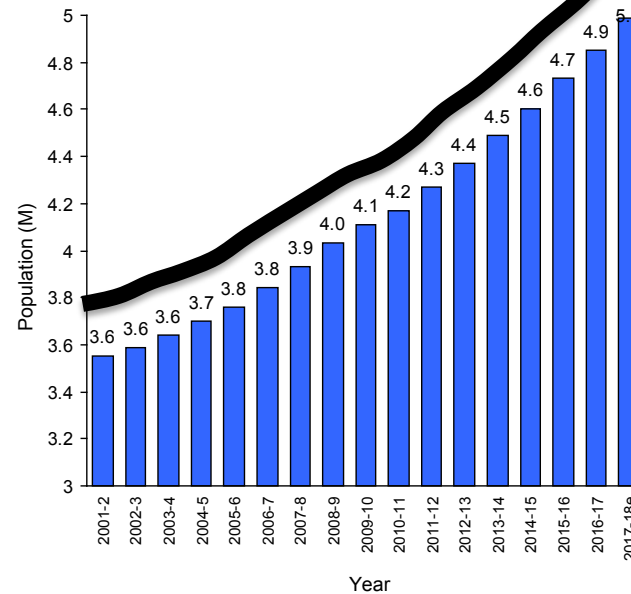
Source: Department of Transport/ Public Transport Victoria Annual Reports

…we need to stop going backwards and go FORWARDS per capita

Relative Service Level Per Head

Service Levels (Vkms supplied) Per Capita

Source: Department of Transport/ Public Transport Victoria Annual Reports

On balance Mass Transit is Effective; Social Transit is Weak and hard to justify

	Mass transit	Social transit
Network characteristics	Direct service; long stop spacing; low density	Circuitous service; short stop spacing; high density
Operational characteristics	Frequent, long spans	Infrequent, short spans
Ridership	High	Low
Societal benefits	Reduced congestion, agglomeration benefits, economic benefits	Increased social inclusion, environmental justice
Customer type	Choice	Captive
Typical demographics	Employed persons, younger age groups	Unemployed, retired, very young and very old, ethnic minorities

I favour Route Concentration over Social Transit and seeking new 1st/Last Mile solutions (including longer walk access)

Social Transit (is Dead)

High density/ low frequency

vs.

Route Concentration

High frequency/ low density
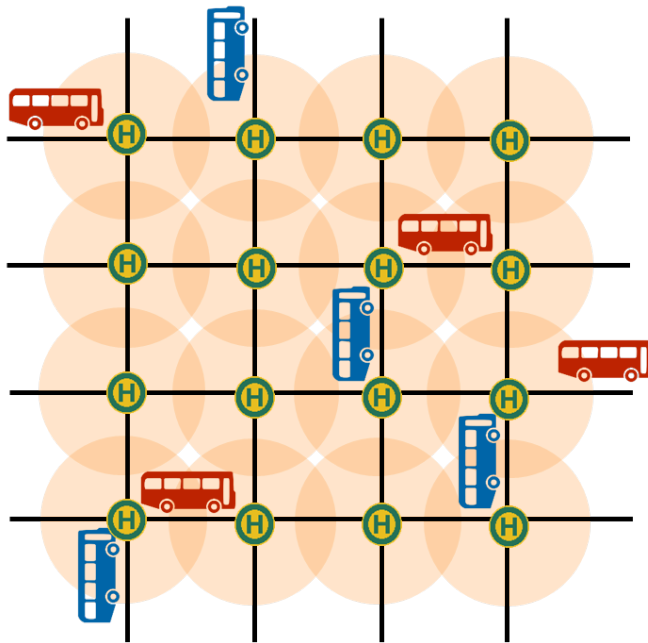
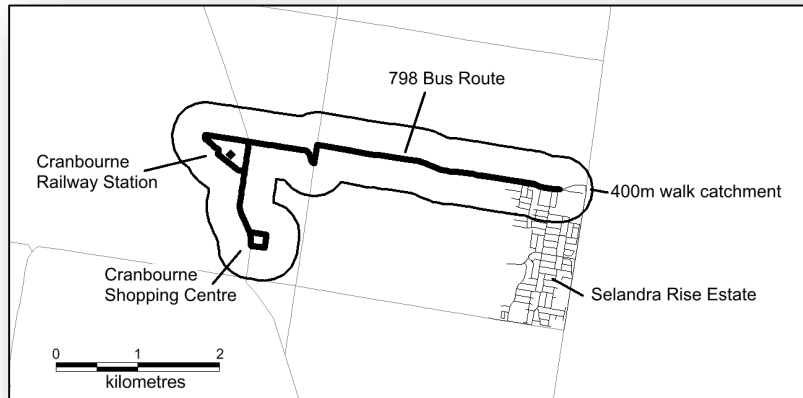

+ area coverage
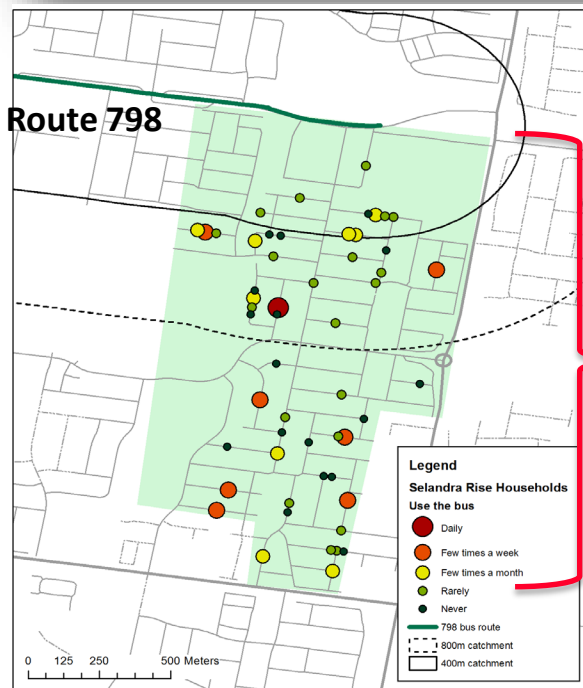− frequency
⚡ waiting time, reliability
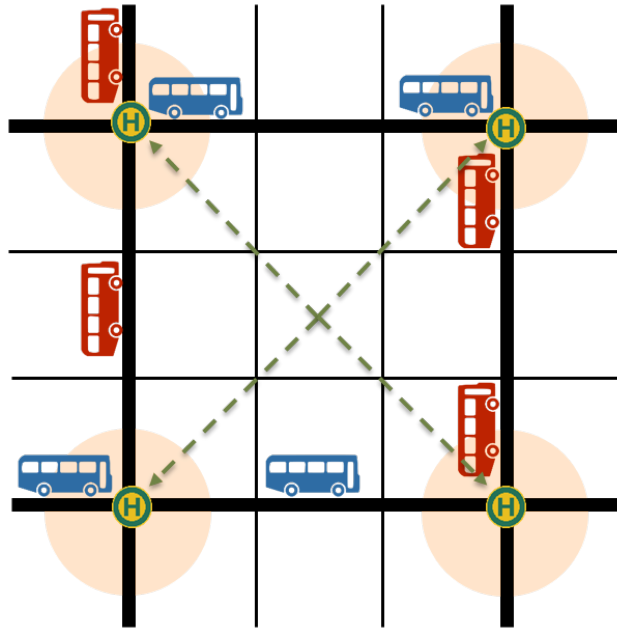
+ frequency
− area coverage
⚡ first/ last mile problem
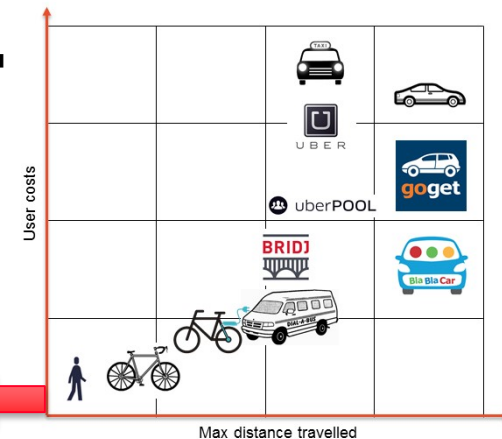
Source: Graphics from the SEPT-GRIP PhD Research of Nora Estfaller

e.g. strong uptake route 798 Cranbourne/ Selandra Rise

798 Bus Route

Cranbourne Railway Station

400m walk catchment

Cranbourne Shopping Centre

Selandra Rise Estate

0 1 2 kilometres

Route 798

Legend
Selandra Rise Households
Use the bus
● Daily
● Few times a week
● Few times a month
● Rarely
● Never
━ 798 bus route
┈ 800m catchment
▢ 400m catchment

0 125 250 500 Meters

- Connects to Cranbourne train station and shopping centre
- Runs every 20-30 minutes
- Good service span
  - 5:30 – 22:30 weekdays
  - 6:30 – 24:00 Saturday
  - 7:00 – 21:30 Sunday

Long Walk Access Distance to a quality frequency

Source: Delbosc A, Currie G, Nicholls L and Maller C (2016) Social Transit as Mass Transit in Suburban Greenfield Development' TRANSPORTATION RESEARCH RECORD Vol 5 2543, pp. 62 –70

Uber/Lift is a bus problem but also (with car/bike share) a possible 1st/Last Mile solution (but this might be wishful thinking)

Uber/Lyft Impact on PT in USA

- net change 6% reduction
- net increase for rail (+3%)
- net decline for bus (-6%) and light rail (-3%).

Source: Clewlow RR and Mishra GS (2017) 'Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States' ITS UC Davis

UBER + DART
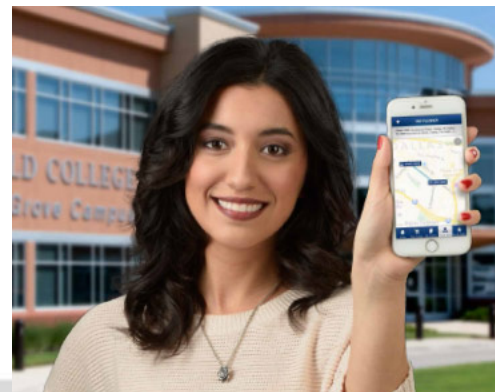
Go further. GoPass.

Simplify your commute with the FREE GoPass app.

Available in English & Español.

DART.org

let's go.

We need more (and better resourced) SmartBus

SmartBus Routes
— Blue Lines
Tram Routes
— Red Lines
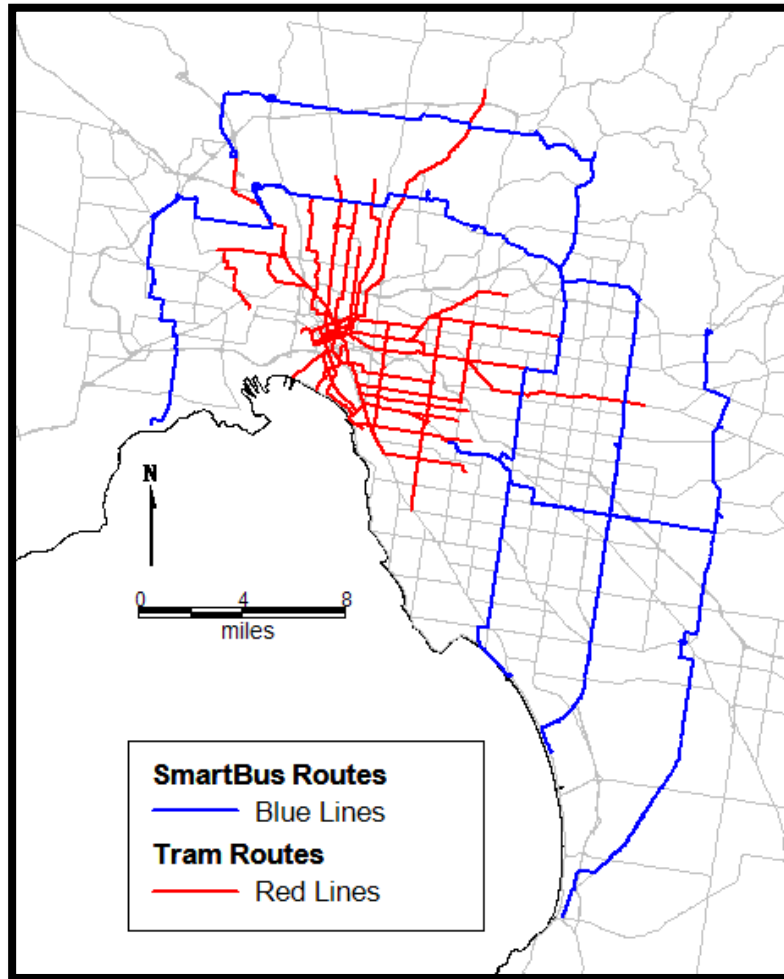
Tram

- Streetcar/Light Rail
- 23 routes/ 500 cars
- High frequency; 7.5 min headway
- Short Routes; Round Trip Time = 110 mins

SmartBus

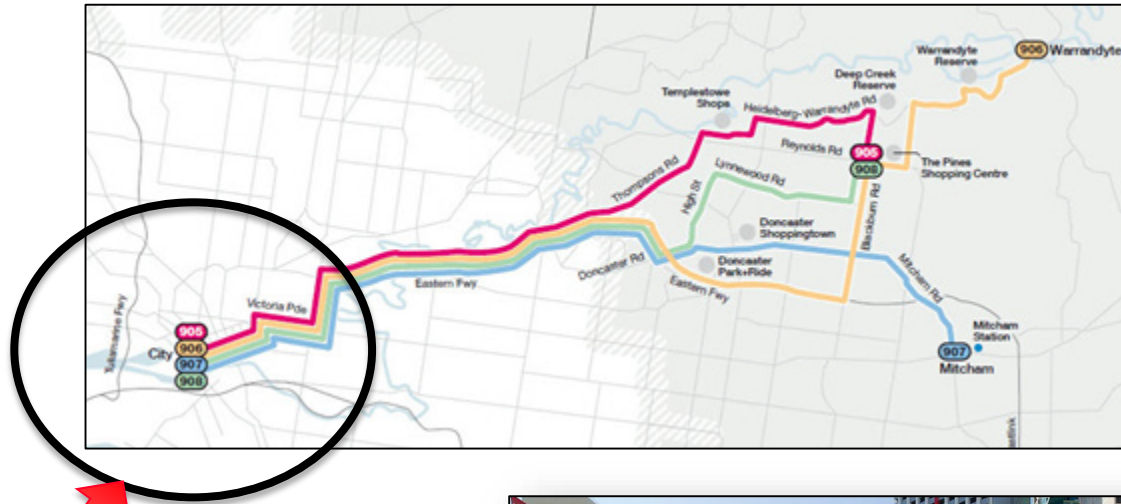- 8 routes
- 200 buses
- Low frequency; 15 min headway
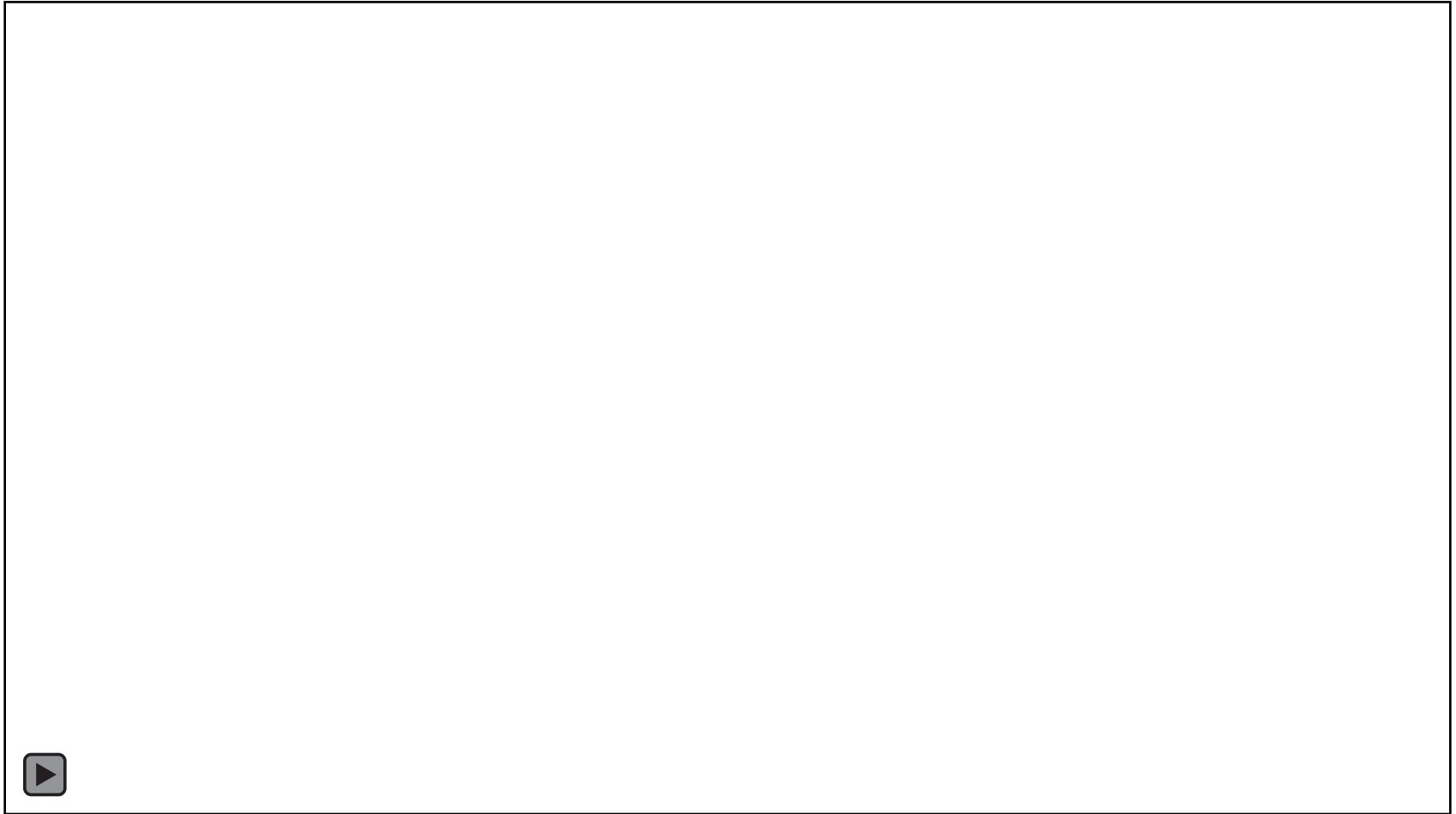- Long Routes; Round Trip Time = 238 mins

MONASH University

PTRG **PUBLIC TRANSPORT RESEARCH** GROUP

For DART; its time to talk city bus tunnels like Brisbane (perhaps part of future rail/Metro 2?)

Bus Rapid Transit (Rubber Tired Rail) or LRT should be part of the plan including urban densification as part of project…

There may be new ways to bring the Train to the City

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UITP
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2025=PTx2

About World Transit Research

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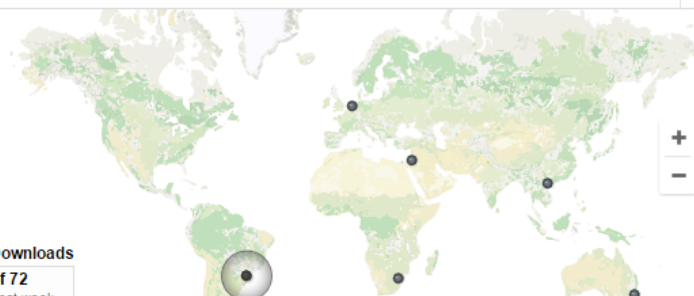
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