Auckland Regional Council

Auckland Passenger Transport Performance Benchmark Study

Final Report

15 August 2011

IWA/N117/Rep/1295

Ian Wallis Associates Ltd

in association with

McCormick Rankin Cagney

Contents

CONFIDENTIAL

EXECUTIVE SUMMARY

1. INTRODUCTION

1.1 This Report

This is the Final Report (Executive Summary) of the Auckland Passenger Transport Performance Benchmark Study for the (then) Auckland Regional Council (now Auckland Council) by consultants Ian Wallis Associates in conjunction with McCormick Rankin Cagney.

1.2 Study Objectives and Scope

The overall study objective was *"To benchmark the efficiency and effectiveness of Auckland's passenger transport performance against similar cities".*

It was agreed at an early stage in the study that:

- It should compare the current/recent performance of AKL's PT system with PT system performance in 13 other cities internationally (details below).
- The data collection and analyses for AKL and the 13 'comparator' cities should focus on two main aspects: the PT contribution to the overall transport task (eg mode shares), and PT system performance in terms of effectiveness and efficiency.
- The work should compare system performance across cities and modes, should assess the key factors 'driving' relative performance in AKL and the other cities (to the extent that information was available), and should comment on the policy implications for further development of AKL's PT system.

1.3 Comparator Cities

The performance of AKL's PT system was compared against the systems in 13 'comparator' cities (metropolitan areas) as listed in Table 1. The selection of these cities was based on a number of factors, including:

- Populations in broadly similar range to AKL (mostly 1.0 – 4.0 million).
- General similarity to AKL in terms of era of urban development, population densities, car ownership, economic development, etc.
- Data availability.
- First preference for Australian and NZ cities, especially those with which AKL's PT system is frequently compared (Brisbane, Perth, Adelaide).

Application of these factors resulted in the selection of cities in NZ (Wellington), Australia (5 cities) and the western seaboard of Canada (4 cities) and USA (3 cities).

2. APPRAISAL OF AUCKLAND'S CURRENT PUBLIC TRANSPORT PERFORMANCE

Table 2 provides a summary of the key findings on the performance of Auckland's PT system and services compared with the PT systems and services in the other 13 cities (metropolitan areas) examined in this project, under the following headings:

A: Passenger Market

B: PT Services – Types, Levels and Quality
C: Fares and Ticketing Systems
D: Cost Efficiency and Effectiveness
E: Financial (Cost Recovery) Performance.

3. APPRAISAL OF FACTORS INFLUENCING PERFORMANCE DIFFERENCES

Table 3 (middle column) summarises our appraisal of constraints and other factors contributing to the generally poor performance of Auckland's current PT system relative to the comparator cities (as outlined in Table 2). This appraisal is arranged under five main headings:

(1) PT-specific policies and service provision
(2) Multi-modal policy aspects
(3) Land use aspects and land use/transport integration
(4) PT cost efficiency aspects
(5) PT planning and regulatory arrangements.

4. POLICY DIRECTIONS TO IMPROVE AUCKLAND'S PUBLIC TRANSPORT PERFORMANCE

In the light of our appraisal of constraints and other factors influencing the current AKL PT system performance, the right hand column of Table 3 outlines the potential policy directions that would contribute to overcoming current constraints and to enhancing AKL's system performance.

These suggested policy directions are generally (although not in all cases) consistent with the transport policy directions currently being pursued or proposed for the Auckland region, in particular as specified in the following policy documents:

- Auckland Regional Public Transport Plan 2010 (ARTA)
- Auckland Transport Plan 2009 (ARTA in collaboration with other authorities in the AKL region)
- Auckland Regional Land Transport Strategy 2010-2040 (ARC)
- Auckland Passenger Transport Network Plan 2006-2016 (ARTA).

We note that policies under sections A, B and C of Table 3 are all likely to have impacts on patronage and mode shares, those under section D are likely to primarily influence the (gross) costs of PT service provision, while those under section E are likely to influence both system effectiveness (including patronage) and cost efficiency.

5. PRIORITY AREAS FOR FURTHER PERFORMANCE APPRAISAL

This project was intended to provide an initial performance analysis and benchmarking appraisal across a wide range of aspects, which would produce high–level results and identify those aspects for which more detailed research/analysis would be most cost-effective. The final section of the report therefore provides a set of recommendations on priority areas for further performance appraisal/benchmarking work, which will then lead to the further development of policies to enhance the effectiveness and cost efficiency of Auckland's public transport system.

TABLE 1: COMPARATOR CITIES AND KEY PT STATISTICS[1]							
Country	**Metro Area**	**Service Area Population (Millions)[2]**	**PT Modes**				**Passenger Boardings /Population**
			Heavy Rail	**Light rail**	**Bus**	**Ferry**	
NZ	Auckland	**1.33**	*		*	*	**44**
	Wellington	**0.43**	*		*	*	**74**
Australia	Brisbane/SEQ	**2.82**	*		*		**65**
	Perth	**1.66**	*		*	*	**77**
	Adelaide	**1.19**	*	*	*		**59**
	Melbourne	**3.96**	*	*	*		**124**
	Sydney	**5.46**	*		*	*	**110**
Canada	Edmonton	**0.75**		*	*		**141**
	Ottawa	**0.79**		*	*		**168**
	Calgary	**1.04**		*	*		**146**
	Vancouver	**2.27**	*	*	*	*	**133**
USA	Honolulu	**0.72**			*	*	**97**
	Portland	**1.58**		*	*		**70**
	Seattle	**2.71**	*	*	*	*	**69**

Notes:

(1) Statistics relate to 2008/09 financial year for NZ and Australian metro areas, to 2008 calendar year for Canada and USA areas.

(2) In some cases the PT service area which is relevant to the analyses is smaller than the whole metropolitan area.

TABLE 2: CURRENT AUCKLAND PT PERFORMANCE RELATIVE TO COMPARATOR CITIES: SUMMARY OF KEY FINDINGS	
Aspect	**AKL Relative Performance and Comments**
A. PASSENGER MARKET – PT TRIP RATES AND MODE SHARES	
A1 PT Patronage Rates	• AKL's PT patronage rate (per service area population) is the lowest of all the comparator cities, including lower than the six cities having significantly lower populations. • AKL's PT patronage rate is between 25% and 40% below the rates for the 3 medium-size Australian cities with which AKL is often compared (BNE, PER, ADL). • AKL's PT patronage rate has grown significantly over the last 10-15 years, with growth averaging around 1.5% - 2.0% pa (and contrasting with its rapidly declining rate in earlier years). However, this growth has been towards the lower end of the range experienced in other Australian/NZ cities.
A2 PT Mode Shares – Journey-to-work	• AKL's PT mode share for journeys to work (2006) is close to the bottom of the range of all the comparator cities. • AKL's JTW mode share is particularly low for trips to the CBD, slightly below the norm for trips to other destinations. • Over the most recent 15 year period (1991-2006), AKL's PT mode share has increased significantly for trips to the CBD, but declined slightly for trips to other destinations.
A3 PT Mode Shares – All Travel	• AKL's PT mode share is only 'substantial' for trips having one or both trip ends in the CBD: o For trips to/from the CBD (c. 10% of all regional trips), the PT mode share (2006) was 32% in peak periods, 13% in off-peak. o For non-CBD trips (89% of all trips), the PT mode share was 3.4% in peak periods, 1.6% off-peak. o The resulting region-wide overall PT mode share was 6.4% in peak periods, 2.8% off-peak (3.9% overall regional daily average).

B.	**PT SERVICES – TYPES, LEVELS AND QUALITY**	
B1	Service Types and Modes	• Relative to most of the comparator cities, a smaller proportion of AKL's PT travel is undertaken on 'rapid transit' services (ie services, whether rail-based or bus-based, that are largely segregated from general road traffic, and consequently have higher operating speeds and generally greater reliability).
B2	Quantity of Service	• Total (in service) PT vehicle km/capita has been used as an overall measure of the quantity of service offered to the population in each city. On this measure, the quantity of service provided in AKL is well below the figures for the Canadian cities and all the other Aust/NZ cities, and on a par with the typical USA cities: AKL's service quantity would need to be increased by around one-third to reach the current levels in the 3 most closely comparable Aust cities (BNE, PER, ADL).
B3	Quality of Service	• Aspects of AKL's PT service quality (as perceived by users of the services) were compared with service quality in other NZ centres using the annual customer satisfaction surveys undertaken by RCs since 2005/06, which incorporate a consistent set of questions (specified by NZTA). • Based on this source, for **Bus** mode, AKL rates the worst of all the regions, in all years, on the 3 attributes that are arguably the most important of those surveyed, ie overall service, service value for money, service reliability. On most attributes, including these three, AKL's user ratings have shown some improvements over the last five years. • For **Train** and **Ferry** users, AKL's quality ratings were lower than those for WGN users in almost all cases. AKL's ratings on most attributes have been either stable or shown slight improvements over the last five years.
C	**FARES AND TICKETING**	
C1	Fare Levels	• In general, of the four countries examined, average fares (per passenger boarding or per passenger km) are highest in the NZ cities, lower in the CAN/USA cities and lowest in the Australian cities. • AKL's average fare/pass km is around 50% higher than typical average fares in the CAN/USA cities and double the typical average fares in the Australian cities.
C2	Fares and Ticketing Integration	• Most of the comparator cities examined operate integrated, multi-modal fares and ticketing systems. With such systems, a complete journey (origin-destination) may be made on one ticket, with no penalty for transferring between routes or modes. • AKL is one of the few cities examined that does not have an integrated fares/ticketing system for at least a large proportion, if not all, PT trips[(1)]. This is believed to be a significant factor contributing to its relatively low PT usage rates.
D	**COST EFFICIENCY & EFFECTIVENESS**	
D1	Working Expenses per Vehicle Km (Cost Efficiency)	• The performance measure used here is total working expenses per in-service vehicle km[(2).]. The main use of this measure is in comparing between cities for each mode separately, rather than comparing between different modes, which involve very different vehicle capacities and very different levels of capital charges. • For **Rail** mode, the AKL cost rate is towards the top end of the range of the seven Australasian cities (exceeded only by ADL and SYD). It is around 50% above the rate for the other three Australian cities (BNE, PER, MEL) and 80% above the WGN rate. *The relatively high AKL rate is likely to reflect: (i) diseconomies associated with the small scale of the system; (ii) some 'transitional' costs associated with the current expansion and development of the system (eg driver training); and (iii) higher operating and maintenance costs associated with diesel-powered systems.* • For **Bus** mode, the AKL cost rate is around the middle of the range for the Australasian cities, but significantly above the corresponding rates for diesel bus services in WGN (and in other NZ centres). *The evidence indicates that the very*

	low level of competition for provision of services in AKL is one factor behind its high rate relative to other NZ centres.
D2 Average Vehicle Loadings	• The performance measure used here is the ratio (for each mode) of passenger km of travel to vehicle km operated (in service): this represents the average passenger load per vehicle (averaged over the full route length and over all periods). • For both rail and bus modes, AKL has the lowest average loadings of all the comparator cities. In each case its average boardings are 15%-30% lower than the WGN average and 1%-32% lower than the 3 Australian cities with which it often compared (BNE, PER, ADL).
D3 Working Expenses per Passenger Km (Cost Effectiveness)	• The performance measure used here is total working expenses divided by total passenger km, by mode and city[3]. While this measure does not cover all costs, it is a useful measure for comparing overall cost-effectiveness across modes and cities. • For **all modes** combined, the AKL figure ($0.61) is considerably higher than that for WGN ($0.33), for all the Australian cities and all the CAN cities. This relatively high figure reflects the combination of relatively high WE/vehicle km (E1 above) and relatively low loadings (D1). • For **rail** mode, the AKL average ($0.52) is substantially greater than all the Australian figures (range $0.18 to $0.41) and the WGN figure ($0.20). Similarly, for **bus** mode, the AKL figure ($0.65) is substantially greater than the range of Australian figures ($0.40 to $0.56) and the WGN figure ($0.52).
E1 Fare Revenue/ Working Expenses	• The performance measure used here is the ratio of total fare(box) revenue to total working expenses, by city and mode. We refer to this as the working expenses recovery ratio (WER): it is sometimes referred to as the 'farebox recovery (ratio)[4][5]. • For **all modes** combined, the AKL WER (39%) is higher than all the USA cities, higher than all but one of the Australian cities, but lower than all the CAN cities. It is considerably lower than the WGN figure. These results reflect AKL's combination of relatively high costs (WE/PKm) with relatively high fare revenues (Rev/PKm). • For **rail mode**, the WER for AKL is 28% (ie well below the AKL all-modes average). It is lower than the corresponding ratios for all but one of the Australian rail systems (WER range 26% to 63%). AKL's relatively high rail fares are insufficient to offset its relatively high costs, resulting in this relatively low cost recovery result. • For **bus** mode, the AKL WER ratio is 38%. This is the second highest of the 10 cities for which data are available, with only WGN (45%) having superior performance[7]. AKL's relatively high fares are in this case sufficient to offset its relatively high costs (relative to the Australian cities in particular). • For the **ferry** mode, AKL's WER ratio is 68%, much higher than for its rail or bus services. This ratio is the second highest (after WGN) of the six cities for which data are available.

Notes:

(1) We understand that AKL proposes to implement such an integrated fares/ticketing system within the next few years.

(2) Note that working expenses exclude all capital expenditure and associated capital charges (depreciation, interest payments, finance lease charges).

(3) This measure may be derived by dividing the cost efficiency measure (D1) by the vehicle boardings measure (D2).

(4) Note that, as working expenses cover only a proportion of the total costs of each mode, any cross-modal comparisons on this measure are of very limited use, but within-mode comparisons between cities are more valuable.

(5) The farebox recovery estimates presented in this report closely approximate to, but are not identical with, the figures presented by NZTA in its Farebox Recovery policy document.

TABLE 3: SUMMARY OF FACTORS CONSTRAINING AUCKLAND'S CURRENT PT PERFORMANCE AND POTENTIAL POLICY DIRECTIONS[(1)]		
Heading	**Factors Constraining Current AKL PT Performance**	**Potential Policy Directions to Enhance Performance**
1 PT-SPECIFIC SERVICE ASPECTS		
1.1 PT Network and Service Strategy	• While an integrated network strategy, with different service types designed to cater effectively and efficiently for different travel needs, is established as policy, it is not yet widely achieved in practice: – Network largely focussed on travel to/from CBD, with services inadequate for great majority of non-CBD trips. – 'Rapid transit' (high speed and quality) services directly serve only a small proportion of the population – less than 15% of population live within 800m of a train station. • PT route coverage of the metro area is reasonably good (in terms of walking distances to nearest PT route), but most routes are of low frequency (every 30 minutes or less often) and limited operating hours: they are not competitive with private car use. • Services on different modes are not well coordinated (in terms of transfer arrangements, timetables) and in some cases are inefficiently or unnecessarily duplicated.	• The 'layered' approach being progressively adopted in AKL in the development of the PT network is supported, involving three main service 'layers' (RTN/QTN/LCN). The services in the top two layers (RTN/QTN) are to be designed to offer competitive alternatives to private car use. • Upgrade the existing RTN routes, progressively extend the RTN route network and identify the services on the QTN – in most cases using bus mode in the shorter term (with potential for upgrading to higher capacity modes later). • QTN/LCN services should be progressively redesigned, on an area/corridor basis, based on patterns of current/potential person travel demand (and not constrained by historic operator/ contract area boundaries). • Greater emphasis should be given to providing higher service frequencies over fewer routes (with coordinated transfers).
1.2 Quantity of Service	• The total quantity of PT services provided in AKL (vehicle km or similar measure) relative to its population is low relative to most of the comparator cities. This low level is particularly evident in poor service frequencies and limited hours of operation.	• As services are improved and made more attractive for users, the extent of services provided should be progressively increased. A particular focus should be given to off-peak periods – with high frequency services on the RTN/ QTN; and regular/clockface timetables, improved frequencies and extended hours of operation on other routes.
1.3 Service Speed	• Relative travel speeds by PT and car are an important indicator of the competitiveness of PT for 'choice' travellers, particularly for longer urban trips. Auckland's PT system performs relatively poorly on this measure, worse than the metropolitan average in most other developed-world cities, with the exception of the USA.	• PT speed performance should be improved through proposals to: – extend and upgrade the RTN (including rail electrification) – extend and strengthen bus priority measures – restructure the bus network to provide more direct routes.
1.4 Service Reliability	○ Indications are that the levels of reliability of PT services are poor relative to other cities (eg NZ annual Customer Satisfaction Surveys rate AKL bus service reliability lower than for all other NZ centres. • Monitoring of AKL's bus service reliability and punctuality is largely done	• Policies to enhance reliability include: ○ Extension and upgrading of the RTN, in which PT vehicles are largely separated from other traffic ○ Extension and upgrading of bus priority measures (refer item 2.4). ○ Wider implementation of real-time passenger information (which reduces the perceived disbenefits of unreliability). • Enhanced monitoring required (using real-time systems) and enforcement of

	through operator self-reporting at present, and the results seem likely to be biased.	reliability standards in operator contracts.
1.5 Service Integration and Infrastructure Aspects	• For historical reasons, in many respects the current AKL PT system operates as a series of largely-separate networks and services (defined by mode, operator and route) with little integration or coordination between them. This limits people's perceived travel opportunities. With the policies now adopted to implement a tiered network structure and to introduce integrated fares/ticketing, an increased proportion of PT trips will involve modal or route transfers, thus placing increased importance on high standards of integration and the associated infrastructure.	• Infrastructure-related policies to better integrate services and to improve users' transfer experience should address (as outlined in PTNP): ○ Train stations, bus stops and ferry terminals – improved amenities (weather protection, seats), customer facilities and passenger information ○ Interchanges (transfer points) – similar to stations, etc ○ Park & ride, kiss & ride facilities at stations, etc (all PT modes).
1.6 Other Service Quality Aspects	• The annual NZ Customer Satisfaction Surveys show that AKL's PT services are ranked poorly by users (all PT modes) in terms of overall service quality and overall value for money as well as other key attributes. Arguably, there is a widespread perception that AKL's PT services are only used as a 'mode of last resort'.	• Policies to improve perceptions and attitudes towards the use of PT will require a mix of improvements to services and infrastructure (as above), improved passenger information (real-time, etc) and enhanced marketing over an extended period.
1.7 Fare Levels	• AKL's current PT fares average (on a per passenger km basis) are around double those in the Australian cities and around 50% higher than those in the USA/Canadian cities. • The annual NZ Customer Satisfaction Surveys indicate that AKL bus users consider the services worse value for money than bus users in the other 13 NZ regions.	• These findings suggest that any policy to raise AKL's overall PT fares substantially should be approached with great caution, unless and until significant improvements in service quality have been achieved. Potentially this may conflict with financial pressures to increase the cost recovery performance of AKL's PT system. • However, there may be scope for greater off-peak/weekend fare discounts, recognising the lower costs and higher demand elasticities associated with off-peak travel.
1.8 Fare and Ticketing Integration	• AKL is one of the few comparator cities that does not have an integrated, multi-modal fares/ticketing system catering for all (or the great majority) of PT trips. Relative to the other cities, the AKL fares/ticketing system is difficult to understand, is seen as unattractive to occasional or non-users, and is a significant deterrent to patronage. The lack of fares/ticketing integration would also prevent the full implementation of AKL's proposed network and service strategy (item 1.1).	• Current AKL policy proposals to introduce an integrated fares and ticketing system are supported: they are along broadly similar lines to systems that have been or are being adopted in most developed world cities that are regarded as providing successful (and well patronised) PT systems. Such a system would involve zonal-based fares, allowing 'free transfers' between modes and vehicles within defined zones (and time periods), and using contactless smartcard technology.
1.9 Marketing, Branding and Passenger Information	• PT systems that are generally regarded internationally as 'successful' (in patronage and other terms) are usually designed, operated, presented and marketed as a single integrated system (even though their operations may be contracted out to multiple operators). The AKL system still falls short of this fully integrated system in terms of its marketing and passenger information (eg its diverse vehicle liveries and branding).	• All marketing, branding and passenger information efforts should present AKL's PT services first and foremost as an integrated system (any modal or operator-specific elements to be secondary). • The presentation of the system should emphasise service type rather than mode, consistent with the strategic planning service categories (RTN, QTN, LCN). • High priority should be given to extend real time information for users (at stops, via website and mobile phones, etc).

2. MULTI-MODAL TRANSPORT POLICY ASPECTS		
2.1 Transport Investment Policies and Funding	• As noted earlier, relative travel speeds by car and PT in different cities have a strong influence on the PT mode share. Over the last 5-10 years, the evidence would indicate very little change in the relative travel speeds in the AKL region in general, although there are exceptions in some corridors (eg the Northern Busway). • While investment in AKL's PT system (particularly rail) has increased considerably in this period (with positive results in terms of patronage), investment in the region's roading system has also increased, and is projected to continue over the next 10 years (at least). In general, this would be expected to at least retain, and possibly increase, the advantages of private car in preference to PT use, and hence work against other policies to increase PT mode share. • The strength of this effect may be reduced in the AKL case because a large proportion of the roading expenditures are on schemes in the outer parts of the region and/or non-radial routes, where PT accounts for only minor market shares.	• To minimise any adverse impacts on the PT market share, ARLTS Policy 6 (Additional Road Capacity) would be supported: *"Selectively increase the capacity of the road network where alternative management options (including the use of PT) are not sufficient to address growth in travel demand."*
2.2 Multi-modal Pricing and Cost Recovery Policies	• Just as PT mode share is sensitive to relative travel speeds by car and PT, it is also sensitive to relative travel costs for car and PT use. • Despite this, no in-depth studies have been undertaken for NZ metropolitan areas into the optimum, integrated pricing for both PT (through fares) and car use (through parking and various forms of road use charges).	• An integrated pricing study is recommended for AKL in order to develop consistent pricing policies for PT and car use. Such a study should take account of: – the marginal private and social costs of car and PT use in AKL (by peak/off-peak, PT mode, etc) – the direct and cross price elasticities of demand for each mode – the 'decongestion' and investment implications of alternative pricing policies – the optimum pricing for PT under current road pricing policies and optimum road pricing policies – the overall economic and financial implications of alternative policies.
2.3 Parking Supply and Pricing Policies	• The international evidence indicates that the PT mode share is sensitive to the amount of parking available and its pricing: this is particularly the case for travel to/from the CBD. • The availability of parking in AKL CBD is high by international standards, considerably higher (in terms of parking spaces/ CBD employee) than the average levels in Australia, USA and Canadian cities. • Further, AKL CBD commuter parking charges are low relative to most of the comparator cities.	• The ARLTS recognises the important role of parking supply and pricing policies *"in encouraging a shift in travel behaviour towards PT and active modes as an alternative to single occupant vehicle use*." ARLTS policy 2.3 in particular (*"Manage the location, pricing and availability of parking so that it is consistent with road capacity and growth centre objectives"*) should thus support the retention/increase of PT mode share for trips where road capacity is limited and good PT services are available.
2.4 Road Space Priority	• It was noted above that: ○ PT travel speeds and reliability of services are key features affecting the	• The continuation/strengthening of policies to provide on-road priorities for bus services over general traffic is supported, where this will contribute to

Policies	attractiveness of PT use ○ AKL's average PT travel speeds (relative to car) are poor relative to other cities ○ AKL's bus service reliability appears to be relatively poor (based on user perceptions). • The great majority of AKL's PT travel is undertaken on buses, running in mixed traffic on the road system. • Over the last 10-15 years, a considerable number of bus priority schemes (mostly with-flow bus lanes) have been implemented in AKL: these have had some success in improving bus travel speeds and reliability, and in some cases significantly increasing patronage. • This program needs to be continued and extended, so as to improve the attractiveness of bus services relative to car use.	significant bus travel time savings and/or reliability improvements. • Innovative types of priority measures should be explored where these can provide the most cost-effective solutions eg.: – with-flow bus lanes – contra-flow bus lanes – bus gates – bus advance signals – traffic signal pre-exemption. • Such policies will be particularly important for the QTN, in order for these services to provide a competitive alternative to private car use.
3. LAND USE ASPECTS AND LAND USE/TRANSPORT INTEGRATION		
3.1 Population and Employment Densities	• Relative to other developed-world metropolitan areas, AKL's development is characterised by: – relatively low population densities, which are relatively 'flat' across the whole metropolitan area – a relatively 'weak' CBD, with relatively low employment density and a low proportion of total regional jobs. • Such characteristics are typical of cities that have largely developed in the automobile era: the comparator cities analysed here generally have similar characteristics, although AKL's employment densities are particularly low in the CBD and inner areas. • Both the overall density profiles of such cities and their relative lack of more intensively-developed nodes or corridors (refer below) make then hard to serve effectively by PT services, hence contributing to the dominance of the car and to low PT mode shares.	• Policies which limit the absolute space of the total urban area (eg involving urban growth boundaries), combined with land use transport integration within the urban area (see item 3.2 below) should contribute to reduced car dependence and higher PT mode shares.
3.2 Urban Development Patterns and Land Use/ Transport Integration	• Until recently, Auckland's transport policies and land use policies have been developed largely separately, without taking into account their inextricable inter-relationships and developing integrated policies. Such integration is essential to any goal of reducing car dependence and should contribute to a more cost-effective PT system catering for an increased share of regional travel. • While the AKL authorities have increasingly moved over recent years towards the adoption of more integrated land use/transport policies, including the designation of selected growth centres, to date these policies have had only limited success, eg (refer ARLTS 3.6):	• The ideal (integrated) development pattern that will complement transport policies of reduced car dependence, greater use of 'alternative' modes (including PT) and increased efficiency of the overall transport system adopts the 'nodes and corridors' approach. This approach involves a series of nodes designated for high-density development ('urban villages'); the corridors between these nodes designated for medium density, mixed use (residential, employment) developments; with the corridors served; by high quality, high capacity rapid transit services (rail-based or bus-based). • This is essentially the integrated land use/transport development pattern at the heart of the AKL Regional Growth Strategy and Regional Policy Statement

	– very limited residential intensification (apart from the CBD) – retail activity becoming more dispersed, rather than based in centres – low density of development in major centres, which does not support the provision of good PT services – community facilities (health, education, etc) have not generally been established in growth centres.	and supported through the Regional Land Transport Strategy. • If implemented effectively and consistently over an extended period of time, the combined package of RGS/ RPS/RLTS policies should certainly assist in increasing the market share and cost-effectiveness of the AKL PT system: it is less clear that the policies would reduce the level of PT funding support needed. But, based on experience to date in AKL and in other cities pursuing similar policies, we have two major caveats: o Whether these policies will be implemented effectively and consistently over an extended timescale o Even if so, the impacts of the policies on the PT system (in terms of patronage etc) would develop only slowly and progressively over an extended period of years.
4 PT COST-EFFICIENCY ASPECTS		
4.1 Overview	• 'Cost-efficiency' is defined here in terms of costs per in-service vehicle km (Table 2D).	•
4.2 Rail Mode	• The current AKL cost rate is towards the top of the range of the seven Australasian cities (Table 2D). Three specific factors are suggested as contributing to the relatively high AKL rate: – diseconomies of small scale system – costs higher for diesel than electric operation – some 'transitional' costs associated with system expansion/ development.	• Further research/analysis would be required to: – 'benchmark' the AKL rail system in more detail against the metro rail systems in WGN and the five Australian cities – quantify the impacts of specific factors influencing costs – define a set of good/best practice cost rates that should be achievable for the AKL system in the medium-term, together with a plan of action to achieve these rates.
4.3 Bus Mode	• The current AKL cost rate is around the middle of the range for the seven Aust/NZ cities, but significantly above the corresponding rates for diesel bus services in WGN (and other NZ urban centres). • Without the benefit of a detailed benchmarking appraisal, our judgement is that the AKL unit costs would need to reduce by around 20%-30% to achieve good/best practice levels. • Key factors constraining the current cost-efficiency performance of AKL's bus services are considered to be: – the current regulatory model, including the 'two-tier' system of commercial and contracted services; and – the presence of a dominant operator (NZ Bus) in the AKL market, which (together with the regulatory model) acts as a deterrent to competition for contracts.	• Issues relating to the regulatory model adopted for bus services in NZ are currently being investigated by MoT (with other parties) under the Public Transport Operating Model (PTOM) project. • As part of that project (or otherwise separately), there would appear to be merits in undertaking a detailed cost efficiency benchmarking exercise covering bus services in the main NZ centres. This would both identify/explain current cost differences between centres and provide the basis for establishing appropriate benchmarks for each centre (for potential application in the PTOM project).

5 PT PLANNING AND REGULATORY ARRANGEMENTS		
5.1 PT System Integration	• Relative to most of the comparator cities assessed, the AKL PT system exhibits a low level of 'integration', in terms of modes, routes, fares/ticketing, etc. The international evidence indicates that this negatively impacts on patronage and in some cases on the cost efficiency of service provision.	• The public sector PT authority (now AT) should have sufficient powers (through appropriate regulation, etc) to achieve effective system integration (from the customer perspective) on all aspects, including: – service design and service standards – fares and ticketing – interchanges and infrastructure facilities – marketing, branding and passenger information. • This is the approach adopted in most of the cities examined in the project, and also in many other cities internationally which are regarded as having successful PT systems have adopted strong 'integration' approaches.
5.2 PT Network and Service Planning	• The current 'two-tier' regulatory system (commercial and contracted services) gives rise to difficulties for the PT authority (AT) in implementing the optimum network and service designs. This results in a system which is sub-optimum from the user viewpoint (adversely affecting patronage) and the cost viewpoint (adversely impacting on costs). These difficulties appear likely to increase under AT's proposed integrated/layered network plan.	• The public sector PT authority (now AT) should take the major role in network and service planning and development – with the operators being consulted but playing a secondary role (refer item above). • This is the approach adopted in most of the cities examined in the project, and also for many European cities which are generally regarded as having successful PT systems. • This issue is being currently addressed at national level, through the PTOM project being run by MoT.
5.3 Operator Contracting Funding Model	• Currently, most bus/ferry contracts are funded on a 'net cost' model (operators take responsibility for fare revenues) – unlike for the rail contract, which is on a 'gross' cost basis. This results in significant difficulties and delays for the PT authority in implementing desired service changes, fare changes, etc, and may particularly be an impediment to achieving greater system integration. It also results in operators liable to experience windfall gains and losses resulting from actions of the authority and other factors outside their influence (eg changes in fuel prices).	• Consistent with the above moves towards enhanced system integration and the authority taking the leading role in service planning, bus/ferry operator contracts should move to funding on a gross cost basis. This should be accompanied by a system of operator incentives relating to their quality of service delivery, covering aspects within their direct influence (reliability, vehicle presentation, etc). • This proposal is consistent with AT's Procurement Strategy and with changes to contacting models adopted in other major NZ centres within the last few years (eg Canterbury, Waikato).

1. INTRODUCTION

1.1 This Report

This is the Final Report of the Auckland Passenger Transport Performance Benchmark Study. It has been prepared for the (then) Auckland Regional Council by consultants Ian Wallis Associates (IWA) in conjunction with McCormick Rankin Cagney (MRC).

1.2 Study Overview

1.2.1 Study objectives and desired outcomes

The overall study **objective** was:

> *"To benchmark the efficiency and effectiveness of Auckland's passenger transport performance against similar cities."*

The **expected outcomes** from the study were as follows:

- *Establishment of a benchmarking methodology that allows comparisons with cities that Auckland may seek to emulate.*
- *Assessment of how the Auckland PT system is performing relative to cities of similar size (in terms of delivering desired outcomes).*
- *Identification of best practices.*
- *Identification of gaps in our current transport arrangements and informing the degree to which our policies are effective*
- *A basis for developing strategic responses including:*
  - *identified levels of service for PT*
  - *guidance on farebox policy*
  - *identification of policy responses to issues at the strategic level (RLTS).*
- *A comparative basis on which to comment on the performance of Auckland's PT system reported in the three year RLTS monitoring report.*

1.2.2 Study scope – the benchmarking process

The study RFP outlined a benchmarking process which encompasses the main elements of business planning and business improvement. The process was defined in eight main steps, as shown in Figure 1.1. As specified in the RFP, this study was to cover the first five of these steps only.

1.2.3 Previous relevant studies

The RFP noted that a number of benchmarking studies had already been undertaken relevant to Auckland's PT system and services, and that this study should build on (not duplicate) this previous work. In particular, IWA was in the process of completing a Metropolitan Public Transport Performance Project for the NZ Ministry of Transport, which analyses effectiveness and efficiency aspects of the PT systems (by bus, train, ferry modes) in Auckland, Wellington and the five largest Australian cities: it was considered that the data collected in this MoT project could form a substantial part of the performance database required for the ARC study. A number of other previous projects were also identified that could contribute to this study.

1.2.4 Priority aspects for appraisal

The scope of work which might be undertaken consistent with the RFP was potentially wide, relative to the study timescale and resources available. Early in the study, a workshop was therefore held with ARC staff and other key stakeholders (ARTA and NZTA) to secure agreement on the priority aspects for investigation in this study. Based on this workshop and subsequent discussions between ARC and the consultants, and having regard to the previous studies available, it was agreed that this study should focus primarily on the aspects set out in Table 1.1, and principally:

Figure 1.1: Benchmarking 'Process Chain' – Main Steps

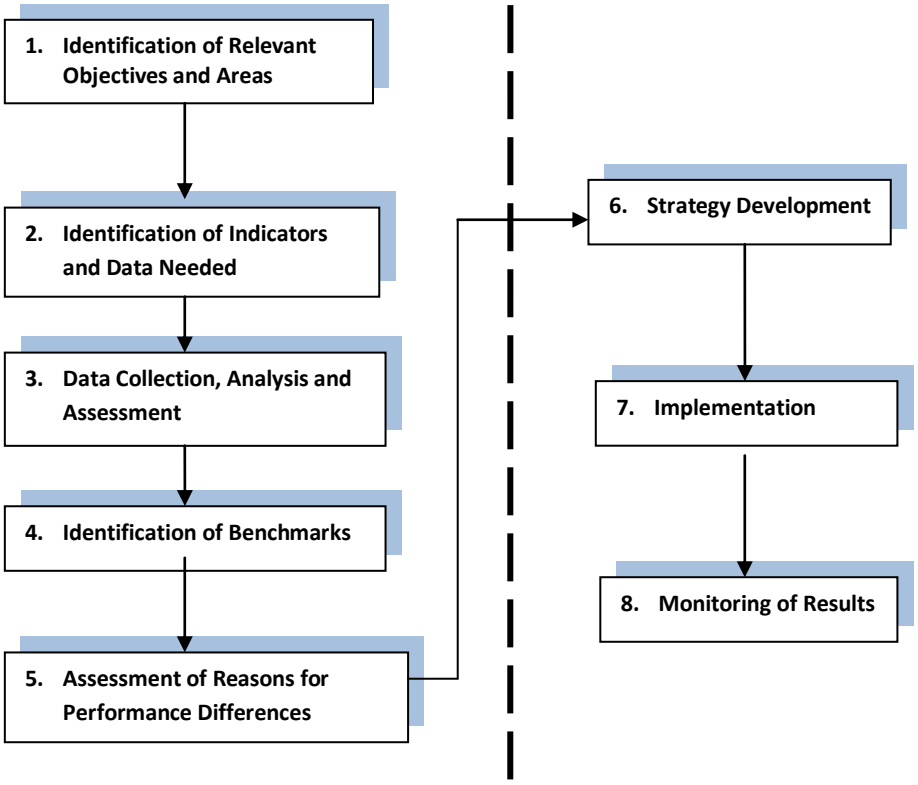


TABLE 1.1: OVERVIEW OF STUDY PRIORITY ASPECTS

Item	Notes, Comments	Report Coverage
A: PT contribution to the overall transport task (data collection and analyses)	Covers: • PT trip rates • PT market shares (all trips, journey-to-work trips)	Chapter 3
B: PT system effectiveness and efficiency performance (data collection and analyses)	Covers (by area/mode): • System effectiveness • Service quality aspects • System cost efficiency • Financial performance.	Chapters 4/5
C: Area contextual information (data collection)	Covers key characteristics (descriptive and quantitative) for each area that would assist in the interpretation of the performance findings under the above aspects.	Chapter 2, Appendix A
D: Appraisal and commentary	For the items listed under A and B above, covers performance comparisons (across modes and metro areas), commentary and assessment of reasons for performance differences, in the light of the area contextual information (C).	Chapters 3-5, Chapter 6

- PT contribution to the overall transport task (item A).
- PT system effectiveness and efficiency performance (item B).

In relation to both of these aspects, it was agreed that data should be collected (based on the most recent statistics available), by:

- PT mode – principally Bus, Train/LRT, Suburban (Heavy) Rail, Ferry.
- Metropolitan areas – AKL, WGN, selected major cities in Australia, Canada and USA (see below).

1.2.5 Comparator cities

As the basis for 'benchmarking' the performance of Auckland's PT system, it was considered desirable to select 'comparator' cities (metropolitan areas) that are broadly similar to Auckland in terms of population size and density, age and phasing of development, geographic situation, cultural mix, economic structure and wealth. Most cities that best meet these criteria are in Australasia and North America – with a particular focus on the north-west coast of North America, where the geography, natural resource economies and city age/phasing of development are most comparable to Auckland.

Other considerations that influenced city selection included:

- The desirability of including other (albeit much smaller) NZ cities, as a contribution to other NZ-based benchmarking comparisons.
- Similarly, the desirability of including major Australian cities, as a contribution to trans-Tasman benchmarking comparisons, which are often of interest to policy analysts and decision-makers.
- The ready availability of data from previous studies.

The cities selected, in the light of these considerations, are detailed in Chapter 2.

1.3 Report Structure and Status

Following this introductory chapter, this report comprises five main chapters, as follows:

- Chapter 2 – provides an overview of the comparator cities selected (further details in Appendix A)
- Chapter 3 – data and analyses on the PT contribution to the overall transport task (usage and mode shares) in each city
- Chapter 4 – data and analyses on service quality aspects (NZ cities only)
- Chapter 5 – data and analyses on PT system effectiveness and efficiency performance
- Chapter 6 – appraisal and conclusions on reasons for performance differences and implications for further development of AKL's PT system.

This report should be treated as **confidential**, for distribution within ARC (now Auckland Council), Auckland Transport and the NZ Ministry of Transport only. Dependant on written agreement from the Australian authorities that have contributed data for the report, the report may be made available more widely.

1.4 Acknowledgements

This study has been dependent on data provision and other contributions from a considerable number of parties. We would thank in particular the following parties:

New Zealand:

- Auckland Regional Council (now Auckland Council)
- Auckland Regional Transport Authority (now Auckland Transport)
- Ministry of Transport, NZ (for making available the dataset collected for its Metropolitan Public Transport Performance Project)
- NZ Transport Agency (for data provision and workshop contributions)

International

- Public transport authorities in 5 Australian, 4 Canadian and 3 USA metropolitan areas (details given in Chapter 2).

2. COMPARATOR CITIES AND DATA SOURCES - OVERVIEW

2.1 Comparator Cities and Principal Authorities/Operators

Following the initial study workshop and discussions with ARC staff, 14 cities/metropolitan areas were selected as 'comparator' areas for data collection and comparative assessment:

- New Zealand – Auckland, Wellington
- Australia – Brisbane, Perth, Adelaide, Melbourne, Sydney
- Canada – Edmonton, Ottawa, Calgary, Vancouver
- USA – Honolulu, Portland, Seattle.

Table 2.1 presents information for each of these comparators on the area for which data were collected and on the principal PT authorities and operators for the area. Where possible, the 'study area' chosen represents the whole of the relevant metropolitan area that is served by regular PT services. This aim was achieved for the NZ areas (the urbanised parts of the AKL and WGN regions) and for the Australian areas. For the Canadian and USA areas, in some cases only the area served by the municipal transit operations was covered, omitting some outlying areas covered by other operators[1].

Appendix A provides a 'profile' for each of the 14 areas, designed to assist in the interpretation of the data collected. These profiles are arranged under the following 15 aspects:

- Urban development profile
- Geographic setting/layout
- Population and demographics
- Employment centres—mono-centric v poly-centric etc.
- Income/car ownership
- Road system development—extent of motorways etc.
- Motoring costs, parking, other traffic restraints etc
- Active modes—roles and popularity
- PT system overview
- Train system
- Tram/LRT system
- Bus system
- Fares and ticketing system/integration
- Institutions and organisational arrangements
- Regulation, procurement, asset ownership and operators.

2.2 Key Statistics for Comparator Areas

Table 2.2 provides a summary of recent key PT statistics for the 14 areas covered, including:

- Area population – both the service area for which data were collected, and for the total metropolitan area.
- Vehicle kilometres of service provided, by mode[2].
- Passenger boardings, by mode[3].
- Passenger boardings per service area population, as derived from the above data.

[1] In some cases, the area to which operations and patronage data related differed from that to which travel survey data (eg census journey-to-work) related; but care was taken to separate these different types of analyses.
[2] For rail services, the vehicle km statistics relate to carriage km provided (rather than train km).
[3] These are sometimes referred to as 'unlinked' trips. Data on 'linked' trips (ie journeys between origin and destination) were not collected, as these data are not readily available for many of the comparator areas.

TABLE 2.1: ASSESSMENT AREAS AND AUTHORITIES INVOLVED			
Country	**Metro Area**	**Principal PT Authorities**	**Area Covered**
NZ	Auckland (urban area)	Auckland Regional Council Auckland Regional Transport Authority KiwiRail Group	Auckland region (urban area)
	Wellington (urban area)	Greater Wellington Regional Council KiwiRail Group	Wellington region (urban area)
Australia	Brisbane/SE Queensland	TransLink Transit Authority	TransLink service area (incl Sunshine Coast, Gold Coast)
	Perth	WA Public Transport Authority	Transperth service area
	Adelaide	SA Department for Transport, Energy & Infrastructure (Public Transport Division)	Adelaide metropolitan service area
	Melbourne	Vic Department of Transport	Melbourne metropolitan service area
	Sydney	NSW Department of Transport & Infrastructure	Greater Sydney metropolitan service area (incl all CityRail services)
Canada	Edmonton	Edmonton Transit System (City of Edmonton)	City of Edmonton
	Ottawa	OC Transpo (City of Ottawa)	City of Ottawa (excludes Hull/Gatineau area)
	Calgary	Calgary Transit (City of Calgary)	City of Calgary
	Vancouver	TransLink (South Coast BC Transportation Authority)	Vancouver metropolitan area
USA	Honolulu	Honolulu Dept of Transportation (City/County of Honolulu)	Honolulu urban area
	Portland	Trimet (Tri-county Metropolitan Transportation District of Oregon)	Portland urban area
	Seattle	King County DoT – Metro Transit division[21]	Seattle urban area

Note: (1) Also covers services provided by City of Seattle (Seattle Monorail Transit), Central Puget Sound Regional Transit Authority and Washington State Ferries.

2.3 Overview of Data Sources and Analyses

Table 2.3 presents an overview of the main sources of data collected for the various aspects of the study. We note in particular:

- The data collected relate in general to the most recent year for which data were available, supplemented in some cases by longer (up to 20 years) historic time series (refer 'Data periods' column in table).
- For the NZ and Australian cities, the data for the 'PT Usage' aspect and the 'Service Effectiveness and Efficiency' aspects were largely drawn from the earlier IWA project for MoT NZ: these data were updated in the study where appropriate.
- For the Canadian and USA cities, the equivalent data were collected in the study through use of published sources supplemented by queries to the relevant authorities/operators involved.
- Data for the 'PT Market Share' aspect (Census JTW data and Household Travel Survey data) and for the 'Service Quality' aspect were collected and analyses by the consultants.

In comparing measures of financial performance across the different countries, there was a need to adjust for exchange rate differences. The adjustment factors used were the 'purchasing power

parity' factors relating to the relevant data periods (taken as 2009), giving the following factors to convert to $NZ[4]:

- $ Canada: 1.255
- $ USA: 1.497.

[4] The relevant PPP factor for conversion of the Australian $ was 1.02: given this, and consistent with the MPT project, no adjustment was made for the Australian data.

TABLE 2.2: SOME KEY PUBLIC TRANSPORT STATISTICS FOR COMPARATOR AREAS[1]

Country	Metro Area	Population (Millions)		Vehicle Km (in-service) – Million				Passenger Boardings – Million					Passenger Boardings /Population
		Service area covered	Metropolitan total	Heavy Rail	Light Rail/ Tram	Bus	Ferry	Heavy Rail	Light Rail/Tram	Bus	Ferry	Total	
NZ	Auckland	**1.33**	1.44[2]	6.9		40.2	0.8	7.7		46.6	4.4	**58.6**	**44**
	Wellington	**0.43**	0.46[2]	10.9		18.8	0.1	11.9		23.4	0.2	**35.4**	**74**
Australia	Brisbane/SEQ	**2.82[3]**	2.83[3]	59.1		89.9		61.0		114.4	6.4	**181.8**	**65**
	Perth	**1.66**	1.66	36.7		52.0	0.1	54.8		73.6	0.5	**128.8**	**77**
	Adelaide	**1.19**	1.19	8.1	0.7	41.8		11.7	5.6	53.2		**70.6**	**59**
	Melbourne	**3.96**	3.96	102.9	22.5	87.2		213.9	178.1	99.5		**491.5**	**124**
	Sydney	**5.46**	5.46	216.0		132.2	1.3	304.8		280.4	14.3	**159.6**	**110**
Canada	Edmonton	**0.75**	1.16		1.1	37.1			14.4	91.4		**105.7**	**141**
	Ottawa	**0.79**	1.22[4]		0.4	45.8			2.2	129.3		**131.5**	**168**
	Calgary	**1.04**	1.23		13.5	42.7			78.1	74.4		**152.5**	**146**
	Vancouver	**2.27**	2.33	1.2	35.4	88.6	0.1	2.7	73.5	220.7	5.5	**302.4**	**133**
USA	Honolulu	**0.72**	0.91			29.4	0.1			69.8	0.1	**69.8**	**97**
	Portland	**1.58**	2.21		11.1	44.0			38.9	71.4		**110.3**	**70**
	Seattle	**2.71**	3.35	1.7	0.2	100.5	1.5	2.7	1.3	159.7	23.5	**187.2**	**69**

Notes:

(3) Statistics relate to 2008/09 financial year for NZ and Australian metro areas, to 2008 calendar year for Canada and USA areas.

(4) These figures represent total regional populations (not all served by PT).

(5) Represents total SE Queensland area covered by TransLink-managed services.

(6) Includes Hull/Gatineau area.

TABLE 2.3: OVERVIEW OF DATA SOURCES[1][2]							
Aspect	**Report References**	**Data Periods**	**Auckland**	**Wellington**	**Australia**	**Canada**	**USA**
PT Usage	Ch 3 – s 3.1/3.2	• Latest year for which data available (2009/10 NZ/Aust, 2008 Can/USA). • Also 20 year time series for NZ/Aust.	• MPT project 2008/09 (from ARTA/NZTA), updated for this study with ARC inputs.	• MPT project 2008/09 (from GW/NZTA), updated for this study.	• MPT project 2008/09, updated for this study.	• CUTA Operating Data (2008).	• National Transit Database (data by metro area by operator by mode, 2008).
PT Market Shares	Ch 3 – s 3.3/3.4	• Census – most recent (generally 2006); also 20 year time series for AKL. • HTS – most recent (2006 for AKL).	• Census JTW data (1991-2006), analyses undertaken by ARC. • Household Travel Survey (2006), analyses undertaken by ARC.	• Census JTW data (2006), analyses by consultant.	• Census JTW data (2006), analyses by state authorities • Household Travel Surveys (some states), analyses by state authorities and consultant.	• Census JTW data (2006).	• Census JTW data (2000), and American Community Survey (2006-08).
Service Quality Aspects	Ch 4	• NZ – 5 year time series.	• NZTA/RC annual Customer Satisfaction Surveys (2005/06-2009/10).	• As AKL	• None	• None	• None
System Effectiveness & Efficiency Aspects	Ch 5	• Latest year for which data available (2008/ 09 for NZ/Aust, 2008 for Can/USA).	• MPT project, 2008/09 (from ARTA/NZTA).	• MPT project 2008/09 (from GW/NZTA).	• MPT project 2008/09 (data provided by state authorities).	• CUTA Operating Data (2008), supplemented by queries to relevant authorities.	• National Transit Database (data by metro area by operator mode), 2008, supplemented by queries to relevant authorities.

Notes:

(1) 'MPT' = Metropolitan Public Transport Performance' Project, IWA for MoT NZ, 2011.

(2) 'JTW' = Journey to work (Census question).

(3) 'CUTA' = Canadian Urban Transit Association, Canadian Transit Fact book – 2008 Operating Data.

3. PT CONTRIBUTION TO THE METROPOLITAN TRANSPORT TASK - PT USAGE AND MARKET SHARES

3.1 PT Patronage Rates

3.1.1 Overview

This section provides data and commentary on annual PT 'patronage' rates (per service area resident) in the different cities. In interpreting the data, it should be noted that PT 'patronage' in this context is defined as the numbers of 'boardings' made on the PT system, ie every time a person boards another PT vehicle, this is counted as a an additional passenger, whether or not this boarding involves a transfer from another PT vehicle. Thus PT systems that involve vehicle transfers (on the same PT mode or to a different mode) on a large proportion of person trips will tend to have a higher number of 'passengers' than those where most trips do not involve such a transfer[5].

The following first provides a summary of PT patronage rates in the surveyed cities for the most recent 12 month period for which the data were available. It then provides time series data on trends in annual patronage over the last 20 years, for those cities (Aust/NZ) for which these data were available.

3.1.2 Recent city comparisons

- Figure 3.1 shows annual PT patronage/capita for all the surveyed cities for the most recent year for which data were available – generally 2009/10 for the Aust/NZ cities, 2008 for the US/ Canadian cities.
- In cities world-wide, PT's annual patronage/capita and its share of total travel tend to be larger in the cities with larger populations. Perhaps surprisingly, Figure 3.1 shows this tendency only in the case of Australia, where the PT patronage rates for the two larger cities (SYD, MEL) are around 70%-80% greater than the rates for the three 'medium' cities (BNE, PER, ADL). For the other three countries, this tendency is not evident – but this result probably reflects the small number of cities covered in each country.
- When comparing patronage rates across the four countries, there is clear evidence that the Canadian cities have higher PT usage than the cities in the other three countries: all the four Canadian cities have higher patronage rates (range 133-168 PT boardings/capita) than any of the cities in the other three countries (range 46-124 boardings/capita). There is no clear evidence of significant differences in patronage rates between these other three countries: the NZ rates (2 cities) range from 46-74 boardings/capita, the Australian rate (5 cities) from 64-124 boardings/capita and the USA rates (3 cities) from 69-97 boardings/capita. The factors influencing the higher patronage rates in the Canadian cities are discussed further in the last section of this chapter.
- Figure 3.2 shows plots of PT patronage rate/capita against service area population. For the Australian cities only, it shows a good correlation between area population and PT patronage rates: the regression line for the Australian cities shows that PT patronage rates increase from around 50/capita for city populations of 1.0 million to around 100/capita for populations of 4.0 million.
- If the cities in all four countries are considered, then the regression line of patronage rates v population is almost horizontal (ie PT patronage rates do not vary significantly with population) – with a 'typical' patronage rate of around 100 PT boardings/capita. Inspection

[5] There would be some advantage if the comparisons in this section could be presented in terms of numbers of 'linked' trips (ie a person trip between origin and destination, which may involve several passenger boardings). However, linked trip data are not readily available for most of the NZ/Australian areas included in the project, so 'unlinked' trip (patronage) data has had to be used. In interpreting these data for the various areas, it needs to be borne in mind that comparisons in terms of 'linked' trips may give different results. This is an aspect that may warrant further exploration.

of the data for the Canadian, USA and NZ cities tends to suggest, for each of these countries, that PT patronage rates **decrease** as population increases. However, we consider this result is most likely an outcome of the small samples involved, and should not be considered representative.

- It is evident from Figures 3.1, 3.2 that Auckland has the lowest PT patronage rate (46/capita) of all the cities examined. This is perhaps surprising as the sample contains 6 cities with lower populations than AKL, including 4 cities with populations of less than 1.0 million. The next lowest PT patronage rates are between 60 and 72 boardings/capita, in four cities (ADL, BNE, POR, SEA).
- Relative to the three Australian cities with which AKL is often compared, AKL's PT patronage rate is 25% lower than ADL (60/capita), 28% lower than BNE (63/capita) and 39% lower than PER (75/capita).
- We would expect that one factor accounting for AKL's low patronage rate relative to these Australian cities (BNE and PER in particular) is the relatively low use of rail in AKL, which contributes to a relatively low proportion of transfer trips and hence a lower-than-otherwise PT patronage rate. However, it seems likely that this factor accounts for only a modest proportion of the patronage rate differences.

3.1.3 Time series trends

- Time series data on annual patronage, service area population and hence PT patronage rates were assembled for the last 20 year period (since 1989/90) for AKL, WGN and four Australian cities (MEL, BNE, PER, ADL). The resultant trends in patronage rates are shown in Figure 3.3, while Table 3.1 shows the average annual percentage changes in the PT patronage rates for these cities over each of the last 5, 10, 15 and 20 year periods[6].
- Key features of Figure 3.3 include:
    - The very strong growth in the MEL and BNE patronage rates since about 2003/04.
    - The strong growth in the PER patronage rates since 1998/99 and particularly since 2007/08[7].
    - The relatively 'flat' performance of AKL since 2002/03, and of WGN since 2005/06.
- These features are also reflected in Table 3.1. Of the 6 cities, AKL ranked 4th = in terms of compound average % patronage growth rates (CAGR) over the last 5 years and 4th over the last 10 years. In both these periods, its growth rates exceeded those for WGN. Over the 15 year perspective, AKL ranked 5th out of 6 cities, and over the last 20 year perspective it ranked 4th out of the 5 cities for which data were available.

TABLE 3.1: PT *PA*TRONAGE RATE TRENDS, SELECTED NZ AND AUSTRALIAN CITIES, 1990-2010

Period	Compound average growth rates (CAGR %pa) over period					
	AKL	**WGN**	**PER**	**ADL**	**MEL**	**BNE**
Last 5 years (04/05-09/10)	**1.95%**	0.71%	3.06%	1.95%	4.35%	3.29%
Last 10 years (99/00-09/10)	**1.90%**	1.37%	2.76%	1.77%	2.63%	2.56%
Last 15 years (94/95-09/10)	**1.54%**	1.67%	1.79%	0.18%	2.08%	1.72%
Last 20 years (89/90-09/10)	**-0.63%**	0.10%	1.58%	-1.08%	1.48%	n/a

[6] The 20 year time series data are incomplete for ADL (started 1990/91) and BNE (started 1994/95).
[7] This recent growth is largely associated with the opening of the Mandurah rail line.

Figure 3.1: PT Patronage/Capita by mode, 2008-2010*

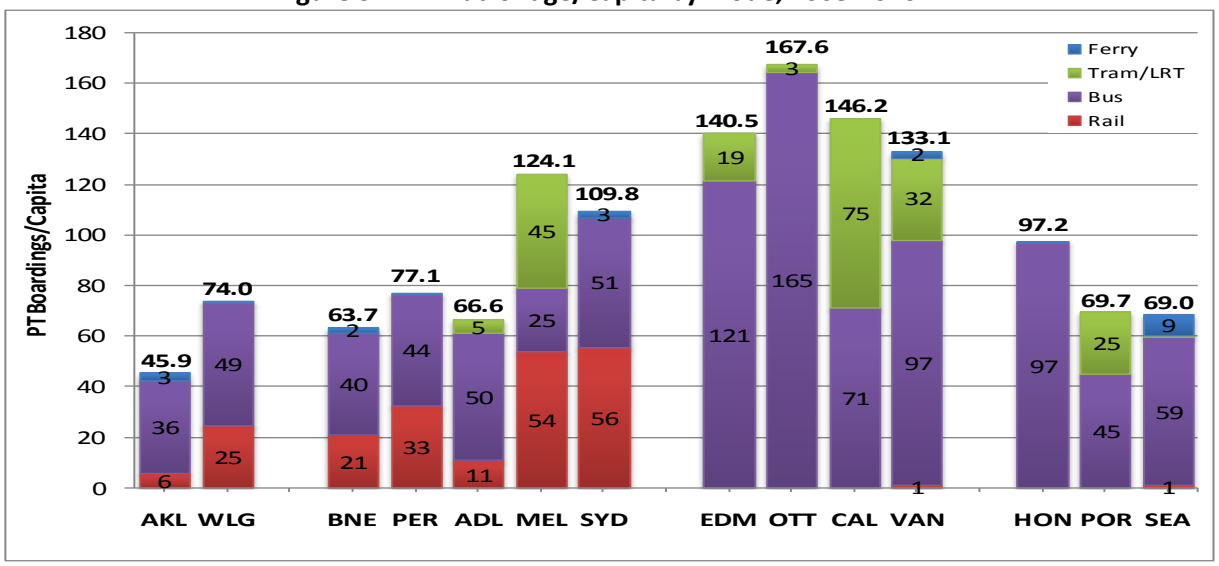
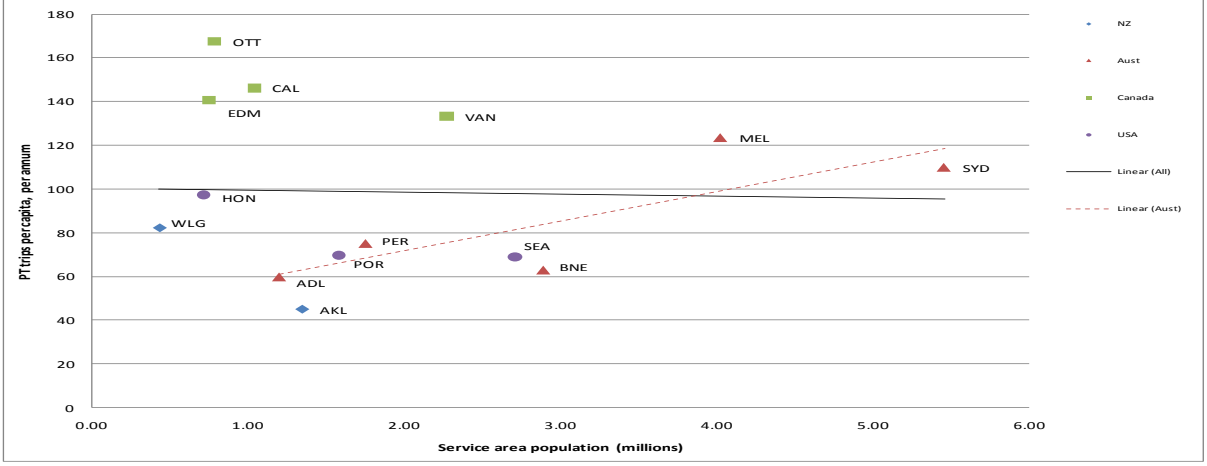
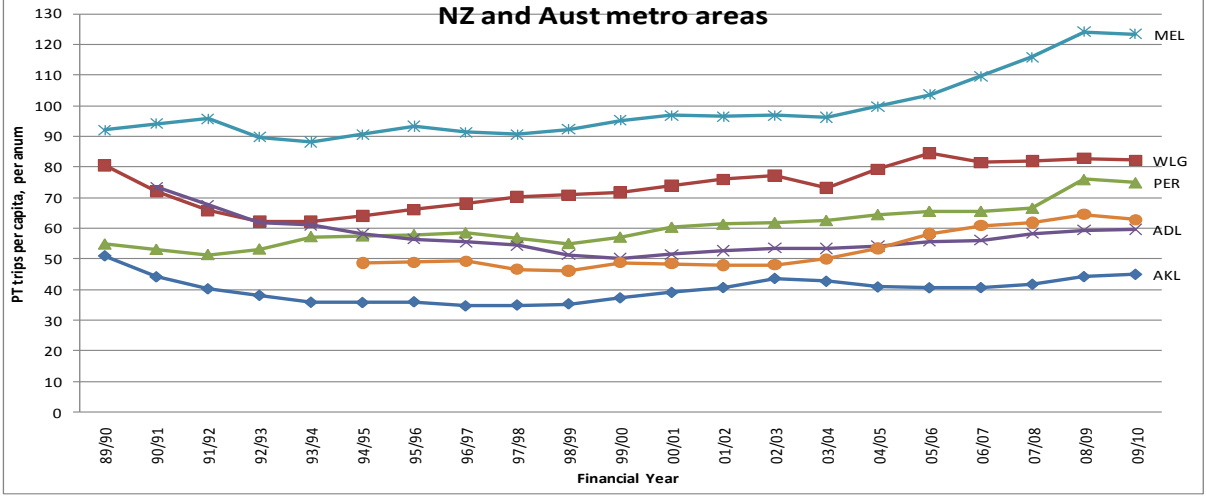


Fig 3.2: PT annual patronage/cap by population, metro areas, 2008-2010*



*09/10 data for AKL, WLG, PER, ADL; *08/09 data for SYD, MEL, BNE
*2008 data for VAN, OTT, CAL, EDM, SEA, POR, HON

Figure 3.3: PT annual patronage rates, 1989/90-2009/10, NZ and Aust metro areas



3.2 PT Trip Lengths and Passenger Kilometres

While PT patronage (boarding) rates are one measure of the usage of the PT system and its contribution to the overall passenger transport task, another measure, superior in many ways, is that of PT passenger kilometres. This may be considered as the product of PT boarding rates and average trip lengths (per boarding). This section presents evidence on average trip lengths in the peer cities, and hence on PT passenger kilometres.

3.2.1 PT trip lengths

- In general, as shown in Figure 3.4A, average PT passenger distances (per boarding) do show a tendency to increase with city size. The shortest PT boardings are in EDM (population 0.75M, average length 4.8km); the longest in SYD (population 5.46M, average length 13.4km).
- The AKL average boarding length of 8.1km is about as expected, given the city's population: the two Australian cities in a similar population range (ADL, PER) have somewhat longer average boarding lengths than AKL; while the two US/Canadian cities in this population range (CAL, POR) have rather shorter average boarding lengths.
- Unsurprisingly, WGN is somewhat of an outlier in terms of the general trends. It has the lowest population of all the cities examined, but the second longest average boarding length (exceeded only by SYD). This result reflects the geographic/topographical constraints on the area's development and the relatively high use of rail services for commuting from the outer areas to the WGN CBD (which has c. 40% of the area's total employment).
- Pronounced differences in average boarding lengths by PT mode are apparent (Figure 3.4B). Boarding lengths on (heavy) rail services are typically between about 16km and 20km in the Australasian cities, with WGN being an outlier at 23km (because of the factors noted above). For bus services, average boarding lengths in all the cities vary between 5.1km (POR) and 9.4km (MEL): however in 9 of the 11 cities for which data are available, the average boarding lengths are between 6.5km and 8.7km, a relatively narrow range. AKL (6.5km average) is at the bottom of this range. There are particular reasons for the two outliers: in the case of MEL, a large proportion of the shorter trips (mainly in the inner areas) are carried by the tram system; while in the case of POR, the LRT system caters for a substantial proportion of the longer trips.
- Average boarding lengths on ferry services do not show a consistent pattern across the cities, but largely reflect the geographic situation of each city and the pattern of development relative to waterways, harbours, etc. The average ferry trip lengths vary between 1.4km (PER) and some 12km (SEA), except for HON which has an average of some 36km (reflecting the inter-island nature of its ferry services).
- While as noted, average boarding lengths do tend to increase with city size, this increase largely results from the greater use of rail in the larger cities rather than from longer trips on the individual modes.
- This increase in average boarding lengths with city size is likely to under-state the increase in overall (linked) trip lengths in the larger cities: it seems probable that, on average, trips in the larger cities involve more boardings to complete a single trip than those in the smaller cities.

3.2.2 PT passenger kilometres

- The PT passenger km/capita (Figure 3.5) is the product of the PT patronage rates (Figure 3.1) and the average boarding lengths (Figure 3.4A). At a city level, the measure shows generally similar patterns to the PT patronage rate results. However, it is notable that

Figure 3.4A: Trip Lengths – All PT Modes Averages

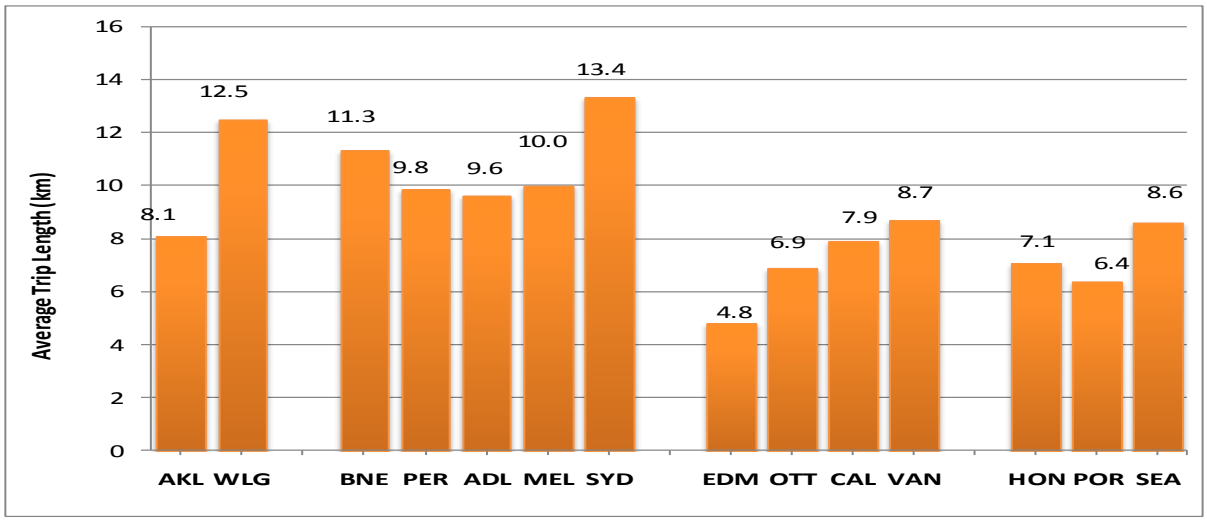


Figure 3.4B: PT Trip Lengths by Mode

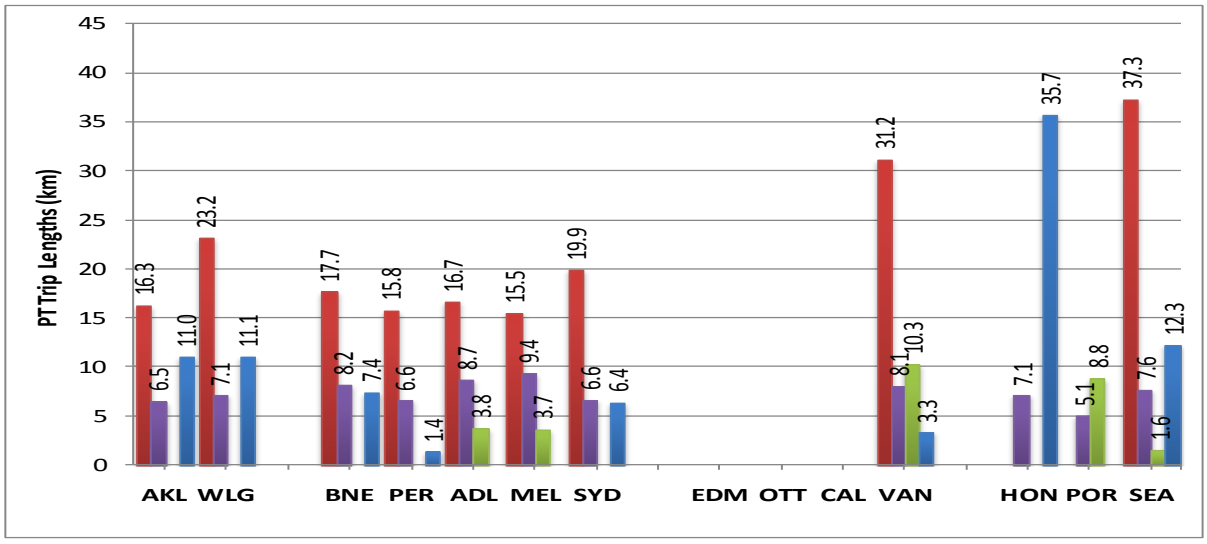
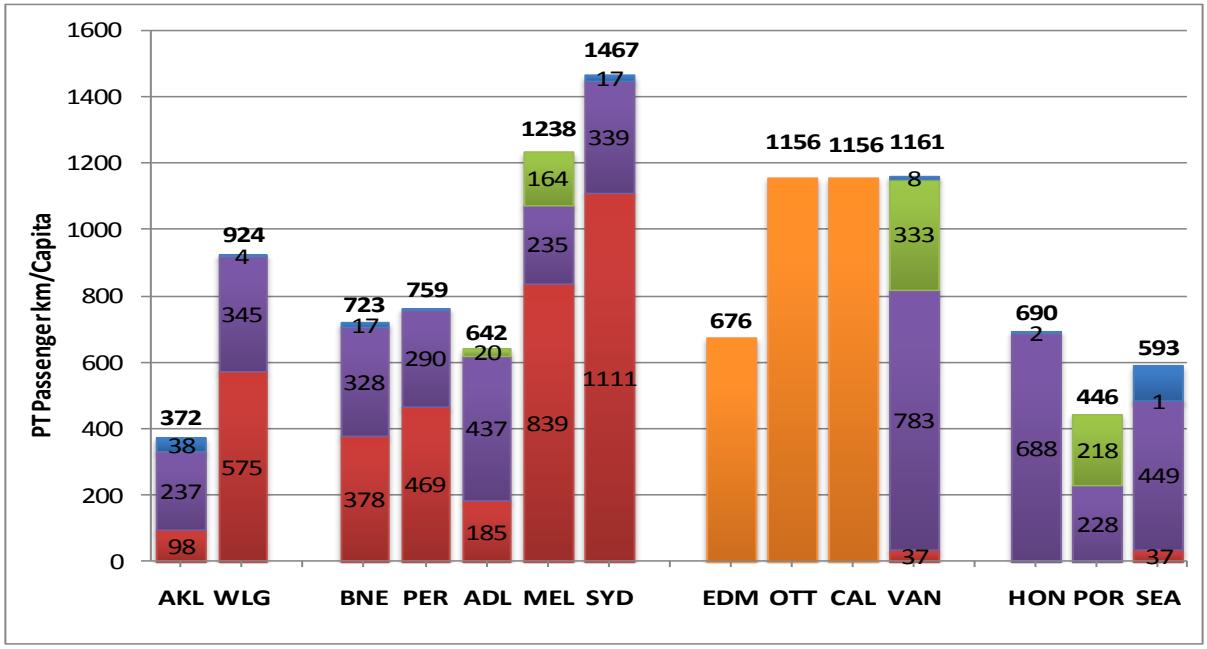


Figure 3.5: Passenger Kilometres/Capita by Mode and City



the larger Australian cities (SYD, MEL) have higher pass km/capita than the Canadian cities despite having lower patronage rates, and reflecting their longer average trip lengths.

- AKL has the lowest pass km/capita figure (372) of all the cities, by a significant margin, followed by POR (446). All the other Australian cities have figures in the range 642 (ADL) – 1467 (SYD).
- At a modal level, the dominance of rail in terms of PT passenger km in the larger Australian cities is notable: in both SYD and MEL around 70% of all pass km are made by (heavy) rail, while in BNE, PER and WGN over 50% of total pass km are by rail. Auckland is somewhat of an outlier in terms of the Australasian cities, with only 26% of its pass km being by rail mode, In contrast to the Australasian results, bus is the dominant PT mode in those (4) USA/Canadian cities for which modal data are available, with LRT being second highest.

3.3 PT Mode Shares – Travel to Work

Data on the share of the total metropolitan transport task that is undertaken on PT modes are available from two main groups of sources:

- Census question on work location and means of travel to work (JTW). The census covers almost 100% of households/persons in the area, thus providing very robust results. In all the areas considered, the most recent census data available related to year 2006. Summaries of results from this source are given below.
- Household travel surveys (HTS), undertaken periodically in most metropolitan areas, covering all travel by household members, usually from travel diaries completed for a 1 or 2 day period. Such surveys involve relatively small samples of households in the area, usually less than 5%. Survey methodologies differ in detail between metropolitan areas, and thus the survey results may be less robust and comparable across areas. Summaries of results from this source are given in Section 3.4 following.

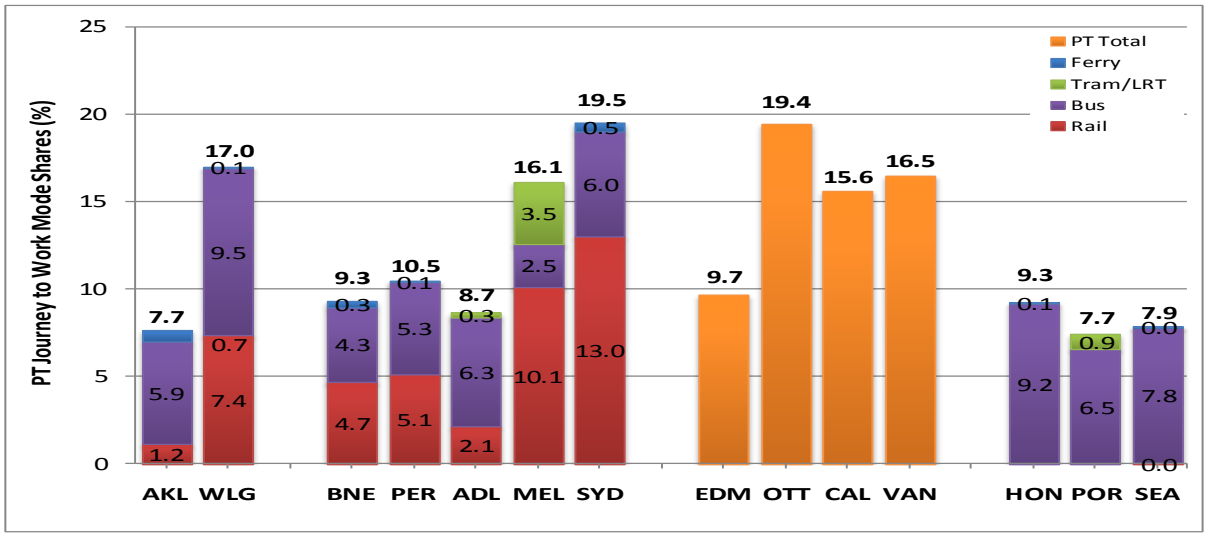
Data on JTW mode shares from the 2006 census were obtained at the metropolitan-wide level for all 14 areas surveyed. These are shown by PT mode in Figure 3.6 and relative to the area population in Figure 3.7. It is evident that the pattern of results is generally similar to that shown in Figure 3.1 for PT patronage rates overall, although there are some significant variations. Features of the results include the following:

- The PT JTW mode shares vary from 16.5% to 19.5% for the Canadian cities[8], the NZ shares from 7.7% to 17.0%, the Australian shares from 8.7% to 19.5% and the USA shares from 7.7% to 9.3%.
- While AKL has one of the lowest JTW mode shares by PT, this share is on a par with POR and SEA, both of which performed relatively better than AKL in terms of total patronage rates.
- These data suggest that, relative to the other areas, AKL's PT usage is highly peaked with relatively low use outside peak periods. This is also true for WGN, and to an even greater extent (this is likely to be particularly the case for residents who commute by PT into the Wellington City area from other parts of the region).
- SYD has the highest JTW mode share in the whole sample (marginally above OTT), whereas its PT patronage/capita is lower than for MEL and also the four Canadian cities[9].

[8] Apart from Edmonton, where the stated mode share of 9.7% appears low relative to the PT trip rate: we suspect this is due to a data inconsistency.

[9] These SYD results are influenced, to as significant degree, by differences in the areas considered: the SYD JTW figures relating to the Sydney Statistical Division only; whereas the SYD PT trip rates relate to a larger area (the effective metropolitan service area) including the Hunter region (Newcastle) and the Illawarra region (Wollongong).

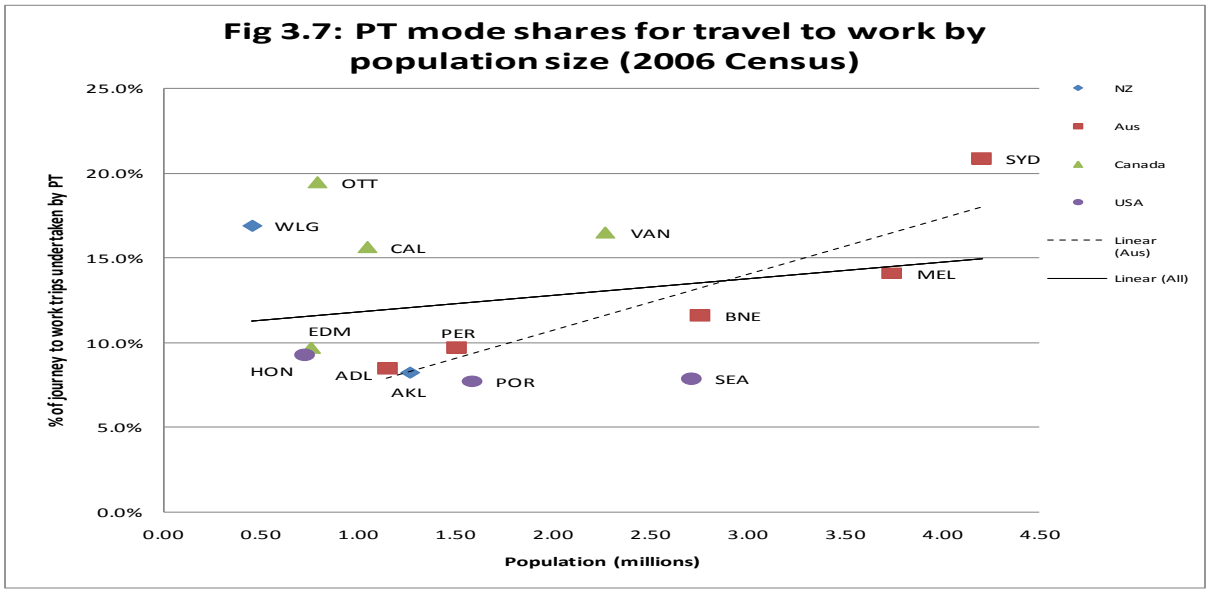
Figure 3.6: Journey to Work Mode Shares by PT Mode

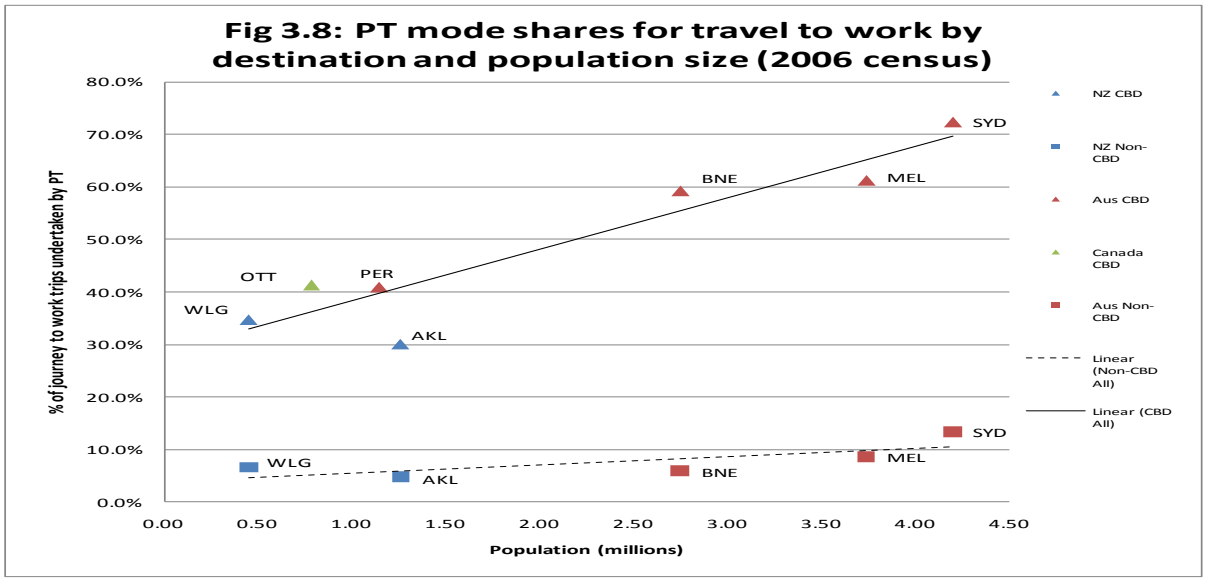


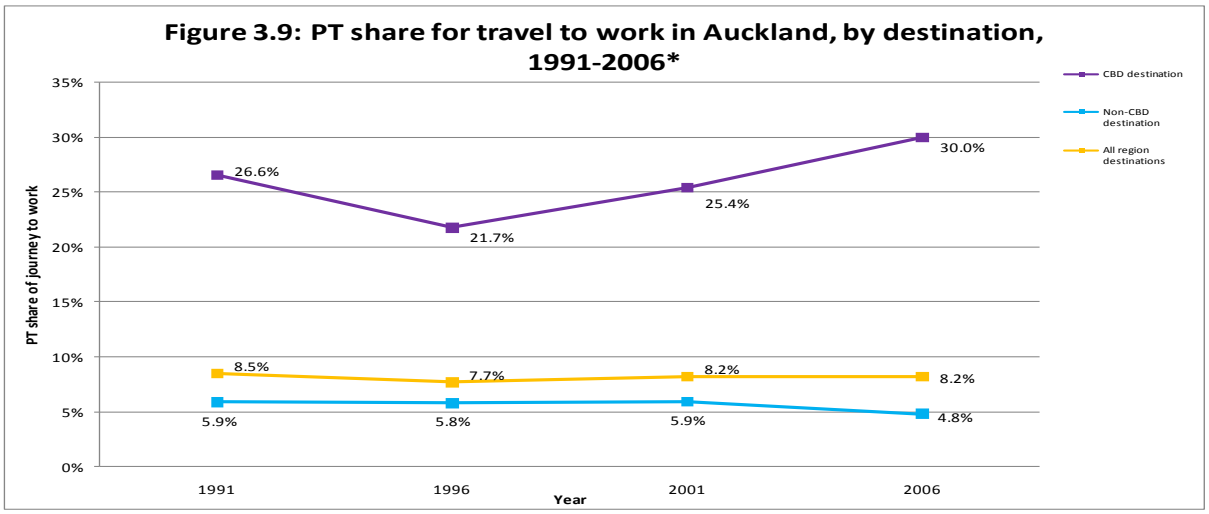
For a sub-sample of the metropolitan areas (7 areas, mainly Australia and NZ), the 2006 census JTW data have been sub-divided to give PT mode shares for trips with destinations (i) in the CBD; and (ii) elsewhere in the region[10]. The results are given in Figure 3.8. This shows some interesting patterns:

- For **non-CBD destinations**, the PT mode share increases gradually with area size (population), from around 5% for the smaller areas (c. 0.5 million population) up to 10% for the larger areas (c. 4-5 million population).
- Further investigation of these data indicates that PT JTW mode shares are typically around 2%-3% for areas well away from the CBD; and that the increase in non-CBD mode shares from 5% to 10% as area size increases primarily reflects the increasing proportion of work trips going to near-CBD locations as city size increases.
- For JTW **travel to CBD areas**, the PT mode share shows strong increases with city size, from around 30%-35% for the smaller areas (c. 0.5 million population) up to around 70% for the largest areas (c. 4-5 million population). This pattern reflects particularly the higher 'costs' of car travel (parking charges and congestion) for commuter trips in the larger cities and, secondly, the very strong radial (often rail-based) PT services in these cities.
- Overall, the PT JTW mode shares in the various metropolitan areas (Figure 3.7) are a function of:
    - the PT mode share to CBD destinations;
    - the PT mode share to other destinations; and
    - the proportion of total jobs in the CBD area.
- For AKL, it is evident that:
    - Its PT mode share to the CBD (30%) is well below the regression line against population (which would indicate a mode share of c. 40%).
    - Its PT mode share to other destinations (4.8%) is slightly below, but close to, this regression line.

[10] The CBD v non-CBD results are of course dependent on how the CBD is defined for each metropolitan area. There appear to be no generally accepted definitions of what constitutes a CBD area, so judgements have had to be made in each case, generally based on what the authorities concerned would regard as their CBD area.







* Adjusted data for 1991-2001

* Expanded data for 2006

- Its proportion of jobs in the CBD (c.13%) is on a par with the corresponding proportions in most of the other cities (but well below the WGN proportion of c. 40%).
- As a result of these factors, AKL's overall JTW mode share (7.7%) is at the low end of the spectrum for its population, somewhat below ADL (8.7% for a slightly smaller population) and BNE/SEQ (9.3%, but with a larger population).

For AKL, the trends in PT mode shares to CBD/non-CBD areas over the last four censuses (1991, 1996, 2001 and 2006) have been analysed, as shown in Figure 3.9. For the region as a whole, the JTW PT mode shares over this 15 year period have varied in a way very consistent with the trends in AKL's overall PT patronage rates over the period (Figure 3.3), ie declining until the mid-90s, then increasing through to the early-00s and then being largely constant through the mid-00s. However, the trends for CBD and non-CBD destinations appear to differ markedly, especially in recent years:

- From 1996 to 2006, the PT mode share to the CBD increased from 21.7% to 30.0%.
- These changes are generally consistent with the results from the annual cordon counts undertaken (by ARC) round the AKL CBD in the AM peak period.
- Expected contributory factors to this mode share growth include: improved rail rollingstock and opening of the Britomart rail extension, increased bus priority measures, and increases in fuel prices.
- For travel to non-CBD destinations since 2001, in general the quality of the PT services has not improved significantly and congestion levels have not changed markedly: PT is rarely seen as a serious competitor to use of the private car. The result has been a continuing gradual decline in the PT mode share to these destinations.

It has not been possible to undertake similar time-series analyses for any of the other metropolitan areas: therefore it is unclear to what extent the AKL JTW trends between CBD and non-CBD destinations over the last 15 years are also reflected in these other areas.

3.4 PT Mode Shares – All Travel Purposes

For Auckland, the most recent household travel survey (HTS) was undertaken in 2006, to coincide with the national census. Various analyses of the (expanded) AKL HTS data were provided by ARC in accordance with the consultants' specification.

Figures 3.10A (peak periods) and 3.10B (weekday off-peak) provide some summary results, broken down by:

- Weekday time periods: peak, off-peak.
- Trip origin-destination areas: both trip ends within the CBD, one trip end within the CBD, all other (non-CBD) trips.
- 'Main' mode used: car/motorcycle, PT, walk/cycle.

Key features of these results include:

- PT mode share is highest for trips to/from the CBD, 32% in the peak periods, 13% in the off-peak. However, these trips account for only some 10% of all trips, in both periods.
- The PT mode share is next highest for within-CBD trips, at about 8% in the peak period, 11% in the off-peak. These trips account for only 1.3% of all trips (and an even smaller proportion of person km), in both periods.
- The PT mode share is lowest for non-CBD trips, at about 3.4% in the peak periods, 1.6% in the off-peak. These trips account for about 89% of all trips, in both periods.
- The resulting region-wide overall PT mode share is 6.4% in the peak periods, 2.8% in the off-peak, with a daily average of 3.9%.

Table 3.2 shows some comparisons of results from the AKL HTS with the equivalent HTSs in MEL, SYD and BNE/SEQ. Comparing AKL with MEL (for which the most complete comparisons were possible):

- The MEL PT mode share overall (in terms of 'main' mode used) is 9.1%, compared with 3.9% for AKL. In peak periods, the MEL PT share (12.5%) is almost twice that for AKL (6.4%); and in off-peak periods, the MEL figure (5.8%) is more than twice that for AKL (2.8%).
- For trips to/from the CBD, the MEL PT mode shares are again more than twice those for AKL: for peak period CBD travel, the MEL PT share is almost 60%, compared with 29% for AKL.
- It is also notable that the BNE/SEQ area (more comparable in population than MEL) has a PT mode share for CBD travel somewhat higher than MEL (62% peak, 34% off-peak) and well over twice as high as AKL.

Fig 3.10A: Mode share of total trips, weekday peaks. Auckland, 2006

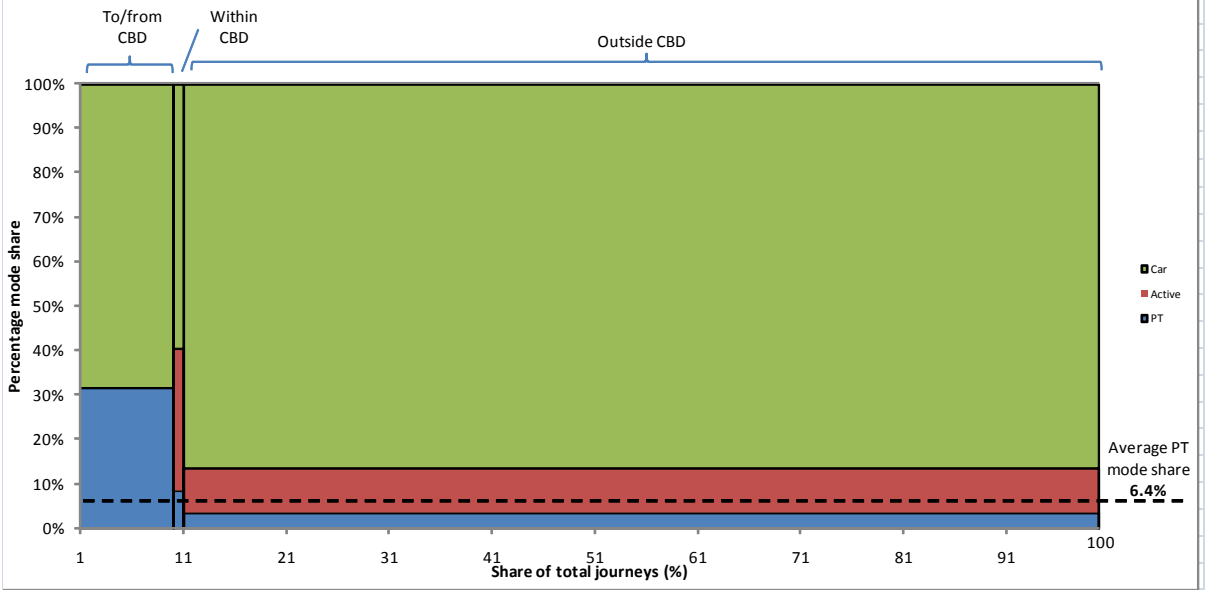


Fig 3.10B: Mode share of total trips, weekday off-peak. Auckland, 2006

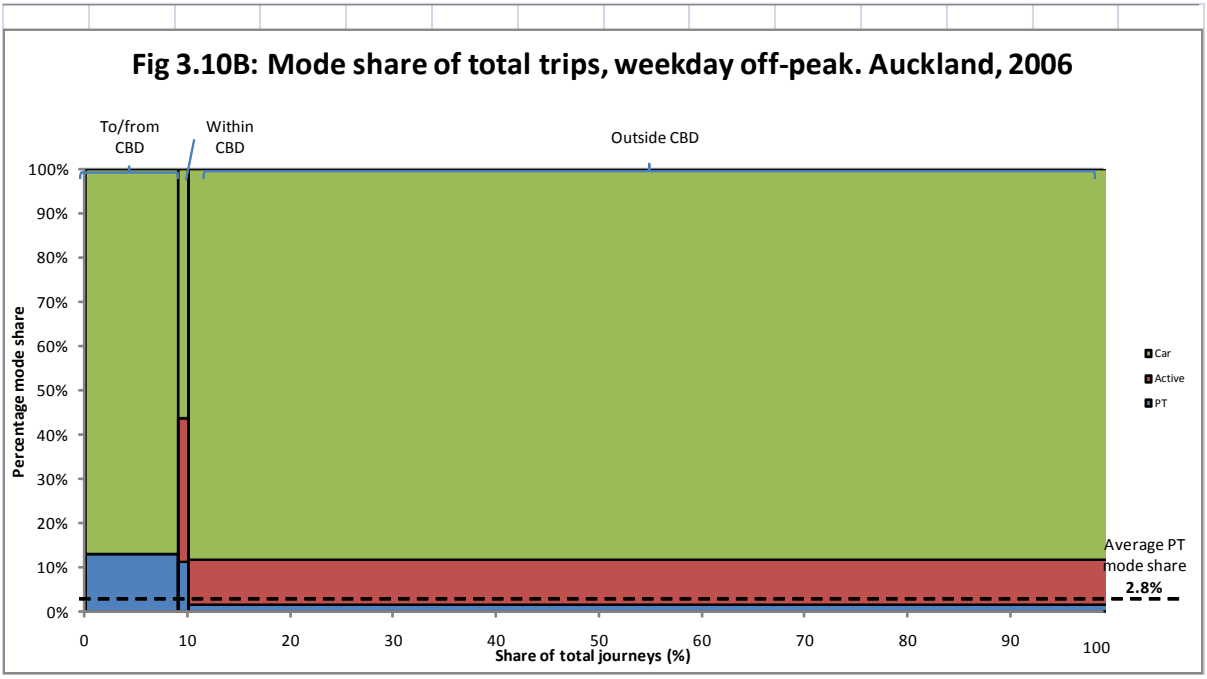


TABLE 3.2: PT MODE SHARES BY TIME PERIOD AND ORIGIN/DESTINATION[1] (Household Travel Survey Results)									
Time Period	**Trip ends**	**AKL[2]**		**MEL[3]**		**SYD[4]**		**BNE/SEQ[6]**	
		Market Proportion (%)	**PT Mode Share (%)**	**Market Proportion (%)**	**PT Mode Share (%)**	**Market Proportion (%)**	**PT Mode Share (%)**	**Market Proportion (%)**	**PT Mode Share (%)**
Peak	CBD	11.7%	28.9%	6.6%	59.9%		76%		62%
	Non-CBD	88.3%	3.4%	93.4%	9.1%				
	Total	100%	6.4%	100%	12.5%		24%[5]		
Off-peak	CBD	10.6%	12.8%	6.1%	30.9%				34%
	Non-CBD	89.4%	1.6%	93.9%	4.1%				
	Total	100%	2.8%	100%	5.8%				
Total Weekday	CBD	10.9%	18.3%	6.4%	45.9%				49%
	Non-CBD	89.1%	2.1%	93.6%	6.6%				
	Total	100%	3.9%	100%	9.1%				

Notes:

(1) Mode shares categorised by 'main mode'. CBD trips are all trips with one or both ends in the CBD area.

(2) AKL HTS (2006) results – analyses provided by ARC. Peak data relate to AM peak only. Off-peak data derived as (Total Weekday – 2* AM Peak).

(3) VISTA 2007 results – analyses provided by DoT Vic.

(4) Sydney 2008/09 Household Travel Survey – analyses provided by NSW Transport (Transport Data Centre).

(5) Relates to all commuter travel within the Sydney SD (not all in peak periods).

(6) SEQ Household Travel Survey (2009) results - provided by Qld Dept of Transport & Main Roads. Relate to all travel undertaken by residents of SEQ area.

3.5 Commentary on Relative PT Usage and Market Shares – Canada v Other Countries

3.5.1 Overview

The earlier sections of this chapter noted the higher usage rates and mode shares for PT in the Canadian metro areas than the areas examined in NZ, Australia and USA. it was noted there that the four Canadian metro areas (Ottawa, Calgary, Edmonton and Vancouver) all had higher levels of patronage/capita than any of the other cities examined, despite being towards the lower end of the population range of the areas included (refer Figure 3.2 and section 3.1.2 in particular).

This section outlines the major factors that are believed to be influencing the superior performance of the Canadian metro areas. Urban planning and design aspects and the quantity and quality of service supplied are probably the most significant factors in this regard. There may be a range of other contextual differences, including unemployment (which drives down patronage) and cultural responses to severe weather, which is more common in Canada than in the other countries studied.

3.5.2 Service quantity

Figure 3.11 shows the In-service Vehicle Kilometres/Capita for each of the peer cities. This measure gives a broad indication of the quantity of service a resident of each city can expect[11].

The quantity of service appears to be a significant factor in explaining why Canadian cities do better than US cities. Canadian cities have roughly 20-30% more service per capita, so this on its own should be likely to increase patronage, although perhaps not to a proportional extent.

Auckland, it should be noted, is in the same low range as the US cities in service quantity per capita and considerably below all the other Australian/NZ cities. This probably reflects decades in which public transport has been given a relatively low priority.

Wellington, by contrast, ranks near the top on service quantity, which probably reflects the city's relatively long history as a dense and physically constrained centre with permanent public transport infrastructure (trolleybuses as well as rail). Wellington ranks generally among Canadian cities in the quantity of its service, though below the Canadian peers in patronage.

3.5.3 Urban form

All four of the Canadian cities exhibit a high degree of centralisation of activity in the CBD and inner city. Calgary, Edmonton and Ottawa in particular all have strong CBDs and unusually high CBD densities given their locations. These high CBD densities have led to high parking prices by North American (though not Australasian) standards.

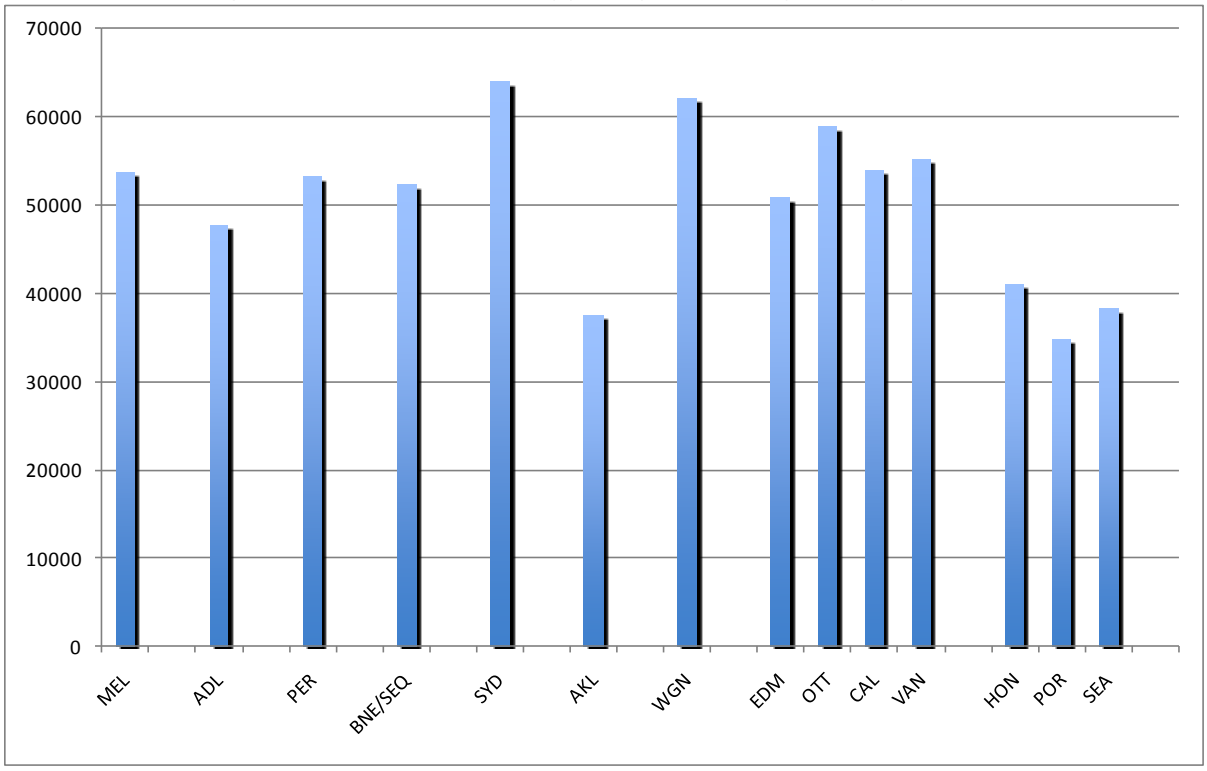
Vancouver's CBD is famous for its exceptional concentration of high-rise residential accomodation at a range of price points. While the CBD does have a business district, as a whole the CBD has more residents than jobs, yielding a slight net out-commute. This unusual feature of Vancouver helps to provide for remarkably balanced loadings on major public transport corridors into and out of the CBD, yielding much better utilisation of service overall than would be expected in a single-centered city.

CBDs and other major centres rely on rapid transit, which means service running at high frequency and high speed, thus yielding high capacity. Rapid transit may be bus, rail, or ferry. What matters is not just the quantity of rapid transit, or the technology used to provide it, but how well it fits with the shape and demand-patterns of the city.

Beyond the CBD, the overall fit of development to public transport is important. Vancouver's suburbs have built remarkable quantities of high-rise residential development immediately adjacent to rapid transit stations, generating permanent markets for these attractive services. In general,

[11] However, we note that the vehicle km measure for trains takes into account the number of carriages per train. For example for a 6 carriage train, one train km accounts for 6 vehicle km. To that extent, the vehicle km measure does not directly reflect the quantity of service experienced by the user.

Figure 3.11: PT Service Quantity per Capita (veh km pa/000 population)



there is a high level of fit between the suburban development pattern and the rapid transit that serves it.

Finally, density overall tends to be slightly higher in Canadian cities than in comparable US ones, though density in the form that matters to public transport usage is impossible to summarise in a citywide statistic.[12]

3.5.4 Major PT trip attractors

Cities dominated by government employment usually achieve good public transport patronage. Governments are especially likely to encourage employees to use public transport, and tend to locate in centralised high density districts, usually parts of CBDs, where public transport is prominent. In Ottawa, the dominance of the Canadian government as an employer is obviously a factor in the strong performance, and this is also a factor in Wellington. Australian major cities are all state capitals, but most major US cities are not. Of the three US cities listed, only Honolulu is a state capital.

CBD-based universities also tend to be major generators of PT patronage. Cities with both universities and national/state governments located in the CBD, such as Melbourne and Ottawa, are likely to have an advantage on this score.

[12] http://www.humantransit.org/2010/10/can-we-make-density-make-sense.html

4. SERVICE QUALITY ASPECTS - USER ATTITUDES AND PERCEPTIONS

4.1 Overview

Surveys of user attitudes and perceptions can be an important source of information on the more qualitative aspects of performance of PT services, particularly those aspects of performance that are not amenable to 'objective' measurement or quantification. They have both advantages and disadvantages in this regard:

- Their main disadvantage is that they do not necessarily correlate very well with more 'objective' measures. In particular, they are likely to be unduly influenced by what people are used to, by recent service aberrations and also by recent external factors (the state of the weather, whether NZ has just won or lost the RWC, etc). If users are accustomed to a high standard to service but then it deteriorates, they are likely to give it a lower rating than exactly the same service where this shows a recent improvement over previous standards.
- However, their advantage is that they do reflect the actual attitudes of users (and potential users) of services, and it is these attitudes that are a major factor in people's decision whether or not (and how often) to use the service.

Such perceptions of service quality may be based on either direct surveys of users themselves or 'mystery shopper' surveys by market researchers. Again, there are advantages and disadvantages of both approaches: mystery shoppers are likely to provide more consistent results over time, but their ratings may be subject to bias to the extent that they are truly representative of the range of users.

In the context of the current project, a major difficulty in using attitude surveys (whether by users or mystery shoppers) is the difficulty of obtaining comparable evidence (identical questions, identical rating scales, identical sampling methods, etc) from such surveys from different cities, and often even for the same city over different years.

For the project we have made use of the Customer Satisfaction Surveys (CSS) undertaken by RCs across all regions on an annual basis since 2005/06, incorporating a consistent set of questions specified by NZTA. The CSS asked customers for their rating of nine attributes of the services in the area, separately for bus, train and ferry modes:

- Overall service
- Service value for money
- Service availability
- Service time
- Service frequency
- Service reliability
- Safety and security during trip
- Safety and security at stops
- Vehicle quality and comfort.

Users were asked to rate each service attribute on the following 6-point scale:

- Dreadful (0)
- Very poor (2)
- Poor (4)
- Good (6)
- Very good (8)
- Excellent (10).

The mean rating score was then derived by ascribing the scores noted above to each scale point. The following CSS results and commentary by mode, focuses on this mean rating for each attribute.

These surveys now provide a dataset which enables comparisons of perceived service performance:

- by attribute
- by region
- by year (last 5 years)
- by mode.

The annual sample sizes used for these surveys in AKL have, for recent years, been in the range 1,300 (Rail) to about 3,000 (Bus), which should result in relatively narrow year-to-year statistical fluctuations for the AKL results. However, much smaller sample sizes have been used in some of the other regions, resulting in wider confidence intervals in these cases.

4.2 Bus User Results

Figure 4.1 shows the rating mean scores by region for Bus users for each of the 9 surveyed attributes over the five years 2005/06-2009/10. Table 4.1 presents a summary of the key findings for AKL for each attribute, in terms of both its rating relative to other regions and any trends in its (absolute) ratings over 3 are largely self-explanatory. We make additional comments on two aspects:

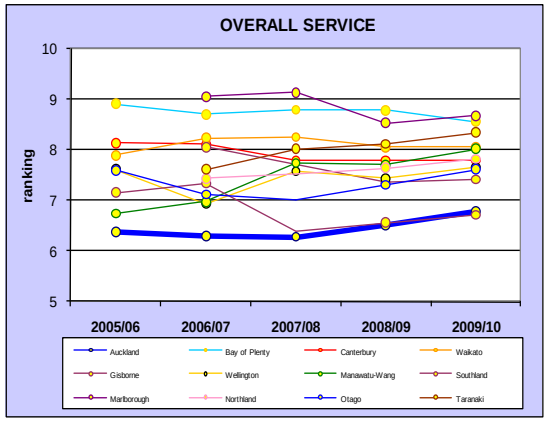
- AKL rates the worst of all the regions, in all years, on the three attributes that are arguably the most important of those surveyed in terms of their influence on passengers' usage of the services, ie:
  - overall service
  - service value for money
  - service reliability.
- On most attributes, AKL's user ratings have improved, at least marginally, over the five year period. The improvements on each of the above three important aspects certainly appear to have been significant.

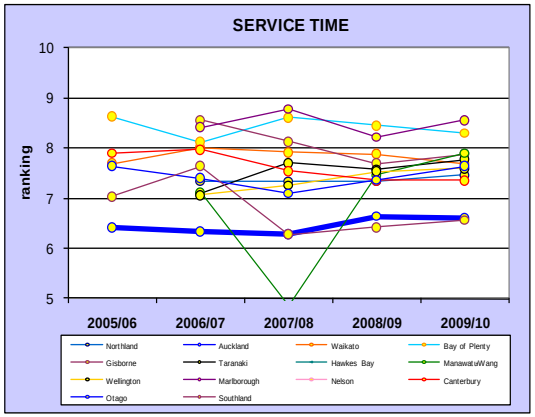
TABLE 4.1: BUS USER RESULTS – AKL RELATIVE RATINGS AND RECENT TRENDS

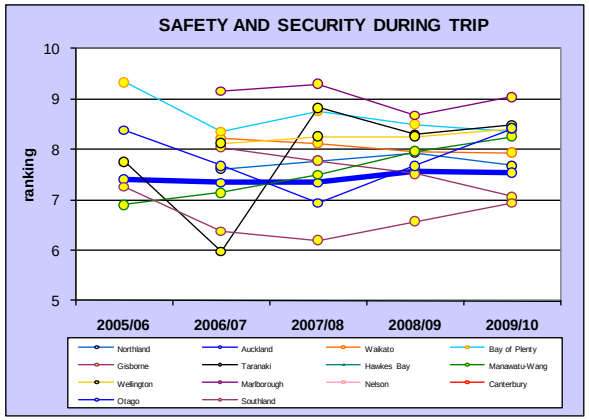
Attribute	AKL Results		
	Rating relative to other regions[(1)]	**Trend over recent years**	**Additional comments**
Overall service	Bottom	Some improvement	Key overall measures of passenger attitudes towards the services
Service value for money	Bottom	Some improvement	
Service availability	Lower	Some improvement	
Service time	Lower	Some improvement	
Service frequency	Lower	Some improvement except 09/10	
Service reliability	Bottom	Some improvement	One of the most important attributes to passengers
Safety and security during trip	Lower	Some improvement	
Safety and security at stops	Lower	Stable	
Vehicle quality/comfort	Middle	Some improvement	The only attribute in which AKL performs around the middle of the range.

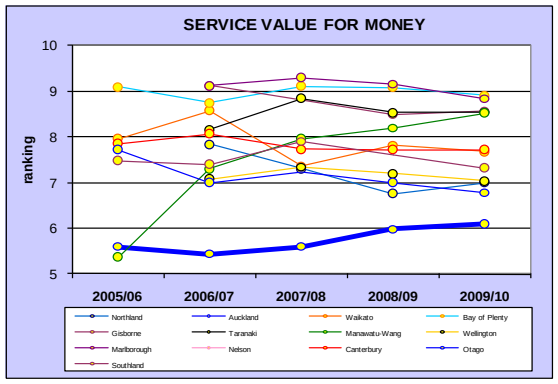
Notes: (1) Bottom: where AKL has lowest rating of all regions, in most years.
(2) Lower: where AKL rating is in the lower one-third of the regions, in most years.
(3) Middle: where AKL rating is in the middle one-third of the regions, in most years.

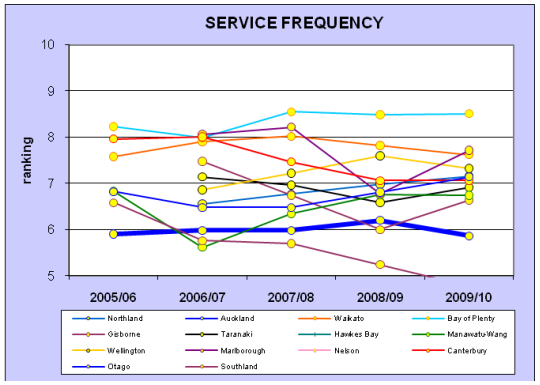
Figure 4.1: SUMMARY OF NZ CUSTOMER SATISFACTION SURVEY RESULTS - BUS

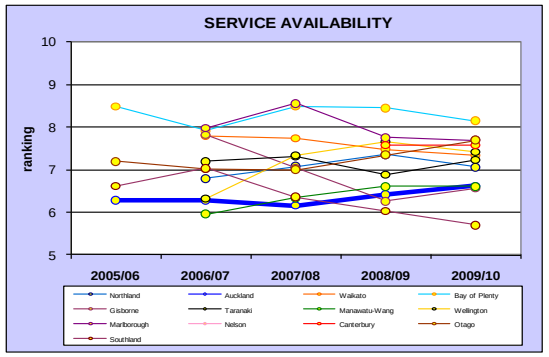


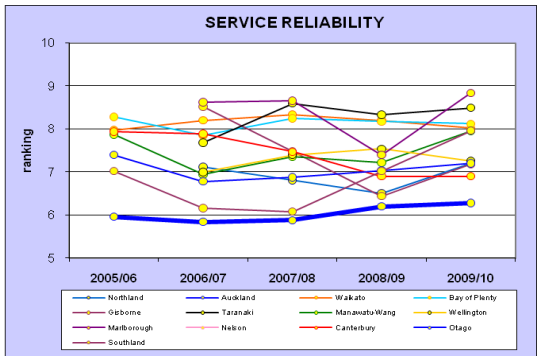


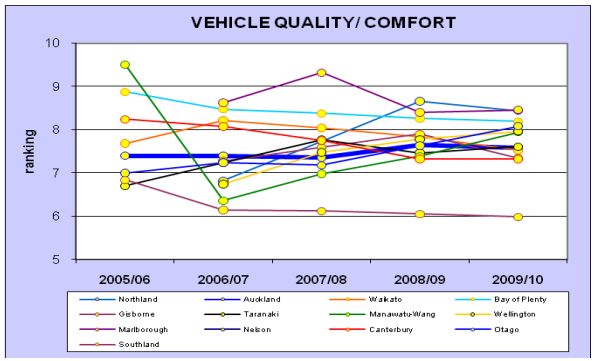












4.3 Rail User Results

Figure 4.2 and Table 4.2 show the equivalent information for Rail (train) users to that given in the previous section for Bus users. In this case, the rating comparisons are with WGN only.

Again, these are largely self-explanatory, but we make the following additional comments:

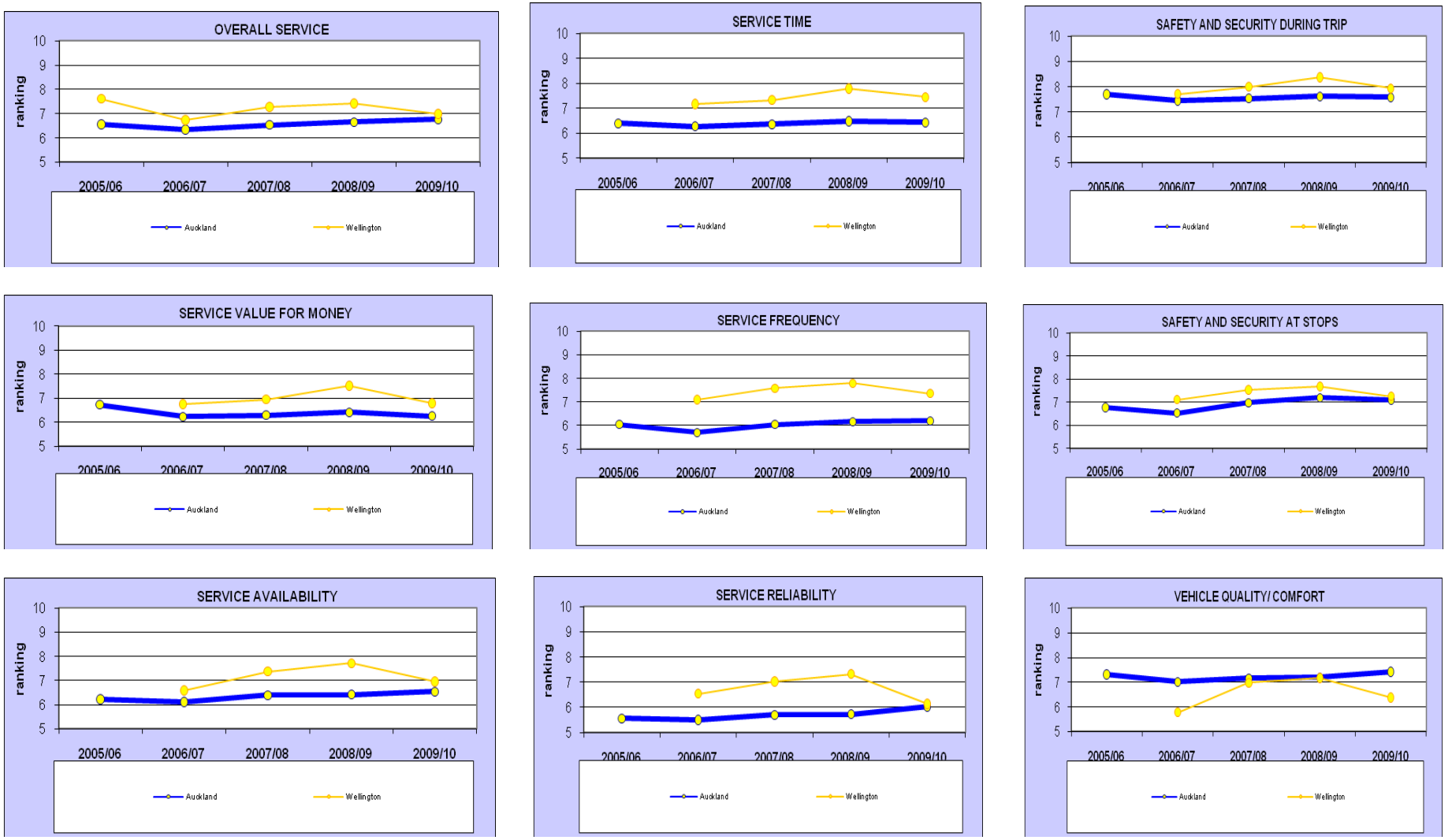
- In most years, the AKL rating performance has been poorer (either slightly or in some cases quite substantially) than that for the WGN train services, on all except one attribute (vehicle quality and comfort).
- The gap between the two cities was, on most attributes, considerably smaller in 2009/10 than in the previous years. This reflects the perceived deterioration of the WGN train performance (particularly marked in terms of reliability) in 2009/10: it seems likely that the deterioration in reliability of the WGN services has 'rubbed off' on users' perceptions of other aspects of the WGN services[13].
- On most attributes, the AKL ratings have either been stable or shown slight improvements over the five year period.
- On most attributes, the AKL rail ratings are similar to the bus ratings (on the same attributes). The main variation to this pattern arise for service frequency, on which rail is rated higher than bus, and service reliability, on which rail is rated somewhat lower.

TABLE 4.2: RAIL USER RESULTS – AKL RELATIVE RATINGS AND RECENT TRENDS

Attribute	AKL Results		
	Rating relative to WGN	Trend over recent years	Additional comments
Overall service	Worse	Slight improvement	Key overall measures of passenger attitudes towards the services
Service value for money	Worse	Stable	
Service availability	Worse	Slight improvement	
Service time	Worse	Stable	
Service frequency	Worse	Slight improvement	
Service reliability	Worse	Slight improvement	One of the most important attributes to passengers
Safety and security during trip	Worse	Stable	
Safety and security at stops	Worse	Slight improvement	
Vehicle quality/comfort	Better	Stable	The only attribute in which AKL performs better than WGN.

[13] The trends in WGN patronage over recent years would suggest that the deterioration in reliability in 2009/10 reduced train patronage by in the order of 5%-10% relative to the level otherwise expected.

Figure 4.2: SUMMARY OF NZ CUSTOMER SATISFACTION SURVEY RESULTS - RAIL



4.4 Ferry User Results

Figure 4.3 and Table 4.3 show similar information for Ferry users to that in the previous sections for Bus and Rail users. As for Rail users, the rating comparisons are with WGN only[14].

Again, the results are largely self-explanatory, but we make the following additional comments:

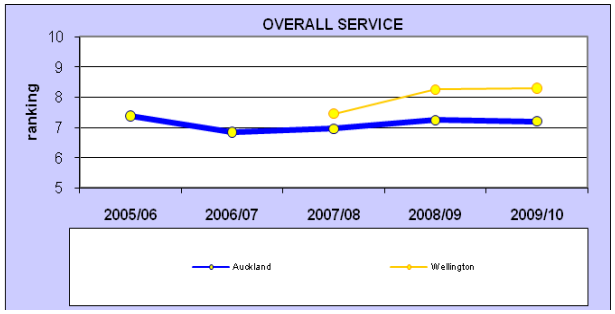
- On most attributes the mean ratings for the AKL ferry services are between 6.0 (good) and 8.0 (very good). The attribute with the highest rating is 'safety and security during trip' (8.1 in 2009/10), that with the lowest rating is for 'service frequency' (5.3 in 2009/10).
- In most years, the AKL rating performance has been poorer (in most cases quite substantially) than that for the WGN region ferry services, on all attributes except service reliability, in which the performance in both cases is almost identical.
- The performance gaps between the services in the two centres have generally not been narrowing over time.
- On most attributes, the AKL ferry performance has been broadly stable or slightly improving over the five year period. The service frequency attribute has shown the poorest absolute performance, with an apparently significant deterioration in 2009/10.
- Relative to the other AKL modes, the ferry services perform significantly better on 'overall service' and similarly on 'service value for money'. In terms of other attributes, they perform very much better in terms of 'service reliability', significantly better in terms of 'service time' and 'safety and security during trip', and significantly worse in terms of 'service frequency'.

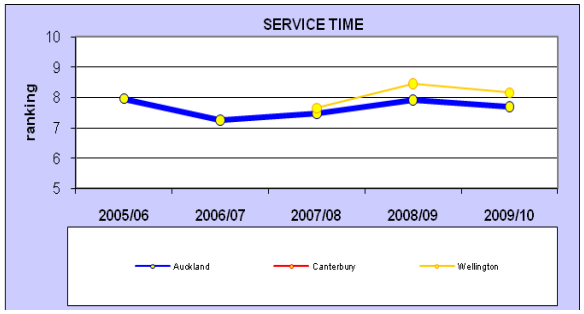
TABLE 4.3: FERRY USER RESULTS – AKL RELATIVE RATINGS AND RECENT TRENDS

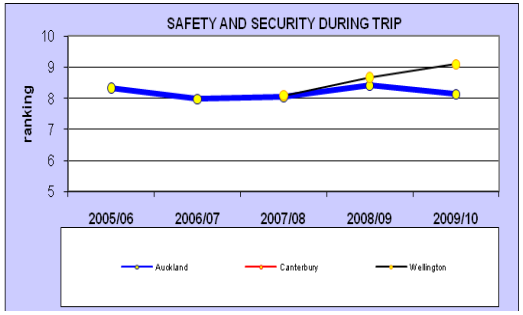
Attribute	AKL Results		
	Rating relative to other regions[(1)]	Trend over recent years	Additional comments
Overall service	Worse	Slight improvement	Key overall measures of passenger attitudes towards the services
Service value for money	Worse	Slight improvement	
Service availability	Worse	Slight improvement	
Service time	Worse	Fluctuating	
Service frequency	Worse	Deterioration	Lowest rating across the attributes
Service reliability	Similar	Fluctuating	One of the most important attributes to passengers
Safety and security during trip	Similar/worse	Stable	Highest rating across the attributes
Safety and security at stops	Worse	Slight improvement	
Vehicle quality/comfort	Worse	Stable	The only attribute in which AKL performs better than WGN.

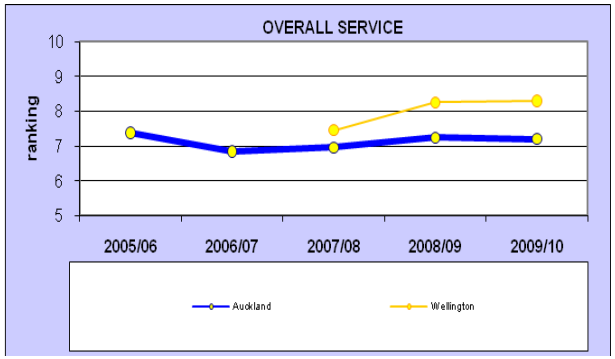
[14] It should be noted that the annual sample sizes for WGN ferry users were only between 30 and 60 passengers, whereas those for AKL were between 1,400 and 1,700. Particular care should therefore be taken in interpreting the WGN results.

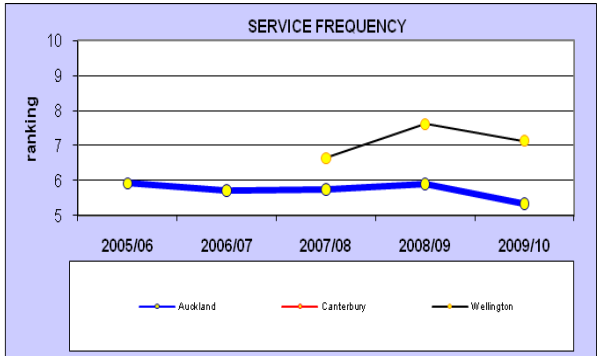
Figure 4.3: SUMMARY OF NZ CUSTOMER SATISFACTION SURVEY RESULTS - FERRY

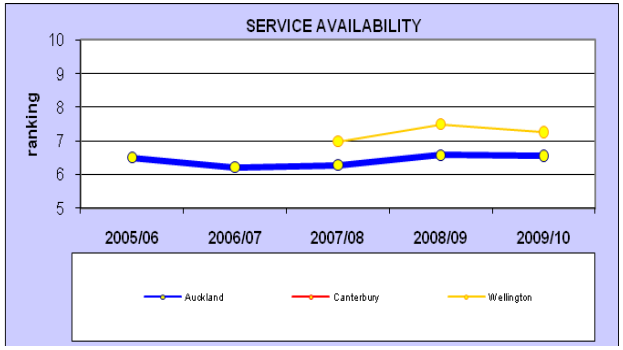


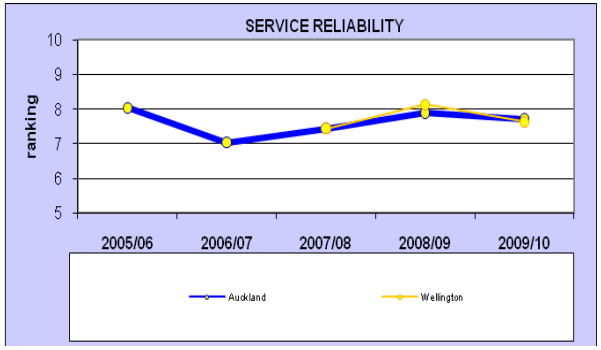


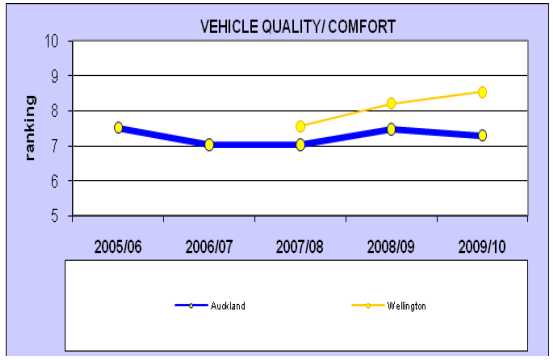












5. PT SYSTEM EFFECTIVENESS AND EFFICIENCY PERFORMANCE

5.1 Overview

This chapter provides comparisons of the performance of the PT systems in the group of comparator cities examined and comments particularly on how AKL's PT system performance compares with that of the other cities. The comparisons are presented, as appropriate, both for each city overall and for the separate PT modes.

The focus of this chapter is on effectiveness, cost effectiveness and efficiency aspects of performance, under the following headings:

- Service utilisation
- Fare levels
- Working expenses – per vehicle kilometre
- Working expenses – per passenger kilometre
- Cost (working expenses) recovery ratio.

Along with the material in Chapter 3 on PT usage levels and market shares and that in Chapter 4 on service quality aspects, these three chapters together provide a multi-faceted appraisal of the performance of AKL's PT system relative to the comparator cities.

5.2 Service Utilisation (Loadings)

The measure assessed here is the ratio, for each mode, of passenger km of travel to vehicle km operated (in service). This represents the average passenger loading on vehicles in service (averaged over all periods and over the full length of each route). The results by area and mode are shown in Figure 5.1A-D.

5.2.1 Rail mode

For rail, average loads in the NZ/Australian areas vary between 18 (AKL and BNE) and 32 (MEL). These figures may be compared with typical rail carriage capacity in the order of 80 seats (single deck carriages).

For the North American cities, the loadings are apparently much higher, at 60 for SEA and 69 for VAN. In both of these cities, heavy rail plays only a minor role, providing limited peak period (peak direction) commuter services: hence high average loadings are achieved .

5.2.2 Bus mode

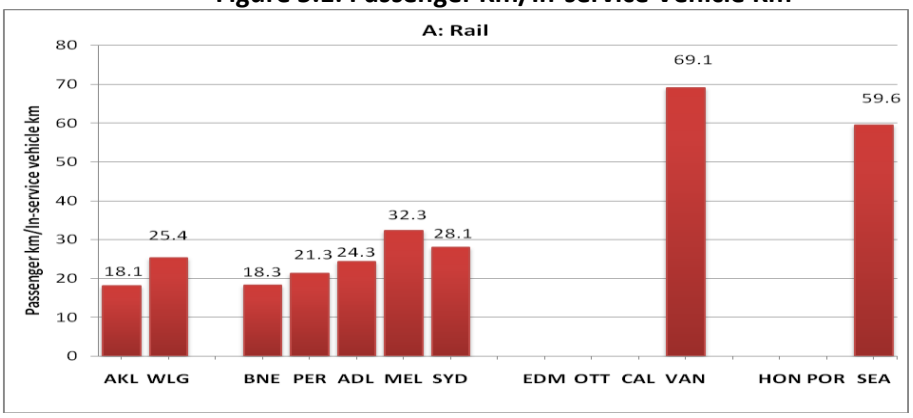
Average bus loads in the NZ/Australian cities vary between 7.5 (AKL) and 14.0 (SYD). These may be compared with typical bus seating capacity in the range 40-50 seats. The lower average loadings in AKL and WGN, and the higher than average figure for SYD, are notable.

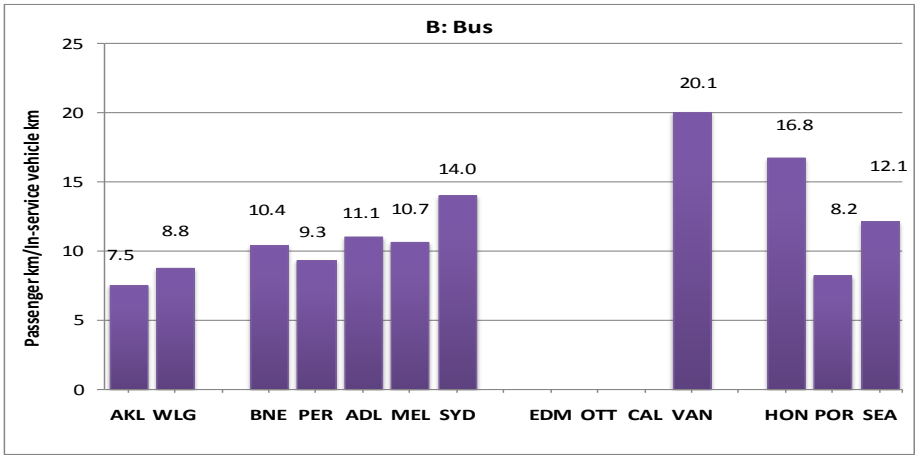
For the North American cities, the average loadings in VAN (20.1) and HON (16.8) are relatively high, well above any of the NZ/Australian figures. In the case of VAN, the high loadings reflect the high development densities and the disposition of activities in the main transit corridors: these result in relatively high utilisation throughout the day, in both directions. In the case of HON, which has no rail-based system, buses act as the rapid transit mode in the corridors of highest demand, using high capacity vehicles and resulting in high average loads.

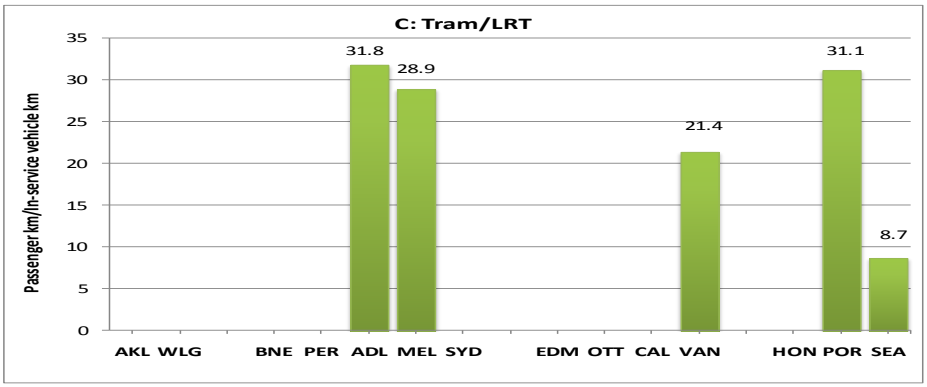
5.2.3 Tram/LRT modes

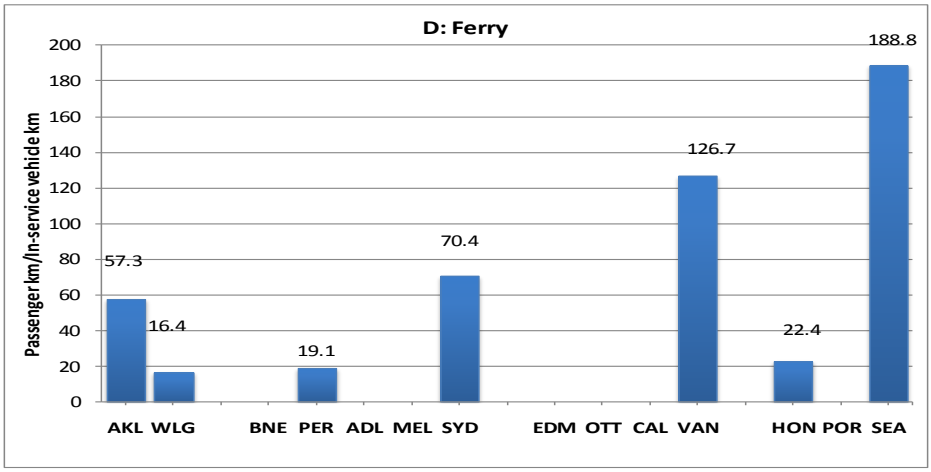
Average loadings on the two (Australian) tram-based systems (ADL, MEL) are both around 30 passengers. For the three North American LRT-based systems, average loadings vary over a wide range, from 31 for POR to 9 for SEA. In the case of POR, the LRT system acts as the primary rapid transit system for the entire city, with the bus network being oriented largely to provide feeder services to the LRT.

Figure 5.1: Passenger Km/In-service Vehicle Km









5.2.4 Ferry mode

As expected, the average loadings on the various ferry services vary widely, from 16 (WGN) to 189 (SEA): these differences reflect the different nature of the operations, the vehicle capacities and the extent and quality of competing travel alternatives in each metro area. In the case of SEA, most ferry services cross water barriers where there is no bridge, and carry cars as well as passengers: in this regard they are more comparable with the Interislander service than with the local ferry services in AKL and other Australasian cities.

5.2.5 Comments on Auckland performance

AKL has the lowest average loading of all the metro areas for the Bus mode, and also the lowest loading (very similar to BNE) for the Rail mode. These results may be indicative of a number of factors:

- In the case of Rail, the AKL system and its market are currently in a state of active development. Over time, increased market response might be expected to increased and improved services, and it might be expected that the current loading levels would increase[15].
- Similarly in the case of Bus, substantial service improvements have been made over recent years in a number of areas (eg North Shore), and the market may be still growing in response to these improvements[16].
- In general, the AKL bus network is characterised by relatively low frequency of services on a relatively large number of routes, often operating a considerable proportion of their distance through low-density suburban areas. This service design configuration is likely to result in lower average loadings than would be likely to be achieved with a higher frequency/lower coverage network.

We would suggest that AKL's relatively low bus loadings should be addressed as part of the ongoing process of area/sector service reviews. Given the loading levels currently achieved in the other NZ/Australian cities, we suggest a provisional AKL-wide average target of 10 passenger km/bus km (ie one-third higher than achieved in 2008/09) be adopted for achievement in the medium-term (c. 5 years).

5.3 Fare Levels

Two indicators of relative average fares across the metro areas surveyed are examined here:

- Fare revenue/passenger (boarding) – which takes no account of trip lengths. Results for each mode and overall are given in Figures 5.2A-5.2E.
- Fare revenue/passenger kilometre – which allows for differences in trip lengths (but which, by averaging the fare paid over the distance travelled, does not take explicit account of any 'flag-fall' fare component). Results for each mode and overall are given in Figures 5.3A-5.3E.

Both these sets of results are considered together in the following assessment and commentary.

5.3.1 All-mode average results

The results in Figures 5.2E, 5.3E indicate that:

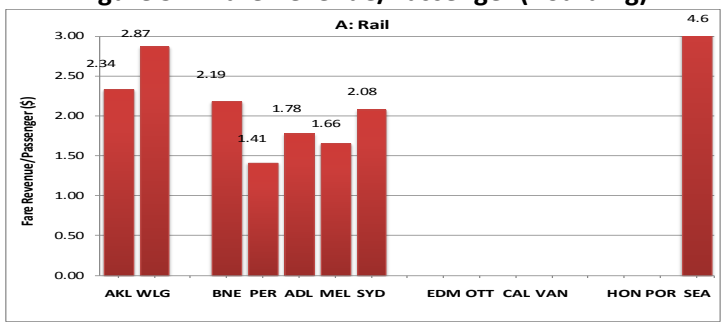
- On a per passenger (boarding) basis, the AKL and WGN fares are the highest of all the 14 metro areas, by a considerable margin. The AKL average fare is $1.91 and the WGN average is $2.09 (for longer trips on average), while the average fares for most of the other cities are in the range $1.00-$1.20[17].

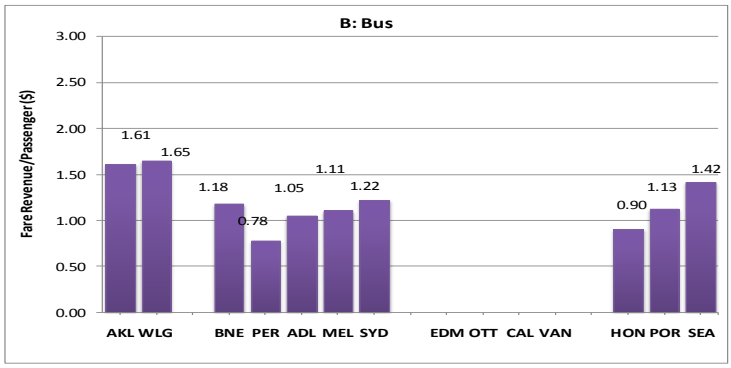
[15] Over the last 10 years, average loading levels (per train km) on the AKL rail system have increased by some 60%, but loadings per carriage km have stayed broadly constant.

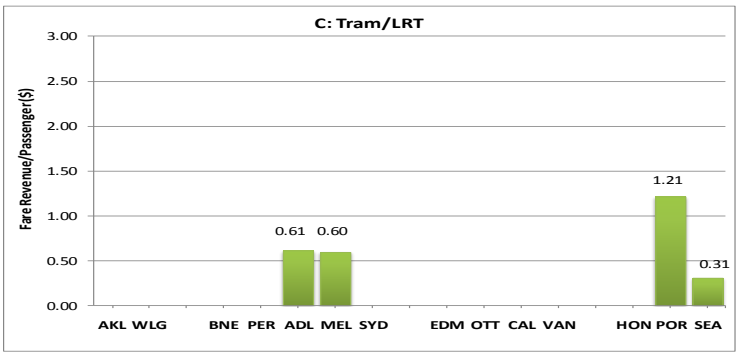
[16] Over the last 10 year period up to 2009/10, average AKL bus loadings have remained generally static, with passenger km and bus km increasing at similar rates.

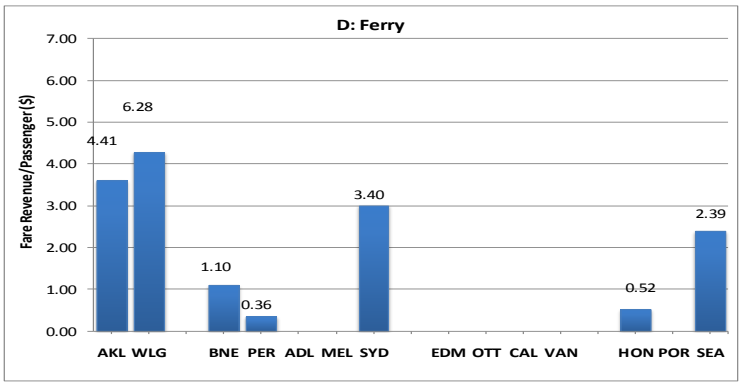
[17] These figures exclude GST (where applicable) and have all been converted to NZ$ based on purchasing power parity conversion rates. If GST were included, the fare disparity between AKL/WGN and the other 12 cities would be even greater.

Figure 5.2: Fare Revenue/Passenger (Boarding)









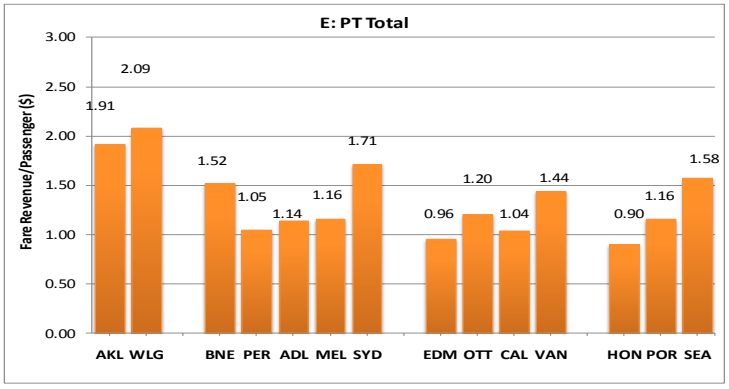


Figure 5.3: Fare Revenue/Passenger Kilometre

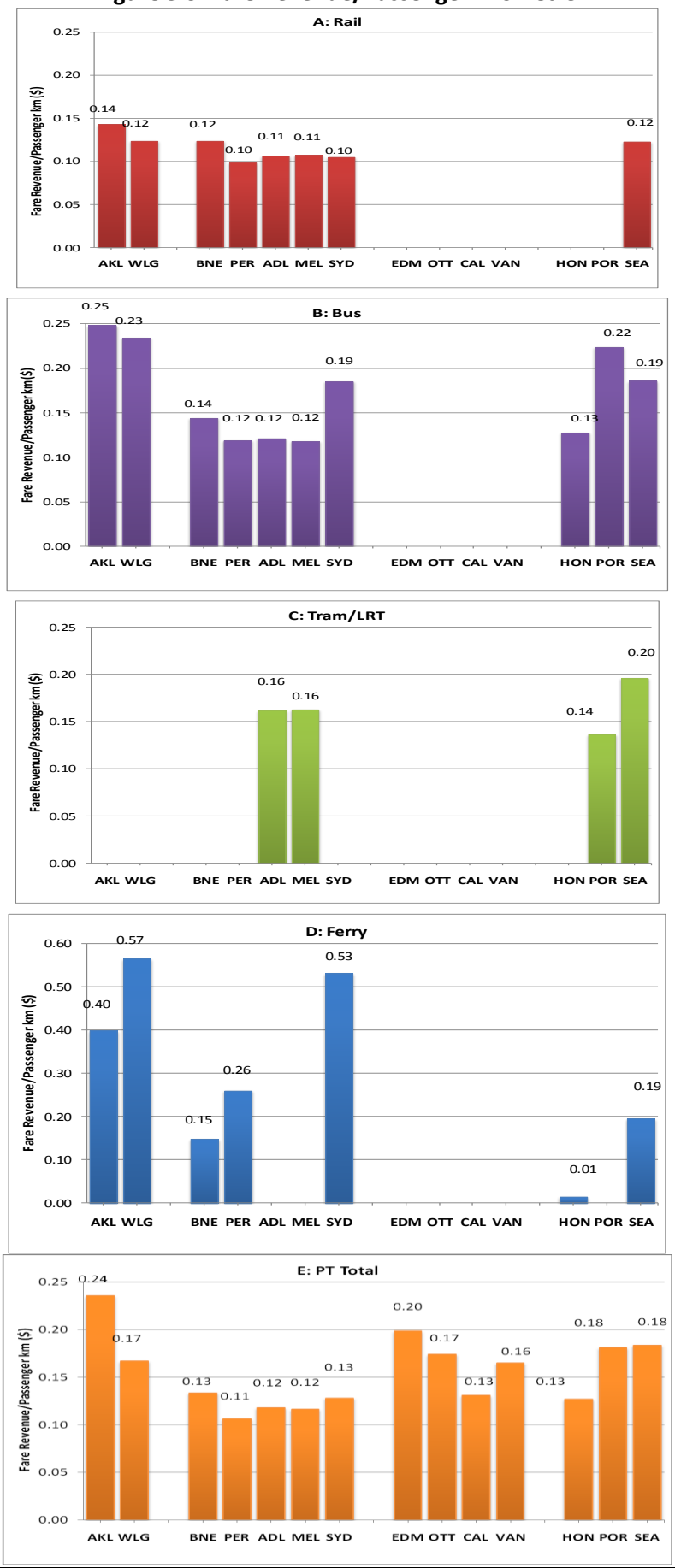
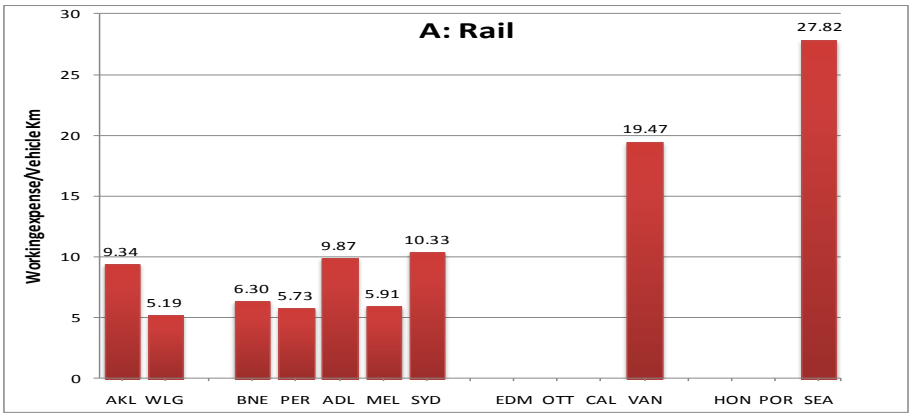
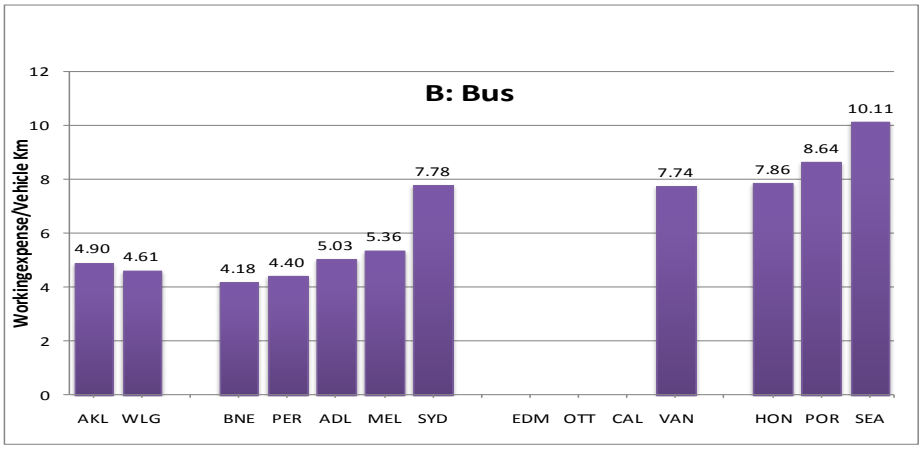
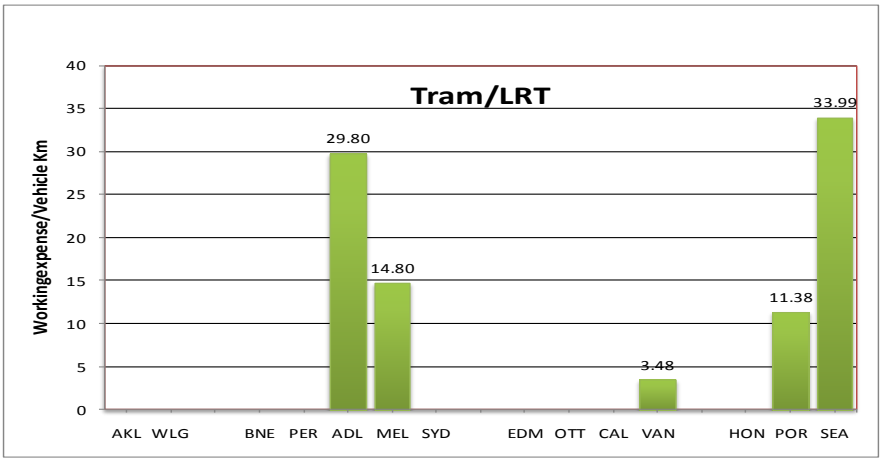
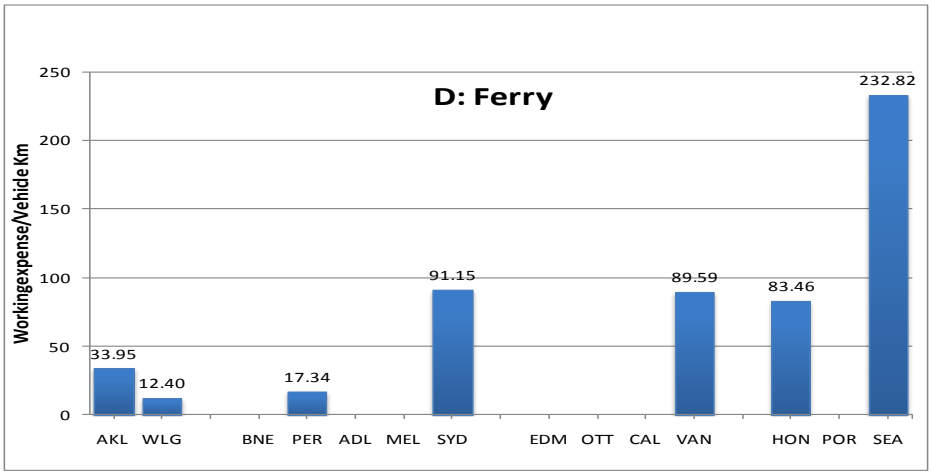


Figure 5.4: Working Expenses per Vehicle Kilometre









- On a per passenger km basis, the average AKL fare rate ($0.24/pass km) is still the highest of all the cities by a substantial margin. It is approximately twice the rate of the unit fares in all the Australian cities (range $0.11 to $0.13/pass km).

*5.3.2 **Rail mode** (Figures 5.2A/5.3A)*

- The AKL rail fares are significantly higher than the fares on the Australian rail systems, whether expressed per boarding or per passenger km, but the differences are not a great as for bus fares (refer below).
- The AKL fares are significantly lower than those in WGN on a per boarding basis, but significantly higher on a per passenger km basis (the WGN rail trips being substantially longer).

*5.3.3 **Bus mode** (Figures 5.2B/5.3B)*

- The AKL bus fares are considerably higher than bus fares in all the other cities (except WGN), both on a per boarding and a per passenger km basis. Relative to the Australian bus systems, the AKL fares per boarding are around 50% higher than the typical Australian fare, and the fares per passenger km around 100% higher.
- Compared with WGN, the AKL fares are marginally lower per boarding, marginally higher per passenger km.

*5.3.4 **Ferry mode** (Figures 5.2D/5.3D)*

- Fare comparisons across different ferry services in different cities are difficult and of limited interest, given the widely-differing trips lengths and styles of operation involved. Generally, the AKL ferry fares (per boarding or per passenger km) are well within the range of ferry fares in the other cities.
- It is notable, generally and in AKL, that ferry fares are considerably higher than fares on other PT modes, whether expressed on a per boarding or per passenger km basis[18].

5.4 Working Expenses – per Vehicle Kilometre

5.4.1 Overview

This indicator, total working expenses divided by total in-service vehicle kilometres, is a measure of relative cost efficiency. Its main use is in comparing between cities for each mode separately, rather than comparing between modes, which involve very different vehicle capacities[19].

For cost efficiency comparisons, the more desirable denominator would be total vehicle km (including non-service running). However, data on non-service running were not generally available (by mode) for the USA and Canadian systems: hence in-service vehicle km has been used as a proxy measure. The results are shown in Figure 5.4.

*5.4.2 **Rail mode** (Figure 5.4A)*

- The AKL rail average rate ($9.34/vehicle km) is towards the top end of the range of values in the seven Australasian cities[20]. It is below the rates for ADL ($9.87) and SYD ($10.33), but between 48% and 63% above the rates for the three other Australian cities, and 80% above the WGN rate ($5.19).
- The evidence across the Australasian systems may suggest some diseconomies of the smaller rail systems: both AKL and ADL are relatively small systems, with relatively low

[18] Often, ferry services offer a shorter route than the alternative (bus) services between a given origin and destination. Hence the higher ferry fare per passenger km may not result in a higher overall fare for the point-to-point trip.
[19] With any given PT mode, of course vehicle capacities may differ somewhat between cities, and no adjustments have been made for this in the current analyses. It may be more desirable, in future analyses, to collect information on vehicle capacities, and hence derive working expenses per seat km or per capacity (including standing places) km.
[20] The two N American values are much higher than all the Australasian rates.

operating costs (fuel and vehicle repairs/maintenance) for diesel systems – AKL and ADL are the only two of the seven systems that are not currently electrified, although both systems will be within the next few years.

5.4.3 Bus mode (Figure 5.4B)

- With the exception of SYD, the cost rates for all the seven Australasian bus systems lie within a reasonably narrow range, between $4.18 and $5.36 per in-service vehicle km. The rate for SYD is substantially higher ($7.78/vehicle km)[21] and is on a par with the values for VAN and HON.
- The AKL rate ($4.90/veh km) is around the middle of the range for the Australasian cities. It is some 6% higher than the WGN rate[22].

5.4.4 Ferry mode (Figure 5.4D)

- Ferry service comparisons in terms of working expenses/vehicle km are of very limited interest, given the wide range of vessel sizes and types of ferry operations.

5.5 Working Expenses – per Passenger Kilometre

5.5.1 Overview

- This indicator involves total working expenses divided by total passenger kilometres, by mode and city. As in the previous section, working expenses excludes all capital expenditures and associated capital charges (which include depreciation, interest payments and any finance leasing charges).
- While this section presents some cross-modal comparisons and some all-mode averages for this indicator, in interpreting these results it should be kept in mind that the 'working expenses' covers only a proportion of total system costs, and in the case of rail-based modes often a minority of total costs.
- The performance ratios on this indicator by city are shown in Figures 5.5A-E, and comments on the key features follow.

5.5.2 All modes average (Figure 5.5E)

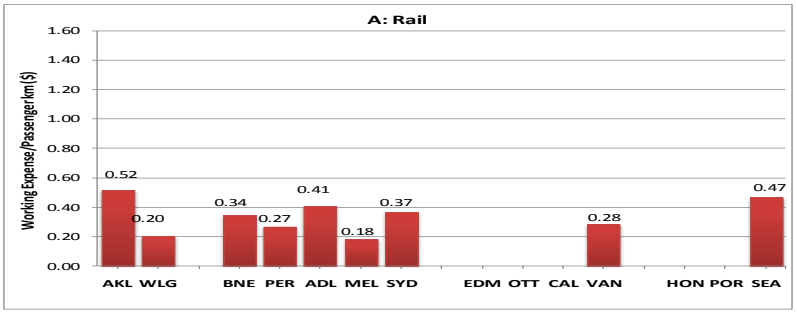
- All modes average figures for this indicator (WE/PKm) are typically around $0.40, with a range across the different cities between a low of $0.26 (Calgary) and a high of $0.89 (Seattle).
- The AKL figure ($0.61) is the third highest figure for the 14 cities: it is exceeded only by two of the USA cities (Portland, Seattle). it is substantially higher than:
  - WGN ($0.33)
  - all the 5 Australian cities (range $0.29-$0.46)
  - all the 4 Canadian cities (range $0.26 - $0.48)

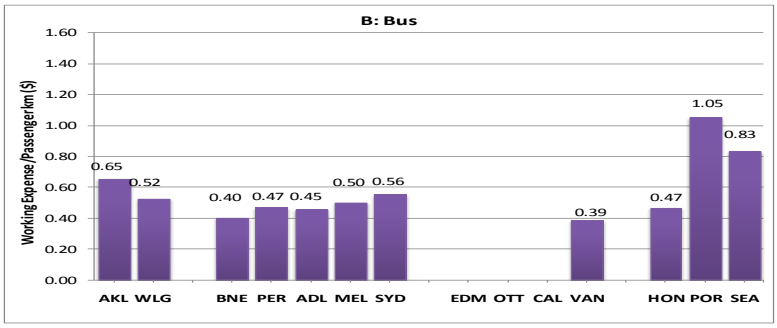
  This AKL performance reflects the combination of its relatively high working expenses (per vehicle km) and its relatively low loadings (passenger km/vehicle km).

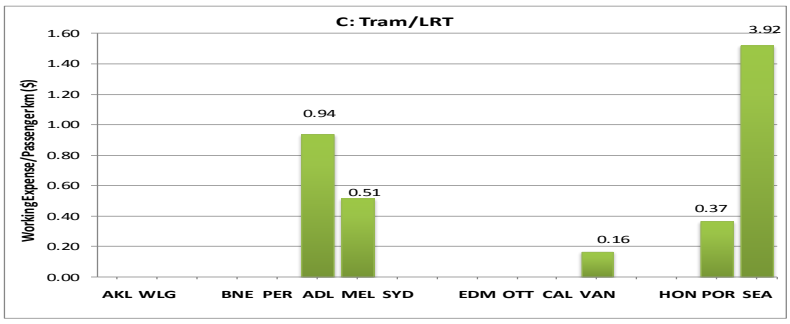
[21] The WGN figure includes both diesel and trolley services: the unit costs for trolley services are known to be higher than those for diesel services (on a like-for-like basis). Previous IWA analyses of the costs for diesel bus contracts have shown that 'standardised' costs/bus km for AKL bus contracts were some 31% higher than those for WGN diesel bus contracts.

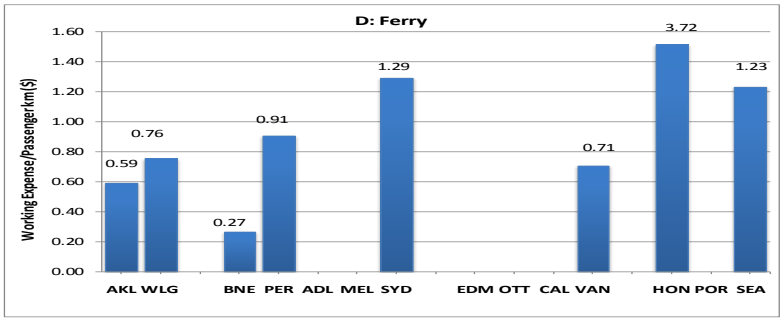
[22] This relatively high rate for SYD is influenced by an apparently very high proportion of dead running in the SYD bus system: this proportion may be over-estimated. If the SYD dead running proportion was on a par with the proportions in the other Australasian cities, the SYD WE/VKm rate would be the highest of the 7 cities, but not by such a substantial margin.

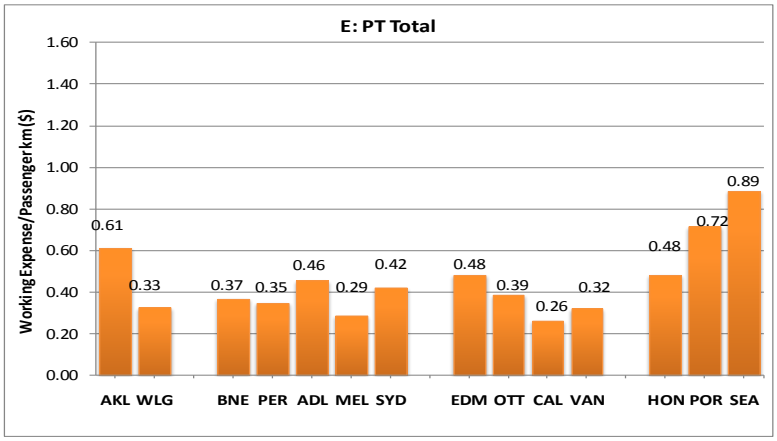
Figure 5.5: Working Expenses per Passenger Kilometre











5.5.3 Rail mode (Figure 5.5A)

- For rail, the AKL WE/Pkm average figure ($0.52) is the highest of all the 9 cities with significant rail systems. It is well over twice the WGN figure ($0.20) and well above the figures for the Australian rail systems (range $0.18 - $0.41).
- As above, the AKL result reflects both its relatively high WE/veh km figure and its relatively low average loadings.

5.5.4 Bus mode (Figure 5.5B)

- For bus, the AKL WE/Pkm is the third highest of all the cities for which data are available, below both Portland and Seattle (ie a similar ranking to that for all modes above).
- The AKL figure of $0.65 is significantly higher than that for WGN ($0.52) and than all the Australian cities (range $0.40 - $0.56). Again, this result reflects the combination of moderately high costs (WE/Vkm) and relatively low average loadings.
- It might be noted that, in each city, the WE/Pkm figure for the bus system is higher than that for the rail system, typically by around 50% (but with a range between about 10% and 180%). The difference for AKL is about 25% (and for WGN 160%).

5.5.5 Ferry mode (Figure 5.5D)

- For ferry, the AKL WE/PKm figure ($0.59) is towards the lower end of the range of cities: it is second out of the 8 cities, with only BNE having a lower ratio.
- It is notable that the AKL ferry figure lies midway between the AKL figures for rail ($0.52) and bus ($0.65). This tends to indicate a relatively good level of efficiency (relative to its passenger task) for the AKL ferries: in most of the other cities, the ferry WE/Pkm figures are well above the rail and bus figures for that city.

5.6 Working Expenses Recovery Ratio

5.6.1 Overview

- This indicator measures the ratio of total fare(box) revenue to total working expenses, by city and mode. It is sometimes known as 'farebox recovery' (and closely approximates the definition of farebox recovery ratios adopted by NZTA in its recent Farebox Recovery Policy).
- As in the previous section, while this section provides some cross-modal comparisons and all-mode averages for this indicator, it needs to be kept in mind that the 'working expenses' constitute only a component of total system costs, with the proportions covered differing radically between rail-based and bus-based modes.
- Figure 5.6(A-E) shows performance ratios on this indicator for each city, by mode. Figure 5.7 shows for each city (all modes combined) performance on the two separate indicator components, ie working expenses/passenger km and fare revenue/passenger km. Table 5.1 summarises the Figure 5.7 results at a country level, based on the (unweighted) averages of the results in the cities concerned. Comments on these results follow.

5.6.2 All modes average

- In terms of WE/PKm, Table 5.1 shows, at a country level, that:
    - The cost rates for Canadian and Australasian cities are relatively low, those for the NZ centres slightly higher and those for USA are highest.
    - On this scale, AKL ranks as on a par with the USA cities, substantially higher than any of the other cities outside USA (see Fig 5.5E).
- In terms of Rev/PKm, Table 5.1 shows:

- The average revenue rates for the Australian cities rank as 'low', for the USA and Canadian cities as 'medium' and for the NZ cities as 'high'.
- On this scale, AKL ranks as 'high', with its overall Rev/PKm the highest of all the comparator cities (refer Figure 5.3E).

- In terms of overall working expenses recovery (WER) ratios:
  - The average WER for the Canadian cities ranks as 'high', for the NZ cities as 'medium/high', for the Australian cities as 'medium' and for the USA cities as 'low'.
  - On this scale, the AKL ratio ranks as 'medium'. Its WER (39%) ranks it well below the Canadian cities and WGN, but marginally above the average of the Australian cities, and well above the USA cities.

5.6.3 *Rail mode (Figure 5.6A)*

- For rail, the AKL WER ratio is 28% (Figure 5.6B). This is the second lowest of the 8 cities with significant (heavy) rail systems, with only ADL (26%) being lower.
- The best-performing rail systems on this measure are MEL (63%) and WGN (61%).

5.6.4 *Bus mode (Figure 5.6B)*

- For bus, the AKL WER ratio is 38% (Figure 5.6C). This is the second highest of the 10 cities for which the data are available, with only WGN (45%) having superior performance.
- This AKL result reflects that its bus system has the highest average bus fares (per Pkm) of all the cities, which more than offsets its relatively high costs.
- It is notable that AKL is one of the only two cities (ADL is the other) where the bus system WER ratio exceeds that for the rail system. In both cases, this may be ascribed primarily to the relatively poor performance of the rail system (as seen in Figure 5.6B).

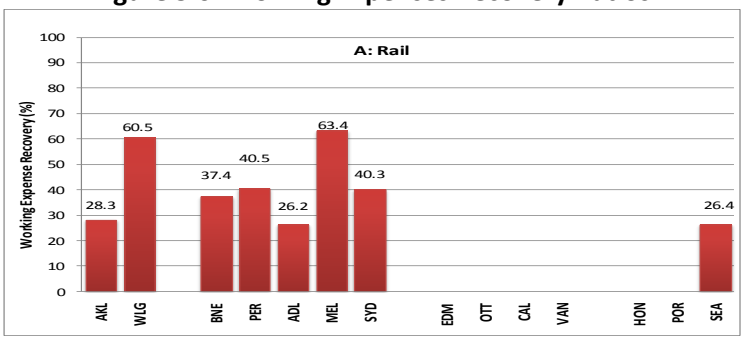
5.6.5 *Ferry mode (Figure 5.6D)*

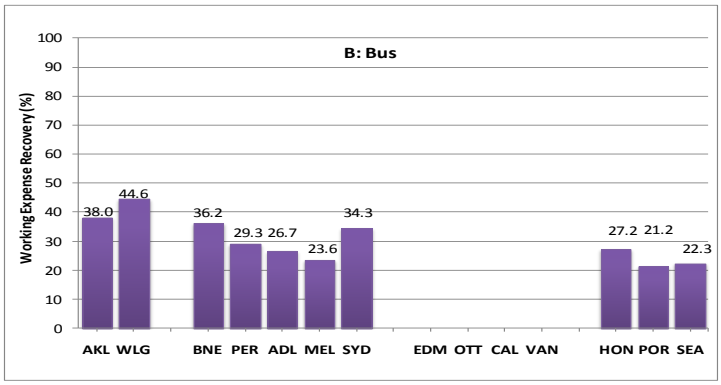
- For ferry, the AKL WER ratio is 68%. This is the second highest of the 6 cities for which data are available, behind only WGN (75%). This AKL result is a combination of average fares and low WE/Pkm relative to the other ferry system.
- The high WER ratio for AKL ferries compared with its rail and bus services is notable.

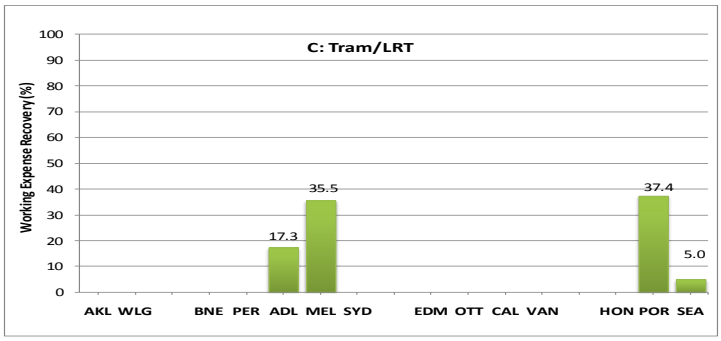
TABLE 5.1: OVERVIEW OF WORKING EXPENSES RECOVERY PERFORMANCE BY COUNTRY

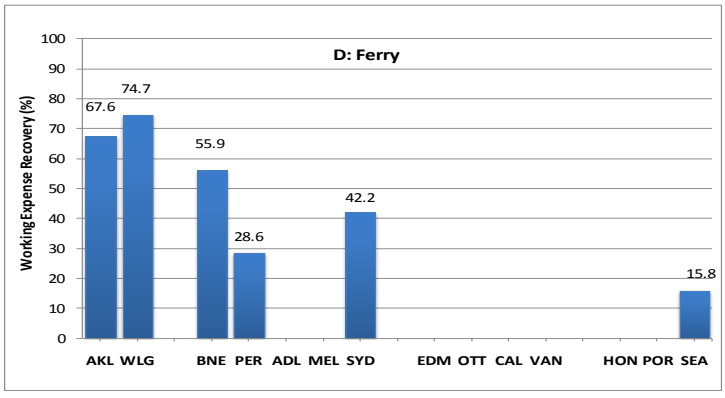
Country	WE/PKm	Rev/PKm	Overall WE Recovery Ratio
Canada	Low	Medium	47% ave – High
NZ	Low/Medium	High	45% ave – Medium/High
Australia	Low	Low	36% ave – Medium
USA	High	Medium	24% ave – Low
Auckland	Medium/High ($0.61)	High ($0.24)	Medium (39%)

Figure 5.6: Working Expenses Recovery Ratios









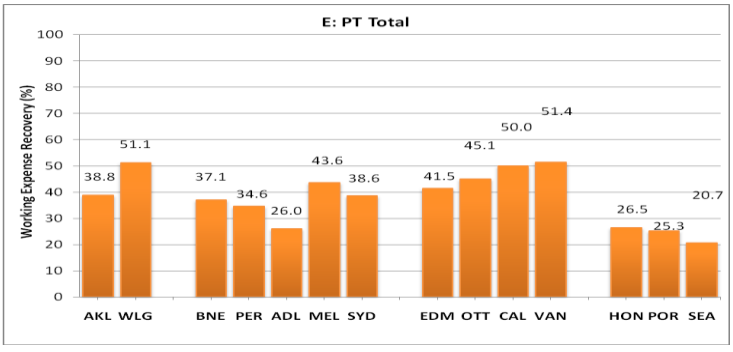
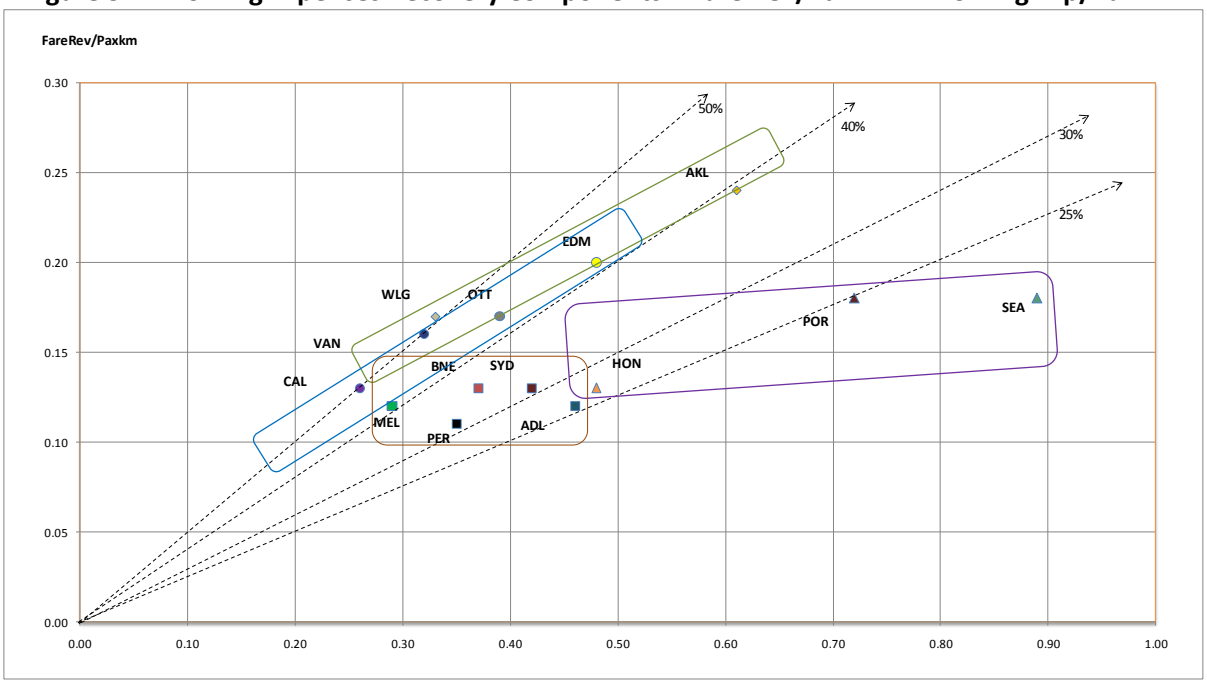


Figure 5.7: Working Expenses Recovery Components – Fare Rev/Pax Km v Working Exp/Pax Km



6. CONCLUSIONS TO DATE AND IMPLICATIONS FOR POLICY DEVELOPMENT

6.1 The Current Situation – Summary of Key Findings

This section provides a summary of the key findings from the earlier chapters (3, 4 & 5) on the performance of Auckland's PT system and services compared with the PT systems and services in the other 13 NZ, Australian, Canadian and USA cities (metropolitan areas) examined in this project.

These summary comparisons are presented in Table 6.1, under the following headings:

A: Passenger Market
B: PT Services – Types, Levels and Quality
C: Fares and Ticketing Systems
D: Service Utilisation
E: Cost Efficiency and Effectiveness
F: Financial (Cost Recovery) Performance.

TABLE 6.1: CURRENT AUCKLAND PT PERFORMANCE RELATIVE TO COMPARATOR CITIES: SUMMARY OF KEY FINDINGS

Aspect	AKL Relative Performance and Comments	Report Refs
A. PASSENGER MARKET		
A1 PT Patronage Rates	• AKL's PT patronage rate (per service area population) is the lowest of all the comparator cities, including lower than the six cities having significantly lower populations. • AKL's PT patronage is between 25% and 40% below the rates for the 3 medium-size Australian cities with which AKL is often compared (BNE, PER, ADL). • AKL's PT patronage rate has grown significantly over the last 10-15 years, averaging around 1.5% - 2.0% pa (and contrasting with its rapidly declining rate in earlier years). However, this growth has been towards the lower end of the range experienced in other Australian/NZ cities.	3.1, Table 3.1, Fig 3.1/3.2/3.3
A2 PT Mode Shares – Journey-to-work	• AKL's PT mode share for journeys to work (2006) is close to the bottom of the range of all the comparator cities (POR and SEA have similar mode shares). • Relative to the Aust/NZ comparator cities, and allowing for their population differences, AKL's JTW mode share is particularly low for trips to the CBD, slightly below the norm for trips to other destinations. • Over the most recent 15 year period (1991-2006), AKL's PT mode share has increased significantly for trips to the CBD, but declined slightly for trips to other destinations.	3.3, Fig 3.6/3.7/ 3.8/3.9
A3 PT Mode Shares – All Travel	• AKL's PT mode share is only 'substantial' for trips having one or both trip ends in the CBD: o For trips to/from the CBD (c. 10% of all regional trips), the PT mode share (2006) was 32% in peak periods, 13% in off-peak. o For trips within the CBD (1.3% of all trips), the PT mode share was 8% in peak periods, 11% off-peak. o For non-CBD trips (89% of all trips), the PT mode share was 3.4% in peak periods, 1.6% off-peak. o The resulting region-wide overall PT mode share was 6.4% in peak periods, 2.8% off-peak (3.9% overall daily average).	3.4, Table 3.2, Fig 3.10

		• Consistent with the journey-to-work mode share results (above), it would be expected that AKL's overall PT mode shares are at or close to the bottom of the range of all the comparator cities. Comparisons with MEL (for which good data are available) indicate that AKL's PT mode shares are about half those in MEL, for both peak and off-peak periods, for both CBD and non-CBD travel.	
B.	**PT SERVICES - TYPES, LEVELS AND QUALITY**		
B1	Service Types and Modes	• Relative to most of the comparator cities, a smaller proportion of AKL's PT travel is undertaken on 'rapid transit' services (ie services, whether rail-based or bus-based, that are largely segregated from general road traffic, and consequently have higher operating speeds and generally greater reliability): o A smaller proportion of AKL's PT travel is on rail-based services then is the case in any of the other Aust/NZ cities. o Additionally, AKL has only one true rapid transit bus corridor (Northern Busway), which is less than most of the other cities with a heavy bus emphasis (eg OTT, BNE).	Fig 3.1/3.4
B2	Quantity of Service	• Total (in service) PT vehicle km/capita has been used as a, relatively crude, measure of the quantity of service offered to the population in each city: o On this measure, the Canadian cities typically provided the highest quantities of service, the USA cities the lowest quantities (broadly 30% lower), with the Aust/NZ cities slightly below the Canadian cities. o On this measure, the quantity of service provided in AKL is well below the figures for all the other Aust/NZ cities, and on a par with the typical USA cities: AKL's service quantity would need to be increased by around one-third to reach the current levels in the 3 most closely comparable Aust cities (BNE, PER, ADL).	3.5.2, Fig 3.11
B3	Quality of Service	• Aspects of AKL's PT service quality (as perceived by users of the services) were compared with service quality in other NZ centres using the annual customer satisfaction surveys undertaken by RCs since 2005/06, which incorporate a consistent set of questions (specified by NZTA)[(1)]. • Based on this source, for **Bus** mode, AKL rates the worst of all the regions, in all years, on the 3 attributes that are arguably the most important of those surveyed, ie overall service, service value for money, service reliability. On most attributes, including these three, AKL's user ratings have shown some improvements over the last five years. • For **Train** and **Ferry** users, AKL's quality ratings were lower than those for WGN users in almost all cases. AKL's ratings on most attributes have been either stable or shown slight improvements over the last five years. • AKL's train ratings are generally similar to those for bus on most attributes. Its ferry ratings are generally better than the ratings for the other two modes.	4.1-4.4, Fig 4.1-4.3
C.	**FARES AND TICKETING SYSTEMS**		
C1	Fare Levels	• In general, of the four countries examined, average fares (per passenger boarding or per passenger km) are highest in the NZ	5.3, Fig 5.2/5.3

		cities, lower in the CAN/USA cities and lowest in the Australian cities. • On a per passenger km basis, AKL's average fare/pass km ($0.24 + GST) is around 50% higher than typical average fares in the CAN/USA cities and double the typical average fares in the Australian cities.	
C2	Fares and Ticketing Integration	• Most of the comparator cities examined operate integrated, multi-modal fares and ticketing systems. With such systems, a complete journey (origin-destination) may be made on one ticket, with no penalty for transferring between routes or modes[(2)]. • AKL is one of the few cities examined that does not have an integrated fares/ticketing system for at least a large proportion, if not all, PT trips[(3)]. This is believed to be a significant factor contributing to its relatively low PT usage rates[(4)].	
D.	**SERVICE UTILISATION**		
D1	Average Vehicle Loadings	• The performance measure used here is the ratio (for each mode) of passenger km of travel to vehicle km operated (in service): this represents the average passenger load per vehicle (averaged over the full route length and over all periods). • For **Rail** mode, AKL has the lowest average loadings of all the comparator cities. Its average is about 30% lower than the WGN figure, and between 1% and 25% lower than the 3 Australian cities with which it often compared (BNE, PER, ADL). • For **Bus** mode, AKL also has the lowest average loadings of all the comparator cities. Its average is about 15% lower than the WGN average, and between 19% and 32% lower than the 3 most comparable Australian cities (BNE, PER, ADL).	5.2, Fig 5.1
E.	**COST EFFICIENCY & EFFECTIVENESS**		
E1	Working Expenses per Vehicle Km (Cost Efficiency)	• The performance measure for cost efficiency used here is total working expenses per in-service vehicle km. Note that working expenses exclude all capital expenditure and associated capital charges (including depreciation, interest payments, finance lease charges)[(5)]. The main use of this measure is in comparing between cities for each mode separately, rather than comparing between different modes, which involve very different vehicle capacities. • For **Rail** mode, the AKL cost rate is towards the top end of the range of the seven Australasian cities, exceeded only by ADL and SYD. It is around 50% above the rate for the other three Australian cities (BNE, PER, MEL) and 80% above the WGN rate. The relatively high AKL rate is likely to reflect: (i) diseconomies associated with the small scale of the system; (ii) some 'transitional' costs associated with the current expansion and development of the system (eg driver training); and (iii) higher operating and maintenance costs associated with diesel-powered systems. • For **Bus** mode, the AKL cost rate is around the middle of the range for the Australasian cities, but significantly above the corresponding rates for diesel bus services in WGN (and in other NZ centres). The evidence indicates that the very low	5.4, Fig 5.4

		level of competition for provision of services in AKL is one factor behind its high rate relative to other NZ centres.	
E2	Working Expenses per Passenger Km (Cost Effectiveness)	• The performance measure used here is total working expenses divided by total passenger km, by mode and city. While this measure does not cover all costs, it is a useful measure for comparing overall cost-effectiveness across modes and cities. • For **all modes** combined, the average figures (WE/PKm) are typically around $0.40, with a range between $0.26 (CAL) and $0.89 (SEA). All the Australian systems are in the range $0.29 to $0.46 and the CAN systems in the range $0.26 to $0.48. • The AKL figure ($0.61) is considerably higher than that for WGN ($0.33), for all the Australian cities and all the CAN cities. This relatively high figure reflects the combination of relatively high WE/vehicle km (E1 above) and relatively low loadings (D1). • For **rail** mode, the AKL average ($0.52) is substantially greater than all the Australian figures (range $0.18 to $0.41) and the WGN figure ($0.20). • For **bus** mode, similarly the AKL figure ($0.65) is substantially greater than the range of Australian figures ($0.40 to $0.56) and the WGN figure ($0.52).	5.5, Fig 5.5
F.	**FINANCIAL (COST RECOVERY) PERFORMANCE**		
F1	Fare Revenue/ Working Expenses	• The performance measure used here is the ratio of total fare(box) revenue to total working expenses, by city and mode. We refer to this as the working expenses recovery ratio (WER): it is sometimes referred to as the 'farebox recovery (ratio)'. Note that, as working expenses cover only a proportion of the total costs of each mode, any cross-modal comparisons on this measure are of very limited use, but within-mode comparisons between cities are more valuable. • At a country level, the all modes cost recovery (unweighted) averages are: o Canada 47% (ave WE/PKm $0.36, ave Rev/Pkm $0.17) o Australia 36% (ave WE/PKm $0.38, ave Rev/Pkm $0.12) o USA 24% (ave WE/PKm $0.70, ave Rev/Pkm $0.16). • The AKL all-modes figure is 39% (WE/PKm $0.61, Rev/PKm $0.24). By comparison, the WGN figure is 51% (WE/PKm $0.33, Rev/PKm $0.17). This AKL cost recovery figure is higher than all the USA cities, higher than all but one of the Australian cities, but lower than all the CAN cities. It is considerably lower than the WGN figure. These results reflect AKL's combination of relatively high costs (WE/PKm) with relatively high fare revenues (Rev/PKm). • For **rail mode**, the WER for AKL is 28% (ie well below the AKL all-modes average). It is lower than the corresponding ratios for all but one of the Australian rail systems (WER range 26% to 63%). AKL's relatively high rail fares are insufficient to offset its relatively high costs, resulting in this relatively low cost recovery result. • For **bus** mode, the AKL WER ratio is 38%. This is the second highest of the 10 cities for which data are available, with only WGN (45%) having superior performance[(7)]. AKL's relatively high fares are in this case sufficient to offset its relatively high	5.6, Table 5.1, Fig 5.6/5.7

	costs (relative to the Australian cities in particular). • For the **ferry** mode, AKL's WER ratio is 68%, much higher than for its rail or bus services. This ratio is the second highest (after WGN) of the six cities for which data are available.	

Notes:

(6) No quality comparisons were possible with cities in Australia, Canada and USA because of the lack of comparable quality statistics for these cities.

(7) Such tickets are typically valid for unlimited PT travel within a specified time period (eg 3 hours from initial validation) within a specified set of 'zones', with their price depending on the number of zones of their validity.

(8) We understand that AKL proposes to implement such an integrated fares/ticketing system within the next few years.

(9) Under most integrated fares/ticketing systems, once the ticket is purchased, incremental trips can effectively be made for zero fare.

(10) Note that the exclusion here of capital charges severely limits the usefulness of any cross-modal comparisons for assessing cost efficiency or cost effectiveness performance, as capital charges account for a much larger proportion of total costs for rail-based modes than for bus-based modes. However, comparisons across cities within each mode individually should be reasonably valid.

(11) The farebox recovery estimates presented in this report closely approximate to, but are not identical with, the figures presented by NZTA in its Farebox Recovery policy document. Differences relate to: (i) the NZTA definition of costs covers only those costs included in payments to operators, whereas our definition for costs includes other working expenses; and (ii) the NZTA definition of fare revenues includes SuperGold Card reimbursement payments, whereas these are excluded from our definition.

(12) Cost recovery data by mode were not available for the Canadian cities.

6.2 Factors Influencing Auckland's Comparative PT Performance and Policy Directions to Enhance Performance

The project ToR specify that the project should address (inter alia) the following aspects:

(A) The performance of the AKL (public) transport system compared to similar cities.
(B) Assessment of the reasons for performance differences.
(C) Areas that warrant close further investigation.

However, the project ToR specify that it is **not** required to address:

(D) Development of strategy/policies (to tackle any aspects of poor performance identified).

Aspect (A) is covered primarily by Chapters 3, 4 and 5 of this report, with the material being summarised in Table 6.1.

Aspect (B) is covered, to the extent feasible at this stage of assessment, in this section, drawing on some of the findings summarised in Table 6.1. While the study has assessed AKL's PT performance relative to the comparator cities in quantitative (and rating) terms, a rigorous quantified appraisal of the causes of the various performance differences has not been undertaken (and, in any event, would not be possible in any comprehensive manner). Therefore the following assessment of the causes of differences is essentially qualitative, drawing on the wider international evidence on the factors contributing to 'successful' metropolitan PT systems in the developed world in addition to the specific comparator analyses of this study.

We would note that, at this stage, the comparator ('benchmarking') analyses that have been undertaken in the study have been at a relatively high level: aspect (C) (refer section 6.3) is to identify areas that would warrant priority for closer investigation. Such further investigations would sensibly examine in more detail the factors influencing performance differences, and hence provide additional contributions to aspect (B) in due course.

Table 6.2 following provides our comments on:

- Factors currently constraining the performance of AKL's PT system, both in general and relative to the comparator cities.

- In the light of these factors, potential policy directions that would contribute to overcoming current constraints and to enhancing AKL's system performance[23][24].

These comments are arranged under five main headings:

(1) PT-specific policies and service provision

(2) Multi-modal policy aspects

(3) Land use aspects and land use/transport integration

(4) PT cost efficiency aspects

(5) PT planning and regulatory arrangements.

Note that policies under the first three of these headings are all likely to have impacts on patronage and mode shares, those under the fourth heading are likely to primarily influence the (gross) costs of Pt service provision, while those under the fifth heading are likely to influence both system effectiveness (including patronage) and cost efficiency.

[23] In regard to this point, we note that "the development of strategy/policies (to tackle any aspect of poor performance)" relates to aspect (D) above, which is outside the current study ToR. This section thus only provides initial comments on potential policy directions, based on our professional interpretation of appropriate policies to address the identified current constraints in performance.

[24] We note that these suggested policy directions are generally consistent with the transport policy directions currently being pursued or proposed for the Auckland region, in particular as specified in the following policy documents:

- Auckland Regional Public Transport Plan 2010 (ARTA)
- Auckland Transport Plan 2009 (ARTA, in collaboration with other authorities in the AKL region)
- Auckland Regional Land Transport Strategy 2010-2040 (ARC)
- Auckland Passenger Transport Network Plan 2006-2016 (ARTA).

TABLE 6.2: SUMMARY OF FACTORS CONSTRAINING AUCKLAND'S CURRENT PT PERFORMANCE AND POTENTIAL POLICY DIRECTIONS[1]			
Heading	**Factors Constraining Current AKL PT Performance**	**Potential Policy Directions to Enhance Performance**	**Notes, Comments**
1. PT-SPECIFIC SERVICE ASPECTS			
1.1 PT Network and Service Strategy	• While an integrated network strategy with different service types designed to cater effectively and efficiently for different travel needs, is established as policy, it is not yet achieved in most aspects of operation and branding. • Network largely focussed on travel to/from CBD, with services inadequate for great majority of non-CBD trips. • 'Rapid transit' (high speed and quality) services directly serve only a small proportion of the population – less than 15% of population live within 800m of a train station. • PT route coverage of the metro area is reasonably good (in terms of walking distances to nearest PT route), but most routes are of low frequency (every 30 minutes or less often) and limited operating hours: they are not competitive with private car use. • Services on different modes are not well coordinated (in terms of transfer arrangements, timetables) and in some cases are inefficiently or unnecessarily duplicated.	• The 'layered' approach being progressively adopted in AKL in the development of the PT network is supported, involving three main service 'layers' (RTN/QTN/LCN). The services in the top two layers (RTN/QTN) are to be designed to offer competitive alternatives to private car use. • Upgrade the existing RTN routes, progressively extend the RTN route network and identify the services on the QTN – in most cases using bus mode in the shorter term (with potential for upgrading to higher capacity modes later). • QTN/LCN services should be progressively redesigned, on an area/corridor basis, based on patterns of current/potential person travel demand (and not constrained by historic operator/ contract area boundaries). • Greater emphasis should be given to providing higher service frequencies over fewer routes (with coordinated transfers). • Establish and monitor the proportion of the regional population living/working within 400m/800m of frequent (RTN/QTN) services. (Vancouver, for example, aims for the majority of all residents and jobs to have ready access to RTN/QTN services.)	• This is consistent with the current AKL policy, as set out in the PTNP. • Generally consistent with PTNP policies. • AT has been undertaking such redesigns over recent years, with a substantial degree of success.
1.2 Quantity of Service	• The total quantity of PT services provided in AKL (vehicle km or similar measure) relative to its population is low relative to most of the comparator cities (Table 6.1, B2). This low level is particularly evident in poor service frequencies and limited hours of operation.	• As services are improved and made more attractive for users, the extent of services provided should be progressively increased. A particular focus should be given to off-peak periods – with high frequency services on the RTN/ QTN; and regular/clockface timetables, improved frequencies and extended hours of operation on other routes.	• This off-peak emphasis recognises the differences in marginal costs and in patronage responses to service levels (elasticities) in off-peak and peak periods.
1.3 Service Speed	• Relative travel speeds by PT and car are an important indicator of the competitiveness of PT for 'choice' travellers, particularly for longer urban trips. Auckland's PT system performs relatively poorly on this measure, worse than the metropolitan average in most other developed-world cities, with the exception of the USA (refer BNK).	• PT speed performance should be improved through proposals to: – extend and upgrade the RTN (including rail electrification) – extend and strengthen bus priority measures – restructure the bus network to provide more direct routes.	• These proposals are consistent with PTNP policies.

1.4 Service Reliability	• Indications are that the levels of reliability of PT services are poor relative to other cities: ○ NZ annual Customer Satisfaction Surveys rate AKL bus service reliability lower than for all other NZ centres, and rail and ferry reliability as lower than WGN (Tables 4.1 – 4.3). ○ AKL's RLTS monitoring shows large travel time variability on a sample of bus routes (ATP, App 3). • Monitoring of AKL's bus service reliability and punctuality is largely done through operator self-reporting at present, and the results seem likely to be biased.	• Policies to enhance reliability include: ○ Extension and upgrading of the RTN, in which PT vehicles are largely separated from other traffic ○ Extension and upgrading of bus priority measures (refer item 2.4). ○ Wider implementation of real-time passenger information (which reduces the perceived disbenefits of unreliability). • Enhanced monitoring required (using real-time systems) and enforcement of reliability standards in operator contracts. AT should have direct access to vehicle location data so that it can perform its own analyses of reliability.	• •
1.5 Service Integration and Infrastructure Aspects	• For historical reasons, in many respects the current AKL PT system operates as a series of largely-separate networks and services (defined by mode, operator and route) with little integration or coordination between them. This limits people's perceived travel opportunities. With the policies now adopted to implement a tiered network structure and to introduce integrated fares/ticketing, an increased proportion of PT trips will involve modal or route transfers, thus placing increased importance on high standards of integration and the associated infrastructure	• Infrastructure-related policies to better integrate services and to improve users' transfer experience include (as outlined in PTNP): ○ Train stations, bus stops and ferry terminals – improved amenities (weather protection, seats), customer facilities and passenger information ○ Interchanges (transfer points) – similar to stations, etc ○ Park & ride, kiss & ride facilities at stations, etc (all PT modes).	•
1.6 Other Service Quality Aspects	• The annual NZ Customer Satisfaction Surveys show that AKL's PT services are ranked poorly by users (all PT modes) in terms of overall service quality and overall value for money: individual attributes in which they ranked poorly included safety and security, both at stops and during the trip (refer Tables 4.1 – 4.3). Arguably, there is a widespread perception that AKL's PT services are only used as a 'mode of last resort'.	• Policies to improve perceptions and attitudes towards the use of PT seem likely to require a mix of improvements to services and infrastructure (as above), improved passenger information (real-time, etc) and enhanced marketing over an extended period.	• Further detailed market research and its application required.
1.7 Fare Levels	• AKL's current PT fares average (on a per passenger km basis) around double those in the Australian cities and around 50% higher than those in the USA/Canadian cities (Table 6.1, item C1; Fig 5.2/5.3). • The annual NZ Customer Satisfaction Surveys indicate that AKL bus users consider the services worse value for money than bus users in the other 13 NZ regions.	• These findings suggest that any policy to raise AKL's overall PT fares substantially should be approached with great caution, unless and until significant improvements in service quality have been achieved. • However, there may be scope for greater off-peak/weekend fare discounts, recognising the lower costs and higher demand elasticities associated with off-peak travel (refer also item 2.2).	• There is clearly a conflict here with financial pressures to increase the cost recovery performance of AKL's PT system.
1.8 Fare and	• AKL is one of the few comparator cities that does not have an	• Current AKL policy proposals to introduce an integrated	• Consistent with ARTA/AT

Ticketing Integration	integrated, multi-modal fares/ticketing system catering for all (or the great majority) of PT trips. Relative to the other cities, the AKL fares/ticketing system is difficult to understand, is seen as unattractive to occasional or non-users, and is a significant deterrent to patronage. In practical terms, the lack of fares/ticketing integration would prevent the full implementation of AKL's proposed network and service strategy (item 1.1).	fares and ticketing system are supported. Such a system would involve zonal-based fares, allowing 'free transfers' between modes and vehicles within defined zones (and time periods), and using contactless smartcard technology. • In setting fares within this system, particular attention should be paid to: – setting fares so as to not discourage shorter-distance trips; – providing effective discounts for off-peak trips.	proposals. Broadly similar systems have been or are being adopted in most developed world cities that are regarded as providing successful (and well patronised) PT systems.
1.9 Marketing, Branding and Passenger Information	• PT systems that are generally regarded internationally as 'successful' (in patronage and other terms) are usually designed, operated, presented and marketed as a single integrated system (even though their operations may be contracted out to multiple operators). The AKL system still falls short of this fully integrated system in terms of its marketing and passenger information (eg its diverse vehicle liveries and branding).	• All marketing, branding and passenger information efforts should present AKL's PT services first and foremost as an integrated system (any operator-specific elements to be secondary). • The presentation of the system should emphasise service type rather than mode, consistent with the strategic planning service categories (RTN, QTN, LCN). • High priority should be given to extend real time information for users (at stops, via website and mobile phones, etc).	•
2. MULTI-MODAL TRANSPORT POLICY ASPECTS			
2.1 Transport Investment Policies and Funding	• As noted earlier (section 1.3), relative travel speeds by car and PT in different cities have a strong influence on the PT mode share. • Over the last 5-10 years, the evidence would indicate very little change in the relative travel speeds in the AKL region in general, although there are exceptions in some corridors (eg the Northern Busway). • While investment in AKL's PT system (particularly rail) has increased considerably in this period (with positive results in terms of patronage), investment in the region's roading system has also increased, and is projected to continue over the next 10 years (at least). In general, this would be expected to at least retain, and possibly increase, the advantages of private car in preference to PT use, and hence work against other policies to increase PT mode share. • The strength of this effect may be reduced in the AKL case because a large proportion of the roading expenditures are on schemes in the outer parts of the region and/or non-	• To minimise any adverse impacts on the PT market share, ARLTS Policy 6 (Additional Road Capacity) would be supported: *"Selectively increase the capacity of the road network where alternative management options (including the use of PT) are not sufficient to address growth in travel demand."*	•

	radial routes, where PT accounts for only minor market shares.		
2.2 Multi-modal Pricing and Cost Recovery Policies	• Just as PT mode share is sensitive to relative travel speeds by car and PT (above), it is also sensitive to relative travel costs for car and PT use. • Despite this, no in-depth studies have been undertaken for NZ metropolitan areas (over the last 20 years) into the optimum, integrated pricing for both PT (through fares) and car use (through parking and various forms of road use charges).	• An integrated pricing study is proposed for AKL. Such a study would take account of: – the marginal private and social costs of car and PT use in AKL (by peak/off-peak, PT mode, etc) – the direct and cross price elasticities of demand for each mode – the 'decongestion' and investment implications of alternative pricing policies – the optimum pricing for PT under current road pricing policies and optimum road pricing policies – the overall economic and financial implications of alternative policies.	• Such a study may lead to changes in charges for car users; and should in any event provide a sound foundation for PT fare policies consistent with the policies adopted for car user charges ('second best' pricing).
2.3 Parking Supply and Pricing Policies	• The international evidence indicates that the PT mode share is sensitive to the amount of parking available and its pricing: this is particularly the case for travel to/from the CBD. • The availability of parking in AKL CBD is high by international standards, considerably higher (in terms of parking spaces/ CBD employee) than the average levels in Australia, USA and Canadian cities (refer BNK, p 48, 85).	• The ARLTS recognises the important role of parking supply and pricing policies *"in encouraging a shift in travel behaviour towards PT and active modes as an alternative to single occupant vehicle use*." ARLTS policy 2.3 in particular *("Manage the location, pricing and availability of parking so that it is consistent with road capacity and growth centre objectives"*) should thus support the retention/increase of PT mode share for trips where road capacity is limited and good PT services are available.	• We are not aware what steps are being taken in practice to implement ARLTS Policy 2.3 in particular.
2.4 Road Space Priority Policies	• It was noted above (items 1.3, 1.4) that: ○ PT travel speeds and reliability of services are key features affecting the attractiveness of PT use ○ AKL's average PT travel speeds (relative to car) are poor relative to other cities ○ AKL's bus service reliability appears to be relatively poor (based on user perceptions). • The great majority of AKL's PT travel is undertaken on buses, running in mixed traffic on the road system. • Over the last 10-15 years, a considerable number of bus priority schemes (mostly with-flow bus lanes) have been implemented in AKL: these have had some success in improving bus travel speeds and reliability, and in some cases significantly increasing patronage. • This program needs to be continued and extended, so as to	• The continuation/strengthening of policies to provide on-road priorities for bus services over general traffic is supported, where this will contribute to significant bus travel time savings and/or reliability improvements. • Innovative types of priority measures should be explored where these can provide the most cost-effective solutions eg.: – with-flow bus lanes – contra-flow bus lanes – bus gates – bus advance signals – traffic signal pre-exemption.	• Such policies will be particularly important for the QTN, in order for these services to provide a competitive alternative to private car use.

	improve the attractiveness of bus services relative to car use.		
3. LAND USE ASPECTS AND LAND USE/TRANSPORT INTEGRATION			
3.1 Population and Employment Densities	• AKL population densities are low relative to other developed-world metropolitan areas, and are relatively 'flat' across the whole area: o Overall AKL urban area (resident population) densities are higher than Aust/USA average figures, lower than Canadian and European averages. o AKL CBD densities are lower than the averages for all other regions (Aust, USA, Canada, Europe), while inner area densities are on a par with Australian cities, well below the averages for all other regions. • Broadly similar patterns are found with AKL employment densities: o AKL CBD employment densities are the lowest among the 49 cities studied, well below the averages for cities in all other regions (Aust, USA, Canada, Europe, Asia). o AKL's inner area employment densities are similarly well below the averages for cities in all the other regions. o The proportion of AKL's total regional jobs located in the CBD (c. 15%) is higher than the USA city average (10.5%), on a par with the Australian average (14.5%) and well below the Canadian, European and Asia averages. • Such relatively 'flat' population and employment profiles and relatively weak CBD areas are characteristic of cities that have developed largely in the automobile era: cities in NZ, Australia, western Canada and western USA mostly have similar characteristics. Both the overall density profiles of such cities and their relative lack of more intensively-developed nodes or corridors (refer below) make then hard to serve effectively by PT services, hence contributing to the dominance of the car and to low PT mode shares.	• Policies which limit the absolute space of the total urban area (eg involving urban growth boundaries), combined with land use transport integration within the urban area (see item 3.2 below) should contribute to reduced car dependence and higher PT mode shares.	•
3.2 Urban Development Patterns and Land Use/	• Transport policies and land use policies are inextricably inter-related, inasmuch as changes in land use policies affect transport choice and changes in transport policies affect land use. Certainly until recently, Auckland's transport policies	• The ideal (integrated) development pattern that will complement transport policies of reduced car dependence, greater use of 'alternative' modes and increased efficiency of the overall transport system adopts the 'nodes and	•

Transport Integration	and land use policies have been developed largely separately, without taking these inter-relationships into account and developing integrated policies. Such integration would be essential to any goal of reducing car dependence and would contribute to a more cost-effective PT system catering for an increased share of regional travel. • While the AKL authorities have increasingly moved over recent years towards the adoption of more integrated land use/transport policies, including the designation of selected growth centres (refer next column), to date these policies have had only limited success, eg (refer ARLTS 3.6): – very limited residential intensification (apart from the CBD) – retail activity becoming more dispersed, rather than based in centres – low density of development in major centres, which does not support the provision of good PT services – community facilities (health, education, etc) have not generally been established in growth centres.	corridors' approach: ○ A series of nodes are designated for high-density development, including major employment and education establishments, retail and community facilities, etc ('urban villages') ○ These nodes are linked by high quality , high capacity rapid transit services (rail-based or bus-based) ○ The corridors linking the major nodes are designated for medium density, mixed use (residential, employment) developments. • This is essentially the integrated land use/transport development pattern at the heart of the AKL Regional Growth Strategy and Regional Policy Statement and supported through the Regional Land Transport Strategy: *"Their spatial vision focuses on accommodating growth primarily in a network of highly accessible centres, from the neighbourhood level up to the regional CBD. Concentrating growth and high trip generating activities in particular, in centres and corridors linked by high frequency public transport corridors and good walking and cycling connections where appropriate, allows people to access opportunities with less need for travel, and improves the feasibility of public transport"* (ARLTS, 3.6). • If implemented effectively and consistently over an extended period of time, the combined package of RGS/ RPS/RLTS policies should certainly assist in increasing the market share and cost-effectiveness of the AKL PT system: it is less clear that the policies would reduce the level of PT funding support needed. But, based on experience to date in AKL and in other cities pursuing similar policies, we have two major caveats: ○ Whether these policies will be implemented effectively and consistently over an extended timescale ○ Even if so, the impacts of the policies on the PT system (in terms of patronage etc) would develop only slowly and progressively over an extended period of years.	
4 PT COST-EFFICIENCY ASPECTS			
4.1 Overview	• By 'cost-efficiency' in the provision of PT services, we refer to	•	•

	the ratio between the (gross) costs of service provided and the quantum of services: the primary measure used is costs per in-service vehicle km (Table 6.1, section E). • Note that the costs covered in this appraisal cover working expenses only, and exclude all capital charges that are not covered through operator contracts. • The following material is outline only, for rail and bus modes: further discussion is provided in Section 6.3.5.		
4.2 Rail Mode	• The current AKL cost rate is towards the top of the range of the seven Australasian cities. It is: – exceeded only by ADL and SYD – around 50% higher than the rates for BNE, PER and MEL – around 80% higher than the rate for WGN. • At this stage three specific factors are suggested as contributing to the relatively high AKL rate: – diseconomies of small scale system – costs higher for diesel than electric operation – additional costs associated with system expansion/ transition.	• Further research/analysis would be required to: – 'benchmark' the AKL rail system in more detail against the metro rail systems in WGN and the five Australian cities – quantify the impacts of specific factors influencing costs (as listed) – define a set of good/best practice cost rates that should be achievable for the AKL system in the medium-term, together with a plan of action to achieve these rates.	• Refer Section 6.3.5 for further discussion.
4.3 Bus Mode	• The current AKL cost rate is around the middle of the range for the seven Aust/NZ cities, but significantly above the corresponding rates for diesel bus services in WGN (and other NZ urban centres). • Without having the benefit of a detailed benchmarking appraisal, our judgement is that such an appraisal may identify that the AKL unit costs would need to reduce by around 20%-30% to achieve good/best practice levels. • We consider that key factors constraining the current cost-efficiency performance of AKL's bus services are: – the current regulatory model, including the 'two-tier' system of commercial and contracted services; and – the presence of a dominant operator (NZ Bus) in the AKL market, which (together with the regulatory model) acts as a constraint on competition for contracts.	• Issues relating to the regulatory model adopted for bus services in NZ are currently being investigated by MoT (with other parties) under the Public Transport Operating Model (PTOM) project. • As part of that project (or otherwise separately), there would appear to be merits in undertaking a detailed cost efficiency benchmarking exercise covering bus services in the main NZ centres. This would both identify/explain current cost differences between centres and provide the basis for establishing appropriate benchmarks for each centre (for potential applciation in the PTOM project).	• Refer Section 6.3.5 for further discussion.
5. PT PLANNING AND REGULATORY ARRANGEMENTS			
5.1 PT System	• Relative to most of the comparator cities assessed, the AKL	• The public sector PT authority (now AT) should have	• This is the approach adopted in

Integration	PT system exhibits a low level of 'integration', in terms of modes, routes, fares/ticketing, etc. The international evidence indicates that this negatively impacts on patronage and in some cases on the cost efficiency of service provision.	sufficient powers (through appropriate regulation, etc) to achieve effective system integration (from the customer perspective) on all aspects, including: – service design and service standards – fares and ticketing – interchanges and infrastructure facilities – marketing, branding and passenger information.	most of the cities examined in the project. • Also, many other cities internationally which are regarded as having successful PT systems have adopted strong 'integration' approaches.
5.2 PT Network and Service Planning	• Currently, with the 'two-tier' regulatory system (commercial and contracted services), there are difficulties for the PT authority (AT) in implementing the optimum network and service designs. This results in a system which is sub-optimum from the user viewpoint (hence adversely affecting patronage) and the cost viewpoint (adversely impacting on costs). These deficiencies appear likely to increase under AT's proposed integrated/layered network plan.	• The public sector PT authority (now AT) should take the major role in network and service planning and development – with the operators being consulted but playing a secondary role. Refer also item 5.1 above. • This issue is being currently addressed at national level, through the PTOM project being run by MoT.	• This is the approach adopted in most of the cities examined in the project, and also for many European cities which are generally regarded as having successful PT systems.
5.3 Operator Contracting Funding Model	• Currently, most bus/ferry contracts are funded on a 'net cost' model (operators take responsibility for fare revenues) – unlike for the rail contract, which is on a 'gross' cost basis. This results in significant difficulties and delays for the PT authority in implementing desired service changes, fare changes, etc, and may particularly be an impediment to achieving greater system integration. It also results in operators liable to experience windfall gains and losses resulting from actions of the authority.	• Consistent with the above moves towards enhanced system integration and the authority taking the leading role in service planning, bus/ferry operator contracts should move to funding on a gross cost basis. This should be accompanied by a system of operator incentives relating to their quality of service delivery, covering aspects within their direct influence (reliability, vehicle presentation, etc).	• This proposal is consistent with AT's Procurement Strategy and changes to contacting models adopted in other major NZ centres within the last few years (eg Canterbury, Waikato).

Note: (1) This table draws on material from Bachels, Newman and Kenworthy (1999). Indicators of Urban Transport Efficiency in New Zealand's Main Cities: An International Comparison of Transport, Land Use and Economic Indicators. Specific references to this source in the table are denoted 'BNK'.

6.3 Further Research Issues and Priorities

As noted in the previous section, it was never envisaged that this project would provide 'all the answers': rather it was seen as an initial appraisal across a wide range of performance aspects, which would provide high-level results and identify those aspects for which more detailed research/analysis would be most cost-effective. An important output of the project was to be "recommendations on priority areas for further performance appraisal/benchmarking work". This section therefore provides comments and recommendations on priorities for further research and analysis – within the overall context of developing a more effective and efficient PT system for AKL.

6.3.1 Comparator cities

In selection of comparator cities for further benchmarking appraisals, a 'horses-for-courses' approach will be appropriate: for more detailed investigations, it is likely to be appropriate to choose different groups of comparators to examine different issues.

In general, we would suggest that:

- The use of Australian cities as comparators is preferred to the use of Canadian or USA cities- in part because the Australian cities are more accessible, in part because they have greater similarity in many ways (eg all have urban (heavy) rail systems), and they tend to collect and describe data in ways that are easily compared with each other.
- However, if a 'benchmarking circle' were to be established, the inclusion of some of the Canadian cities as well as the Australian cities should be considered.
- It may also be appropriate to ask "with what cities is Auckland competing for stature in the Pacific region?" On this score, the port cities of HON, VAN and SEA are important peers. All also have strong geographical similarities to AKL, notably their complex bays and promontories and their topographical barriers. Unlike Australian cities, they are also located in volcanic regions where soil quality and reliable rainfall support intense agriculture and forestry, which gives their economies and port functions a similar cast.
- Within the 5 Australian cities covered, the 3 medium size cities (BNE, PER, ADL) are, in most regards the more useful comparators for AKL. However, the geographical situation of AKL is most similar to that of SYD, so some comparisons (eg regarding passenger ferries crossing harbours) will inevitably focus there.
- Within NZ, it would be useful to retain WGN as a comparator city – while the 2 cities are very different in many ways, their PT systems have many similarities (eg in regard to employment conditions, wage rates, vehicle standards, input costs, market and economic factors) which are useful for comparative analysis purposes.

A substantial proportion of any further investigations (eg relating to cost efficiency) are likely to be undertaken on a modal basis: we comment further below on the use of particular comparator cities for such modal investigations, while also noting that the most successful North American comparators have a commitment to strong intermodal planning.

6.3.2 Passenger market

The work in this project has drawn together a useful set of base data on PT usage rates and mode shares for AKL relative to various comparator cities. This gives a fairly clear picture of current AKL performance in comparative terms: this would be expected to change only relatively slowly over time.

This base data set would usefully be updated periodically, on an annual basis and/or as new data become available (eg 2011 census results).

One suggested priority task is a further appraisal of PT usage rates. The rates given in this report are expressed as passenger boardings pa/service area population. It may well be that one factor underlying AKL's relatively low usage rate on this measure is the lack of integrated ticketing, and that the introduction of an integrated ticketing system in AKL would result in a significant (maybe up to

10%) increase in PT boardings, but without a corresponding increase in PT trips (origin-destination). Given this, we suggest some investigation be undertaken to estimate PT trip rates in the comparator cities in terms of O-D (linked) trip rates as well as the current boarding (unlinked) trip rates.

6.3.3 PT services – network design, service types and service levels

This project has not examined network design and service level aspects in any detail. However, we recognise that these are critical aspects affecting the attractiveness of services to users and hence the patronage and revenues, and also affecting the costs of service provision.

Given the importance of this topic and the extent of work likely to be undertaken in AKL in the next few years on network restructuring and service redesign, this aspect may well warrant a close review by a group of international (including NZ) experts, preferably structured in such a way so as to obtain a range of views from a range of independent experts.

Such a review should start from a strategic, region-wide perspective, considering the desirable structure and characteristics of the RTN/QTN networks on a mode-independent basis. At the more tactical level, it should then develop principles and guidelines for the design of QTN and LCN (generally bus-based) services at the more local level, including aspects of integration/coordination with the regional (RTN) networks.

6.3.4 PT services – quality and delivery aspects

Data on PT service quality may potentially be obtained from both 'objective' sources (eg measurement of levels of on-time running) and 'subjective' sources (eg passenger ratings of service quality features).

The only comparative data (across different cities) that we have been able to obtain for this project was from the annual Customer Satisfaction Surveys across all NZ regions (survey questions specified by NZTA). In our view, these surveys are a useful source of service quality data, particularly given the lack of alternatives. However, we suggest that the survey methodology used should be reviewed in detail, so as to ensure greater consistency across regions in survey design, delivery methods, sampling basis and sizes, etc. (This would seem to be primarily a task for NZTA, in conjunction with the RCs.) Subject to the outcome of this review, we suggest that NZTA should publish the full results annually, for use by the RCs (and other parties) as required.

In terms of 'objective' evidence on comparative service quality and delivery performance, it would be desirable if comparable objective data were available for a group of comparator cities in NZ and/or Australia (and possibly also other countries). To date this has not been the case: the limited data that are available are: (i) not reliable (eg obtained from operator self-reporting); and/or (ii) not on a comparable basis across different cities (eg using different definitions of on-time running).

We recommend that AT should investigate possible avenues to obtain such comparable objective data, including:

- For **bus**, one possible source is through the Australian National Bus Performance Benchmarking Group (NBPBG). This recently-formed group covers all the Australian states (capital cities), and discussions on membership have also been held with the 'big 3' NZ regional councils (and NZTA). This may provide a useful avenue to obtain comparable data for urban bus services across the cities involved. Additionally, or alternatively, service quality data for all NZ regional centres may be obtainable through enhanced NZTA monitoring.
- For **rail**, investigation of the availability of performance data through the Australasian Railway Association and/or rail benchmarking consultants.

Initially, to the extent possible, it would be highly desirable that any such performance data are collected/reported on a consistent basis across all urban PT modes: this may be a challenging task, as typically different performance measures and standards are used for rail-based and bus-based nodes. From the AT perspective, it would be desirable for performance to be assessed/reported in a

manner corresponding to the various levels in the network hierarchy (RTN/QTN/LCN) rather than by mode deployed on this network.

6.3.5 PT efficiency and effectiveness performance

This heading covers all the aspects included in Chapter 5. The data provided there have mostly been assembled from two main sources:

- An earlier project undertaken for MoT (by IWA), to collect data relating to metropolitan PT systems for 2008/09 in AKL, WGN and the 5 main Australian state capital cities (SYD, MEL, BNE, PER, ADL)[25].
- A survey/data collection undertaken for this project of the metropolitan PT systems in 2008 for 4 Canadian cities (OTT, VAN, EDM, CAL) and 3 USA cities (HON, POR, SEA).

It would be a considerable task for AT to update this information on an annual basis through a similar data collection/analysis exercise with the authorities concerned. In the medium term, we see considerable merit in such an annual exercise being undertaken through a benchmarking group comprising these authorities. As noted earlier, from the AKL perspective, we consider that the cities that should most usefully be included in such a group are BNE, PER, ADL and WGN.

In the absence of such a benchmarking group, we suggest relatively low priority should be given by AT to a comprehensive annual updating of all aspects covered in Chapter 5. Rather, we suggest a more selective approach be taken, primarily involving more in-depth exploration of performance relativities and their causes in specified areas, as follows.

Based on the Chapter 5 findings in this report, we recommend that the first priority in terms of in-depth research and analysis be given to the cost efficiency area, ie examining the level of working expenses involved in providing a given quantum of services. The following comments relating to this area are set out on a modal basis.

Rail mode

The aggregate data on working expenses/vehicle km across the (heavy) rail systems analysed show that AKL's cost rate is one of the highest in Australasia (exceeded only be SYD and ADL), and some 50%-60% higher than the corresponding WGN rate. However, the AKL figures need to be considered in the context that the system is very much in a transition stage, particularly in relation to electrification and the introduction of new rollingstock.

We understand that recent work for MoT (with ARTA and GW involvement) has been undertaken to develop 10-year financial models (opex, capex and revenues) for both the AKL and WGN urban rail systems. These opex models have been based on 'bottom-up' analyses having regard to the current costs for the two systems, but not making use of wider (Australian/international) costing evidence.

We also understand that KiwiRail (KRG) is participating in an urban rail benchmarking exercise being undertaken with the Australian urban rail systems (by LEK Consulting). We are unclear whether this will include the AKL system, or only the WGN system; whether its results will be made available to AT; and how useful they might be as part of efforts to establish well-supported efficient cost benchmarks for the AKL rail system.

At this stage, we suggest that low priority be given to any further research on the cost efficiency aspects of the AKL rail system; but rather that AT should consider whether any further work might be needed, in the light of the MoT cost modelling work and the possible availability of the LEK Consulting benchmarking work.

Bus mode

The work to date to compare working expenses/vehicle km across the various bus systems analysed highlights that AKL cost rate is significantly above the corresponding rate for WGN. Other, more detailed, work undertaken in NZ on bus service contract rates indicates that AKL's cost rates (on a

[25] NZ Ministry of Transport/Ian Wallis Associates Ltd. Metropolitan Public Transport Performance Project – Final Report. February(?) 2011.

standardised basis) are around 30% higher than those in WGN and up to 40%-50% higher than those in CHC and DUN: it is unclear to what extent these higher rates reflect higher input costs and/or higher profit margins.

Differences of this order suggest that a high priority should be given to more in-depth analyses of AKL bus service cost efficiency levels. For this purpose, we suggest any analyses should focus on comparing AKL's services with bus services in other larger NZ centres, rather than services in Australia or internationally. Hence consideration should be given to a cost benchmarking exercise across bus operations in the larger NZ centres: this exercise could focus on contract prices (based on data held by the RCs) and/or operator cost details (this would require data provision by the operators).

We are aware that, as part of the development/calibration of the proposed PT Operating Model (PTOM), MoT with the major RCs are considering the collection of 'benchmarking' cost data to be used as the basis for setting future bus contract rates. We are unclear as to what data sources the parties propose to use for this purpose.

Rather than proposing any separate benchmarking work at this stage, we recommend that AT should review what outputs will be provided from the PTOM project in terms of efficient operating costs relevant to bus services in AKL: only if these appear to be inadequate, should further consideration then be given to a separate benchmarking exercise.

Ferry mode

We recommend that low priority be given to any more detailed analyses on the cost efficiency of AKL's ferry services, given that:

- The level of subsidy (per passenger km) going to AKL's ferry services is very much lower than the levels to rail and bus services.
- Ferry services are particularly difficult to 'benchmark', given the wide variety of vessel types/ capacities used and the operating conditions encountered on ferry services both in AKL and in other centres.

APPENDIX A

METROPOLITAN AREA PROFILES

New Zealand

A1 Auckland

A2 Wellington

Australia

A3 Brisbane

A4 Perth

A5 Adelaide

A6 Melbourne

A7 Sydney

Canada

A8 Edmonton

A9 Ottawa

A10 Calgary

A11 Vancouver

USA

A12 Honolulu

A13 Portland

A14 Seattle

TABLE A1: METROPOLITAN AREA PROFILE – AUCKLAND

AUCKLAND Metro area	
Aspect	**Summary**
1. Geographic setting/layout	The Auckland urban area lies between the Hauraki Gulf to the east, the Hunua Ranges to the south-east, the Manukau Harbour to the south-west and the Waitakere Ranges to the west/north-west. The central part of the urban area, comprising the original city development, occupies a narrow isthmus between the Manukau Harbour (Tasman Sea) and the Waitakere Harbour (Pacific Ocean). Auckland's geographic situation had (and continues to have) a major influence on its transport system. Its development has also been influenced by its location on a series of extinct volcanic cones: these have generally been protected from urban development.
2. Urban development profile	Prior to the start of European settlement (1832), the Maori population in the area was some 20,000 people. In the early years of European development, Auckland became the capital city of NZ (1841-1865). The city grew rapidly in the early years of the 20th century, with the development being shaped by tram and railway lines. Subsequently, the motor vehicle became dominant, and major roads have become both defining and directing features of the urban landscape. They also allowed further massive expansion, that resulted in the growth of adjacent urban areas like the North Shore (especially after opening of the Auckland Harbour Bridge) and Manukau City. Most of the Auckland urban area is dominated by a very suburban style of building, giving the city a relatively low population density: this has made the efficient provision of PT services more difficult than otherwise.
3. Population/demographics (densities)	The urban area population is estimated at 1.35M (2010), resulting in an urban density of about 1250 people/km^2. The population has grown by some 55% over the last 20 years, an average growth rate of 2.2% pa. Auckland is notable for having the largest Polynesian population of any city in the world, and also has substantial Asian and Maori populations.
4. Employment centres—mono-centric v poly-centric etc.	Auckland CBD is the largest employment centre in the metropolitan area, by a considerable margin, with about 13% of the area's employment (although this proportion has gradually diminished over time). Auckland CBD contains the head offices of most of the largest NZ companies and also branch offices of many major international corporations. The largest commercial and industrial areas are in the south-east of Auckland city and the western parts of Manukau City, mostly adjacent to the Manukau Harbour or the Tamaki River estuary.
5. Income/car ownership	Median incomes in the AKL region are higher than most other parts of NZ. Car ownership is also relatively high, reflecting both income and the deficiencies of alternative modes of travel.
6. Road system development—extent of motorways etc.	Some researchers have commented that, over the last 50 years, Auckland has engaged in some of the most pro-automobile transport polices anywhere in the world. State Highway 1, to motorway standard, runs north-south right through the metropolitan area, and includes the Auckland Harbour Bridge. The other main motorway is the North-western Motorway (SH16), which joins SH1 at 'Spaghetti Junction', adjacent to the CBD. SH20, the Western Ring Road round the main metropolitan area, is being progressively developed.

7. Motoring costs, parking, other traffic restraints etc	Motoring costs in Auckland are on a par with those for other metropolitan areas in NZ and Australasia, with petrol prices in particular being similar. There are claims that parking charges in Auckland CBD are among the highest in the 'western' world, although the evidence on this is not conclusive. There is only one toll road in the region (a new section of SH1, on the northern outskirts of the metropolitan area). Studies have been undertaken into the feasibility of a more comprehensive system of road use charging, but it seems unlikely that such a scheme will be implemented within the next 5-10 years.
8. Active modes – roles and popularity	Auckland has been described as a very pedestrian- and cyclist-unfriendly city, although efforts have been made in recent years to address this. In the 2006 Census, only 4.9% of journey-to-work were made by walking, 1.0% by cycle: these proportions were in both cases, about half the corresponding figures for Wellington, which is less favourable to both modes in terms of topography and climate.
9. PT system overview	Auckland has the lowest PT use of all Australasian cities with populations exceeding 1.0M, on all three measures examined: (i) PT boardings/capita – less than 75% of the next lowest figure; (ii) PT passengers km/capita – less than 60% of the next lowest figure; and (iii) PT mode share for journey-to-work – 7.7%, less than 90% of the next lowest figure. On a per capita basis, Auckland's PT patronage fell more-or-less continuously through the 1960s, '70s and '80s, then appearing to 'bottom out' at around 35 boardings/capita in the mid 1990s: since then, it has increased by around one-third, to reach 45 boardings/capita in 2009/10. Bus has long been the dominant PT mode in Auckland. In 2009/10, it accounted for 78% of total PT boardings and 64% of passenger km; suburban rail accounted for 14% of boardings and 26% of passenger km; while ferry accounted for 8% of boardings and 10% of passenger km.
10. Train system	Auckland's rail system comprises three main lines, accounting for 93 route km (176 track km), and converging on the Britomart (CBD) terminal. The rail system has seen major increases in patronage over the last 15-20 years: from a low point of just over 1.0M boardings in 1992/ 93, patronage increased to over 2.0M in 1995/96, over 3.0M in 2003/04 and since then to some 8.5M in 2009/10. These increases reflect in large measure some substantial investments in upgrading and expanding the system, including: moving the city terminus from the edge of the CBD to nearer its heart (Britomart); double-tracking of the western line; re-opening the Onehunga branch; refurbishments of rollingstock; and increases of off-peak and weekend services. Major investment projects, which are committed, but still to be completed, include electrification of the system and acquisition of new electrified rollingstock.
11. Tram/LRT system	Auckland does not have any tram/LRT services as part of its regular PT system. Two transit-oriented tram services are in operation (one of these opened in mid-2011) and some preliminary planning has been undertaken for a 'regular' tram/LRT service in the CBD area.
12. Bus system	Bus is the dominant PT mode in Auckland, with a fleet of some 1030 buses operating some 40.2M in-service km pa. All buses are diesel-powered, almost all of 'standard' size. A number of initiatives have been taken in recent years to improve bus service levels, speeds and service quality. These include: extension of bus priority measures; introduction of the Northern Busway (Auckland's first BRT route) and associated services;

	opening of the Central Connector scheme; and provision of real time information. Area/sector service reviews are also being progressively undertaken, in part to overcome service deficiencies associated with having different operators within the same area.
13. Ferries	Ferry services are a significant mode in Auckland, accounting for 8% of all PT boardings and 10% of passenger km. Popular routes include those from the North Shore to the CBD, which avoid the severe congestion on the Harbour Bridge (services from Devonport, Bayswater, Birkenhead/Northcote and Stanley Bay). Ferry patronage has grown steadily from a low point in 1991/91 (0.89Mpa) to reach 4.53Mpa in 2009/10. Current plans are to develop the existing services further, through increasing service levels, and to open up new routes once new wharves are constructed.
14. Fares and ticketing system/integration	Auckland's fares/ticketing system is in a state of transition. Hitherto, there have been separate tickets (generally paper or magnetic stripe) for each operator, not transferable between modes/operators and in some cases not between services of a single operator: while some stored value tickets exist, again they are confined to the services of a single operator. The PT authority (Auckland Transport) has determined to move to a zonal fares policy, with fully-integrated fares and associated smartcard (stored value) ticketing across all operators and modes. A contract has been let for this (to Thales) and implementation is scheduled for 2012.
15. Institutions and organisational arrangements	The main policy, planning and funding authority for all PT services in the region is Auckland Transport (AT), which is a CCO of the Auckland Council. Central government, through the NZ Transport Agency, funds approximately half the total PT subsidy. The train services are provided by Veolia, under contract to AT. Most of the buses and some of the ferry services are provided by operators under contract to AT, the remainder (accounting for about 35% of bus patronage in 2009/10) on a commercial basis by these operators. The operators own the vehicles/vessels and the depot etc facilities involved in their operations, while on-street bus infrastructure (stops, shelters, etc) and some of the ferry wharves are owned by AT.
16. Regulation, procurement, asset ownership, operators	For the train services, the contract was originally awarded through competitive tender, with subsequent contract extensions being negotiated: the contract is on a gross cost basis, with various incentive payments. For the contracted bus and ferry services, contracts were awarded through competitive tendering, mostly on a net cost basis, with typical contract term of around 5 years (although many contracts have subsequently been extended). The regulatory model applied to bus and ferry services in NZ is currently under review, and a new 'Public Transport Operating Model' (PTOM) is being proposed and is shortly to be trialled.

TABLE A2: METROPOLITAN AREA PROFILE – WELLINGTON

WELLINGTON Metro area	
Aspect	**Summary**
1. Geographic setting/layout	Wellington is situated at the south-western tip of the North Island, close to Cook Strait. It is the southern-most capital city in the world. Its area of urban development is constrained by its large harbour and several ranges of hills. Due to its exposure to the winds from Cook Strait, the city is widely known as 'Windy Wellington'.
2. Urban development profile	The original city has been developed from the mid 19th century. The early development, on flat land alongside the harbour, and constrained by the hills, was at relatively high densities. The early suburbs were served by tram and motor-bus. The introduction of an urban railway system in the late 19th/early 20th century saw urban development spread along the valleys served by the railway, at much lower densities. Over the last 60 years, there has been extensive infill development and low density suburban expansion into areas difficult to serve by public transport.
3. Population/demographics (densities)	Wellington region's population is approximately 460,000 (170,000 dwellings), with almost 200,000 of these (70,000 dwellings) living in the Wellington City area.
4. Employment centres—mono-centric v poly-centric etc.	Wellington has a strong CBD, which is the dominant employment centre in the region (c. 70,000 employees).
5. Income/car ownership	Wellington's average income is well above the New Zealand average and reflects the higher proportion of people with tertiary qualifications. Car ownership in the region is below the NZ average: about 10% of households do not have regular access to a motor vehicle, while close to 50% have access to two or more vehicles.
6. Road system development—extent of motorways etc.	Given its topographical constraints, Wellington has only two major roads (and two railways) connecting it with the rest of NZ. Sections of these roads are of motorway/expressway standard, whereas other sections remain as 2-lane roads, particularly where major topographical constraints exist. There are several short road tunnels in the Wellington City area. Current plans are to improve the major route to the north (State Highway 1) to dual carriageway standards throughout its length in the region, providing improved connections within the next 10 years with the airport, the port and other parts of the North Island.
7. Motoring costs, parking, other traffic restraints etc	Commuter parking in Wellington CBD is relatively expensive for cities of its size in the region, whereas outside the CBD parking is cheap, generally free. The extent of traffic congestion and the length of the peak period is moderate (considerably less than Auckland).
8. Active modes—roles and popularity	Due to the compact nature of the city, walking is a popular mode for commuter travel, especially between the inner suburbs and the Wellington CBD. Cycling accounts for a relatively small mode share, as both the topography (hills) and the weather (cold, windy) act as impediments. However, cycling is a popular recreational activity (both on and off-road).
9. PT system overview	The region's PT system comprises suburban (electric) trains, buses (diesel and trolley), ferries and a single cable car route. Wellington

	has the highest rate of PT usage of all NZ cities (c. 80 boardings/ capita pa), a level that exceeds the rates in the much larger metropolitan areas of Brisbane, Perth and Adelaide. For travel to work, the Wellington region-wide PT mode share was 17%, but about 35% for travel to the CBD (2006 census statistics).
10. Train system	Wellington's electrified suburban passenger rail system comprises three main lines, which converge on the Wellington Railway Station. The rail system has 49 stations and carries approximately 11 million passenger boardings per year, Over recent years, the system has been subject to an extensive programme of 'catch-up' investment: this includes the introduction of new EMUs, associated upgrading of station platforms and electrical overhead systems, some increases in track capacity to ease/reduce bottlenecks, and a short extension of the electrified network to serve an expanding commuter area.
11. Tram/LRT system	Wellington's original tram system was abandoned some years(?) ago, in favour of trolley and diesel buses. A number of studies have been done over the last 20 years into a tourist-oriented tram service along the waterfront, but the costs have been too high to justify the scheme on a commercial basis. A study is currently in progress to re-examine the feasibility of a light rail route through the CBD, as a contributor to improving PT services on Wellington City's main north-south corridor.
12. Bus system	The region has an extensive network of bus services, operated by trolley buses (dominant in the Wellington city area) and diesel buses (elsewhere in the region). Buses account for some 68% of all PT boardings and 39% of all PT passenger km in the region. Two main bus operators account for the great majority of the bus services in the region: NZ Bus is the largest operator (formed by amalgamation of several public bus companies in the 1990s, owned previously by the Stagecoach Group and currently by Infratil); and Mana Coach Services, a private operator serving the northern suburbs of Wellington City and other parts of Wellington's northern corridor.
13. Ferries	One ferry service operates across the Wellington harbour, linking Days Bay (Eastbourne) with Wellington CBD, with some services running via Seatoun. The service is operated by East by West (private operator), and uses two vessels. Inter-island ferries also operate across the Cook Strait, between Wellington and Picton: these serve the long-distance and tourist market.
14. Fares and ticketing system/integration	The region's fare structure is on a 'coarse sectional' basis (locally known as zonal), essentially with any ticket being valid for only a single boarding and no 'free' transfer provision (with limited exceptions). Both bus and train fares operate under this one system, although train fares are usually cheaper than bus fares on a per kilometre basis (as fare 'zones' are generally larger in the outer areas served by trains). Both the major bus operators have their own smartcard (electronic purse) tickets, which have largely replaced single trip cash fares and 10-trip tickets. A 'true' zonal multi-modal integrated ticketing system has been under development and discussion for some years, but has not yet eventuated.

15. Institutions and organisational arrangements	The main policy, planning and funding authority for all PT services in the region is the Greater Wellington Regional Council. Central government, through the NZ Transport Agency, funds approximately half the total PT subsidy. The train services are provided by KiwiRail Group (TranzMetro division), a central government enterprise, contracted by GWRC: ownership of rail assets is split between GWRC (most of the rollingstock) and KiwiRail. The bus and ferry services are provided by private operators under contract to GWRC: these operators own the vehicles/vessels and the depot facilities involved in their operations, while on-street bus infrastructure (stops/shelters, termini, etc) is largely owned by the city councils in the region.
16. Regulation, procurement, asset ownership, operators.	Train, ferry and most bus services are operated under contract to GWRC. For the train services, the contract was negotiated, with payments on a gross cost basis. For the bus and ferry services, the contacts are awarded through a competitive tendering process: these are mostly on a net cost basis, with a typical contract term of around 5 years. In addition, a minority (c. 22% of passengers in 2009/10) of the region's bus services are operated outside the contract system, on a commercial basis: operators are able to 'notify' the services they wish to operate on this basis and the fares to be charged: the remaining services are then subject to competitive tender, on a subsidised basis.

TABLE A3: METROPOLITAN PROFILE - BRISBANE

BRISBANE Metro area	
Aspect	**Summary**
1. Geographic setting/layout	Brisbane lies on both sides of the sinuous Brisbane River, whose numerous loops create many peninsular districts with access challenges. The CBD is on one such peninsula, while many of the oldest and densest areas – including New Farm, the West End, Kangaroo Point, and the main University of Queensland campus – are similarly situated. Much of the city is hilly, leading to significant ranges to the north-west and south. Eastern suburbs line the shore of Moreton Bay, which connects through barrier islands to the Tasman Sea.
2. Urban development profile	While the city developed in the 19th and early 20th centuries, the bulk of its growth has been in the car-dominated era. Extensive low-density suburbs surround a fairly small denser core.
3. Population/demographics (densities)	Population 2.82m in 2009, including the adjacent Sunshine Coast and Gold Coast, about 2.0 million in the Brisbane SD area.
4. Employment centres—mono-centric v poly-centric etc.	Mono-centric with a compact and very intense CBD. Recently, a major effort his gone into developing high-density urban fabric within a radius of 5 km or so of the CBD. Further out, however, prevailing development form is low-density, and apart from major shopping malls there are few large employment centres. Much industrial employment is concentrated downstream of the CBD and especially on port lands around the Airport, collectively known as the Australia Trade Coast.
5. Income/car ownership	Car ownership high overall but substantially lower in inner city.
6. Road system development—extent of motorways etc.	Freeway system is extensive though not completely connected. Brisbane continues to invest in new roads, including a major tunnel under the CBD completed in 2009 and others now under construction or in development. The city's street network features an unusual number of choke-points, most obviously due to the remarkable shortage of bridges. While there are numerous bridges in and around the CBD, there is only one road bridge over the river west of the CBD, and only one (recently duplicated) to the east.
7. Motoring costs, parking, other traffic restraints etc	Strong constraints on CBD parking, and choke-points affecting car access, combine to encourage heavy use of transit and other non-car modes, especially for the peak commute to the CBD.
8. Active modes—roles and popularity	Major investment has been made in the active modes in and around the CBD. Further out accommodation of bikes is more problematic due to terrain and irregular street pattern.
9. PT system overview	PT is historically extremely CBD-oriented. Key features include an electric commuter rail system, a network of passenger ferries on the river, and the developed world's most advanced busway network.
10. Train system	Citytrain, operated by Queensland Rail, has ten lines radiating from the CBD, covering metro Brisbane and linking to the nearby Gold Goast and Sunshine Coast urban areas. Frequencies are generally every 30 minutes, somewhat better in peak periods and worse on outer rural segments.
11. Tram/LRT system	No light rail in Brisbane, though a line is under development in the nearby Gold Coast.

12. Bus system	The Brisbane Busway network comes closer to emulating a heavy-rail metro than any other in the developed world. Largely grade-separated, it contains few causes of delay and moves heavy volumes during the peak period. It features a complete busway under the CBD and a "green bridge" (PT, bikes, and peds only) into the University of Queensland, the latter delivering far better travel times than are possible by private car. Brisbane City Council runs the intensive bus network in the city. Outer suburbs covered by private operators, under the unified planning control of the South East Queensland PT authority, the TransLink Transit Authority.
13. Fares and ticketing system/integration	TransLink introduced an integrated fare system in 2004, covering the entire rail, bus, and ferry network including the adjacent Gold Coast and Sunshine Coast. Fares are based on concentric zones but all transfers are free within an allowed time window. TransLink is now in the process of introducing a contactless smart-card system.
14. Institutions and organisational arrangements	TransLink, an authority of Queensland Government, manages the fare system, develops some infrastructure, and plans and manages the operations.
15. Regulation, procurement, asset ownership, operators	Outer suburban bus systems are run by private operators, while the rail system is run by Queensland Rail and the Brisbane bus and ferry systems are under the Brisbane City Council. The system is in transition toward a more centralised model in which TransLink takes the lead role and operating companies provide service on gross-cost basis. Assets are mostly owned by operators and/or other Queensland Government entities, not TransLink.

TABLE A4: METROPOLITAN PROFILE - PERTH

Perth Metro area	
Aspect	**Summary**
1. Geographic setting/layout	Perth, the capital of Western Australia, is located on the Swan River on Australia's west coast. The city centre and the suburbs are located on the Swan Coastal Plain. The coastal suburbs have an advantageous position due to Perth's ocean-side location.
2. Urban development profile	After WW2, Perth experienced rapid suburban expansion aided by high levels of car ownership. Suburban development happened with the introduction of manufacturing industries. Many firms took advantage of cheap land to build single storey plants in suburbs to take advantage of minimal parking and traffic congestion.
3. Population/demographics (densities)	The population of the Perth PT service area (which includes the City of Mandurah) is 1.76M (2010): the area has been experiencing population growth rates of around 2%pa over recent years, assisted by rapid expansion of the mineral resources sector in WA.
4. Employment centres—mono-centric v poly-centric etc.	Perth's CBD accounts for 92,000 jobs, some 16%of the total metropolitan jobs, but is an order-of-magnitude larger than any other metropolitan centres.
5. Income/car ownership	Perth has the highest car ownership and car usage of all Australian cities. In 2006, 85.3% of the households in the Perth Statistical Division owned at least one car.
6. Road system development—extent of motorways etc.	Perth's freeway system is extensive and well developed. However it still suffers from peak-period congestion.
7. Motoring costs, parking, other traffic restraints etc	CBD parking charges are relatively high, especially in the CBD core, and include a CBD parking levy. Differential parking pricing has been used in an attempt to spread the peak demand over a longer period, thus reducing levels of peak congestion.
8. Active modes—roles and popularity	In the 2006 Census, walking accounted for only 2.7% of all journeys to work, the lowest proportion of all the Australian state capitals: this probably reflects the low development densities generally and the small proportion of the population living in or close to the CBD. Cycling accounted for 1.2% of all journeys to work, around the average for Australian state capitals. Cycling (and walking/jogging) are popular recreational activities in Perth: there are a considerable number of recreational trails and off-road paths.
9. PT system overview	Perth's PT system carried 132M passengers (boardings) in 2009/10, an average of 75/capita: this figure exceeds that in BNE/SEQ and ADL, the other Australian cities with populations of the same order. Perth's annual patronage has increased continuously over the last 20 years, with boardings/population increasing by 37% (close to 2%pa) since 1990. The main PT modes are bus and train (the one ferry service accounts for 0.35% of total patronage). In 2009/10, bus accounted for 57% of total boardings and 38% of passenger km, train for (almost all) the remainder. The train share of total boardings has increased from 14% in 1990 to 43% in 2010.
10. Train system	The Perth train system comprises 5 main lines (narrow gauge), 173 route km (346 track km) and 69 stations. Rollingstock comprises EMU 210 cars

	(86 sets), operating 36.7M (in-service) car km pa. The 'original' three rail lines (Midland, Fremantle, Armadale) were operated by diesel trains until the system was electrified in 1991 (the diesel railcars were then sold for use in the Auckland system). The fourth (Northern Suburbs/Joondalup) line was built in the early 1990s, to serve the expanding northern suburbs, and was subsequently extended. The fifth (Mandurah) line was opened in 2007, and appears to have generated an additional 15-20M PT boardings pa. Recently-announced plans envisage further expansion of the rail network (by 21 route km) over the next 20 years, including further extension of the Northern Suburbs line and a new spur line to the Airport.
11. Tram/LRT system	Perth currently has no tram/LRT services. However, recently-announced plans envisage the introduction of light rail services on several corridors over the next 20 years: light rail is seen as an 'intermediate mode' in capacity terms, between bus-based and heavy rail services.
12. Bus system	Perth has an extensive bus route network, with routes of two main types: feeder services to/from bus stations or bus/train interchanges; and routes operating directly to the CBD. It has a total fleet of c. 1050 buses, operating 52M (in-service) km pa and carrying 74.8M passenger boardings in 2009/10. 'Special' services include: CAT (central area transit) free services round the Perth, Fremantle and Joondalup CBDs); Circle Route; NightRider; Airport service. A substantial proportion of the Perth bus fleet is CNG-powered; in addition, a trial of fuel cell vehicles is being undertaken.
13. Ferries	A ferry service operates across the Swan river between Perth CBD and South Perth foreshore. Services depart every 30 minutes and with an interval of 15 minutes during peak periods. The recently-announced plans for the development of Perth's public transport system over the next 20 years do not envisage any substantial expansion of ferry services.
14. Fares and ticketing system/integration	Perth has a fully-integrated multi-modal fare/ticketing system with tickets allowing unlimited transfers within their defined validity period. Ticket prices vary by zone: the metropolitan area is divided into 9 concentric zones (2-section tickets also available). Free travel is available within the FTZ (free transit zones) in Perth CBD, Fremantle and Joondalup. The ticketing system was upgraded in 2007, with the introduction of the 'SmartRider' contactless/smartcard (stored value) system.
15. Institutions and organisational arrangements	The Public Transport Authority (WA), or PTA, is the statutory authority managing public transport in the State. It was formed in 2003 and its parent agency is the WA Department of Transport. Transperth is the brand name for the Perth public transport system managed by the PTA.
16. Regulation, procurement, asset ownership, operators.	All the Perth public transport services are either managed directly or outsourced by the PTA. The train services are operated directly, through Transperth Trains. The bus services are outsourced to private operators, through a periodic competitive tendering system (gross cost plus patronage incentive contracts): currently three private operators provide all he services. However, the bus fleet and most of the depots remain under ownership of PTA/Transperth. The ferry service is also outsourced, with the vessels and wharves continuing to be owned by PTA/Transperth.

TABLE A5: METROPOLITAN AREA PROFILE - ADELAIDE

Aspect	Summary
1. Geographic setting/layout	Located on flat coastal plain, between the coast and Hills—resulted in an urban area c80km N-S, 15-20 km E-W. Within this area, no major topographical constraints on development.
2. Urban development profile	City centre and inner areas largely developed in late 19C/first half of 20C—moderate housing densities. Developments since WW2 have been at lower densities, largely single blocks—with considerable expansion of the urban area.
3. Population/demographics (densities)	Population has been growing relatively slowly (c0.7% pa average) over last 20 years, with increasing ageing of the population over recent years.
4. Employment centres—mono-centric v poly-centric etc.	The dominance of the CBD as the prime area of employment has been declining for many years, although it still contains around 20% of total metro area jobs—focusing on retail, government and business sectors. Industrial employment is mainly in the inner /middle suburbs, but some distance out of the CBD. Several of the larger tertiary education and health-care facilities are located well away from the CBD.
5. Income/car ownership	The area has relatively high car ownership and use—similar to other Australian state capitals.
6. Road system development—extent of motorways etc.	In many areas, the road system is on a rectangular grid pattern, whereas in other areas this is more of a radial/tangential pattern to suit the topography. The arterial routes in the inner/middle areas typically have 4 lanes, but with 6 lanes being common especially in the middle/outer areas. Several major motorway-standard routes have been built in the last 10-20 years, but these have been largely radial routes in the outer areas (including Australia's only reversible 1-way expressway).
7. Motoring costs, parking, other traffic restraints etc	Except in the CBD, parking is generally easy/cheap or free. CBD parking is constrained in terms of price and availability, but less so than in Australia's eastern state cities (there is no system of parking rate surcharges). Bus lanes exist on some of the major radial routes, with traffic congestion being rather less of a problem than in the E state cities.
8. Active modes—roles and popularity	Despite the relatively flat terrain, cycling accounts for only 1.5% of JTW trips and walking (main mode) for a further 3.2% (2006 census). Cycling and walking account for considerably greater shares of education-based trips.
9. PT system overview	Bus is the dominant PT mode, accounting for 75% of all PT boardings and 68% of all passenger km; heavy rail accounts for 16% of boardings and 29% of passenger km; while tram accounts for 9% of boardings and 3% of passenger km (2009/10 data). Adelaide's average PT trip rate (boardings/capita) is similar to that for Brisbane/SEQ, but quite significantly lower than that for Perth (the two other Australian cities in a similar population range). Adelaide's PT trip growth rate (per capita) has been the lowest of the Australian state capital cities over the last 10-20 years: it decreased steadily through the 1990s, but has since improved with an average growth rate approaching 2%pa over the last 10 years.
10. Train system	Adelaide's rail network comprises four main lines (broad gauge) and various branch lines, totalling 120 route km (200 track km) with 85 stations. The Adelaide railway station is located on the edge of the CBD, but linked through the CBD by the Glenelg tram line. Total rail patronage was 11.75Mpa (2009/10), which is very much lower than all other Australian

	suburban rail systems: the next lowest was Perth, at some 55Mpa boardings. The Adelaide system is the only remaining diesel-powered system among Australia's capital cities. in 2009, a 10-year plan was announced to rebuild and extend the rail network, including its electrification. Other plan components include: purchase of new electric railcars and conversion/ refurbishment of some of the existing railcars; upgrading of the Outer Harbour line; extension of the Noarlunga line to Seaford; and track upgrades at Gawler and Noarlunga.
11. Tram/LRT system	Adelaide's one remaining tram line runs between the seaside suburb of Glenelg and the CBD. In 2005, the entire line was upgraded, with new track and improved tram stops, and in 2006 eleven new articulated light rail vehicles were introduced (some of the previous vehicles were refurbished and retained in service). In 2007, the line was extended 1.2 km through the CBD to North Terrace; and then further extended in 2010 to Adelaide Entertainment Centre. Patronage has increased approximately 3-fold in recent years to 6.3Mpa (2009/10), noting that a large proportion of this increase is accounted for by free travel within the CBD. As part of Adelaide's 10 year transport plan, it is proposed to introduce 'tram-trains' to run to West Lakes by 2013 and Port Adelaide and Semaphore by 2018, thus completing a coast-to-coast light rail system.
12. Bus system	Adelaide's bus services are provided by a fleet of some 800 buses (diesel and CNG powered), operating some 42M vehicle km pa and carrying 53.7M passenger boardings pa (2009/10). The bus system is predominantly focussed on the CBD, although there are a significant number of cross-suburban and rail feeder services. Bus priority measures (bus lanes, signal priority) exist on many of the major arterial routes. Adelaide's O-Bahn is the world's fastest (top speed 100km/hr) and longest (12km) guided busway and has been in operation since the early 1980s: it carries over 7 million passengers pa. Current plans include extensions of the busway route through the CBD, with dedicated bus lanes (but not in guided mode).
13. Fares and ticketing system/integration	Adelaide has an integrated multi-modal fare system. A single fare zone covers the whole of the metropolitan area, allowing multiple boardings within a 3-hour time limit; with a 2-section (3.2km) ticket available for short trips. Free fares are available for 'seniors' in interpeak and weekend periods.
14. Institutions and organisational arrangements	The authority responsible for public transport is the SA Department for Transport, Energy and Infrastructure (DTEI), Office of Public Transport: the services are marketed under the name Adelaide Metro. The bus operations are contracted out to three operators: Australian Transit Enterprises (ATE), Transfield Services, and Transit Systems Australia (Torrens Transit). Until 2010, rail and tram services were operated by TransAdelaide, a state owned corporation: TransAdelaide has recently been abolished and its functions transferred to the new Office of the Rail Commissioner.
15. Regulation, procurement, asset ownership, operators.	The train and tram services are provided through negotiated contracts with the Office of the Rail Commissioner, as noted above. The bus services are outsourced through a periodic competitive tendering process. New contracts were awarded recently for Adelaide's 7 contract areas, for 8 year terms: these contacts involve a gross cost plus incentive funding basis, with OPT taking the major role in specifying service requirements. Most buses and depots remain in the ownership of the state government.

TABLE A6: METROPOLITAN PROFILE - MELBOURNE

Aspect	**Summary**
1. Geographic setting/layout	The metropolis is located on the large natural bay known as Port Phillip Bay with the city centre positioned at the head of the Bay, at the estuary of the Yarra River. The metropolitan area then extends south from the city centre, along the eastern and western shorelines of Port Phillip Bay and expands into the hinterland. The city centre is situated in the municipality known as the City of Melbourne and the metropolitan area consists of further 30 municipalities.
2. Urban development profile	The City was founded in 1835 and developed on a grid like pattern in the centre and the inner areas. Since WWII, lower-density suburban development has spread rapidly, and the urban area now extends around 50km east and south-east from the CBD. Density of population is high in the inner areas, but relatively low in the outer areas. Overall density has increased somewhat since the 1990s as a result of densification/infill policies. There has also been a significant increase in residential population in the CBD area.
3. Population/demographics (densities)	The population of the Melbourne metropolitan area is 4.1 million (June 2011). The population growth rate has accelerated in recent years, with growth currently approaching 2.0%pa.
4. Employment centres—mono-centric v poly-centric etc.	Melbourne is mono centric, sub urbanised and has a low density. Employment in CBD is just over 160,000 Full Time Equivalents which is only a small proportion of the total labour force in Melbourne. The Melbourne CBD is the dominant employment centre for the metropolitan area: CBD employment accounts for some 160,000 (FTE) jobs, but this is less than 10% of total metropolitan employment. Other substantial employment areas are in the newer south-east suburbs (around Dandenong) and in the western suburbs. The state government has had a policy of developing sub-regional centres, as employment and retail centres, as alternatives to the CBD, but this policy has had only limited success to date.
5. Income/car ownership	Car ownership is generally high, as is the case in other Australian cities. Ownership rates are significantly lower for residents of the inner suburbs and the CBD. Concerns are often voiced about the transport disadvantage faced by outer suburban households that do not own cars (often for financial reasons) and have poor (or no) public transport services.
6. Road system development—extent of motorways etc.	Melbourne's freeway network is the largest of any Australian city, and has seen substantial expansion in the last 20 years. The CityLink 'freeway' scheme, completed in the 1990s, comprises an all-freeway link between the north-west suburbs (including the main airport) and the south-east suburbs, including a south/west bypass of the CBD: the scheme was privately funded, with costs recovered through tolls. More recently, the Eastlink scheme has been completed, providing a north-south freeway through the eastern suburbs, again privately funded and tolled. Both these schemes involve state-of-the-art electronic tolling systems, allowing uninterrupted traffic flows.
7. Motoring costs, parking, other	Parking costs in the CBD can be more than A$60 per day, with a

traffic restraints etc	weekend rate of A$9. Residents' parking schemes apply in many inner suburban areas. An active programme of tram priorities has resulted in reductions in general traffic capacity on many arterial roads in the CBD and inner areas.
8. Active modes—roles and popularity	In the 2006 census, walking accounted for 3.6% of all JTW trips and cycling for a further 1.3%. The walking mode share had been declining for many years up to 2001, but then increased significantly to 2006. The cycling mode share has shown little change for the last 25 years, but with some increase in the 2006 census. In both cases, the recent upward trends may be ascribed to health concerns and increases in the CBD/inner area populations. There have also been some increases in recreational walking and cycling in recent years.
9. PT system overview	Melbourne has the highest PT usage rate of all Australian cities, with average passenger boardings/population of 123 (2009/10). It has three main PT modes: electrified (heavy) rail, accounting for 44% of total PT boardings and 68% of passenger km; tram, 36% of boardings and 13% of passenger km; and bus, 20% of boardings and 19% of passenger km. The rail system provides the 'backbone' of the PT system, primarily serving longer-distance trips: for shorter-distance trips, tram is the main PT mode in the inner/middle areas, bus in the outer areas.
10. Train system	Melbourne has an extensive heavy suburban rail network, almost entirely electrified: it comprises 382 route km (830 track km), 212 stations and some 326 3-car sets operating 103 million vehicle km pa and carrying 214 million passengers pa (2008/09 statistics). Plans are currently under development to provide increased capacity of the system into/through the CBD, including the construction of a through-CBD tunnel to accommodate a semi-metro operation.
11. Tram/LRT system	Melbourne has the world's largest tram network consisting of 245 kilometres of track served by nearly 500 trams on 28 routes. The services carried 176 million passengers in 2009/10: tram patronage has increased substantially since its low point in 1989/90 (96 million), in part as a result of the growth in the residential population in the inner areas and in CBD employment. Over recent years, a number of extensions to the tram network have been implemented: these include the Box Hill extension and the extension of several tram routes into the Docklands area.
12. Bus system	Melbourne's bus system comprises 323 routes served by c. 1600 buses operating some 87 million bus km pa, with services provided by approximately 50 bus companies under franchise arrangements. Total passenger boardings (102 million in 2009/10), have shown strong growth over the last 5 years. Over the last 10 years, significant service initiatives have been implemented. These include: introduction of NightRider services (13 routes, operating Friday/Saturday nights); introduction of SmartBus routes (higher frequencies, longer operating hours, bus priority measures, improved bus stop information); and upgrading service levels and operating hours on existing routes.
13. Fares and ticketing system/integration	Melbourne has a fully-integrated multi-modal fare system, with tickets being valid for unlimited transfers within a defined time limit. Ticket prices vary by zone: zone 1 covers the inner/middle suburbs,

	zone 2 covers the outer suburbs. An enhanced electronic ticketing system (myki) has been under development since 2007 and has now been implemented (after considerable delays to the original programme).
14. Institutions and organisational arrangements	The Vic Department of Transport is the lead agency responsible for the planning, funding and contracting of Victoria's public transport system (the transport responsibilities were split out from the previous Department of Infrastructure in 2008). The development and operation of the arterial road system remains the responsibility of a separate agency, VicRoads. Another agency with a significant role in public transport is Metlink: it is responsible for the marketing, branding and information provision for all metropolitan PT services. Metlink Victoria Pty Ltd is jointly owned by the two franchise operators, while representatives of the Bus Association of Victoria and V/Line also have inputs to Metlink.
15. Regulation, procurement, asset ownership, operators.	Until 1999, the train and tram operations were run directly by the Public Transport Corporation, an agency of the state government. At that time they were both franchised, initially through two separate train franchises and two separate tram franchises. Following failure of the initial franchising arrangements, the franchises were consolidated into one single franchise for each mode. New franchises were initiated, following a tendering process, in November 2009: the current franchisees are Metro Trains Melbourne and KDR Melbourne, trading as Yarra Trams. The main assets (infrastructure and rollingstock) remain the property of the state government. Historically, most bus services in Melbourne have been provided by private companies, up until the 1970s on a commercial basis. A minority of services, in the inner/middle areas, were run directly by a state government agency (originally within PTC, later separated as Met Bus). The Met Bus services were sold to the private sector in two tranches, in 1993 and 1998. Currently DoT contracts with about 50 private bus companies, with contracts being on a gross cost basis. Over recent years, the DoT has taken a more active role in bus service planning.

TABLE A7: METROPOLITAN PROFILE - SYDNEY

SYDNEY Metro area	
Aspect	**Summary**
1. Geographic setting/layout	Sydney lies on both sides of Sydney Harbour, and extends south to encompass all sides of Botany Bay. Most of the city has undulating sandstone topography which defined the early alignments of major roads. Only the western part of the city, located on the Cumberland Plain, has flat land and regular street grids. Sydney is bounded by a ring of national parks that limit opportunities for further outward growth.
2. Urban development profile	Established as a penal colony in 1788, grew rapidly in the early 19c and now has a large inner area of pre-car development, featuring narrow streets and attached terrace-style homes.
3. Population/demographics (densities)	Metro area pop 4.5M. City of Sydney consists only of CBD and innermost suburbs, with a population of 177,000. Eastern and northern suburbs are generally the most affluent.
4. Employment centres—mono-centric v poly-centric etc.	Although Sydney CBD is Australia's densest activity centre, Sydney is Australia's most polycentric city. Because the city grew mostly westward from the centre, Sydney has long featured strong secondary centres, all located on the extensive rail network. The largest of these, Parramatta, often called the 'second CBD', lies near the geographic centre of the city, while the main Sydney CBD is much further east. Centres large enough to include tall buildings include Parramatta, St. Leonards, North Sydney, Chatswood, Bondi Junction, Hurstville, Bankstown, Strathfield-Burwood, Liverpool, and Cronulla.
5. Income/car ownership	Car ownership high overall but substantially lower in inner city.
6. Road system development—extent of motorways etc.	Freeway network is fragmentary and largely tolled, including a number of expensive and controversial road tunnels near the centre. No freeway connection between Sydney network and intercity freeways extending north and south. Arterial road network is extensive but features numerous chokepoints. Inner city street network is exceptionally complex and often seemingly random, lacking any organising pattern such as grids. Densest areas are often on or near harbour promontories, further limiting opportunities for access.
7. Motoring costs, parking, other traffic restraints etc	All-day parking in the CBD can cost over A$60/day, and road tolls for access to the city can approach A$5. City of Sydney has been aggressive in steps to discourage cars in the CBD, including new plans to close one of the main streets to cars and establish a new tram/LRT line there.
8. Active modes—roles and popularity	Cycling has developed with some difficulty due to undulating terrain, but City of Sydney in particular has been establishing separated bike paths at the expense of parking. Much of the inner city is pedestrian friendly.
9. PT system overview	An intensive but rather disorganised transit system in which electric heavy rail carries the greatest loads. Bus system is historically partly private but government is now re-asserting control over bus network planning and requiring operators to consolidate and work across their boundaries. Ferries include one heavy all-day market,

	Sydney-Manly, plus a range of services that focus on tourism and peak commuting to residential enclaves close to the harbour.
10. Train system	Australasia's largest urban passenger rail system, with over 305 stations and over 2000 km of track, almost all electrified. Heavy trains with capacities of almost 1000 carry crush loads into the Sydney CBD during peak hours and generally run every 30 minutes midday and evening. Fleet modernisation is a major issue, as the oldest trains still lack air conditioning.
11. Tram/LRT system	One privately operated light rail line, running along a disused goods corridor serving a mixture of tourist and local needs, but at a high fare based on expectations of full cost recovery. This line is now being extended further west, and a new light rail line through the CBD on George Street is now planned.
12. Bus system	Government bus system covering inner suburbs is heavily CBD-oriented, creating serious issues of bus crowding during the peaks. Generally low level of reliance on connections, yielding an extremely complex network with many overlapping routes. Outer suburban networks tend to focus on connecting with rail. Few long corridors cutting across operator boundaries, though government intends to create these.
13. Fares and ticketing system/integration	No fare co-ordination among the many operators, or even within them. Buses do not offer free transfers or any corresponding tool such as a day pass. Multi-modal tickets are available only for weekly and longer intervals.
14. Institutions and organisational arrangements	Transport NSW was recently created, combining the former Ministries of Transport and Roads. This new entity is charged with planning and managing an integrated public transport network, but it is in early stages of development. Bus operators have recently been shifted to gross-cost contracting with small performance incentives, part of a government plan to gradually consolidate these operations and bring them under greater government control.
15. Regulation, procurement, asset ownership, operators	Inner parts of Sydney are covered by a government owned operator, State Transit, while outer suburbs are covered by private operators on gross-cost contracts. Government is gradually re-asserting control of planning of the bus network. Rail and ferries are both government operated, though some private ferries also operate.

TABLE A8: METROPOLITAN AREA PROFILE - EDMONTON

EDMONTON Metro area	
Aspect	**Summary**
1. Geographic setting/layout	About 220 km east of the Canadian Rockies, at the north edge of the plains ecosystem and the south edge of Canada's vast boreal forest. Located on the North Saskatchewan River, which is of little importance to transport but an important shaping amenity for the urban form. The city sits mostly on plateau carved into ravines by the river and its tributaries. The main ravine of the North Saskatchewan, running through the core of the city, is almost entirely parkland.
2. Urban development profile	A very young city, built almost entirely in the 20th Century, but its pre-WWII built form, where the street grid is regular and density relatively high, is more extensive than Calgary's. Outside this area, the development form is typical of car-oriented suburbs, and includes "*the largest indoor shopping mall in North America",* the West Edmonton Mall. Outer edges of the city are quite jagged, with patches of development "leapfrogging" undeveloped areas.
3. Population/demographics (densities)	Metro area popn 1.15M (2009). Most of the metro area is in the City of Edmonton (pop 752,000 in 2008).
4. Employment centres—mono-centric v poly-centric etc.	Apart from the strong destination of West Edmonton Mall, Edmonton is largely monocentric, organised around the downtown and its provincial capital functions, as well as the major University of Alberta just across the river from downtown.
5. Income/car ownership	Car ownership high.
6. Road system development—extent of motorways etc.	Consistent grid of major arterials, mostly numbered in a way that provides readily legible "co-ordinates" for almost every point in the city. Partial freeways along eastern and northern edge serve a bypass function.
7. Motoring costs, parking, other traffic restraints etc	Parking in the CBD is in the range of C$20 per day, much lower for the short term.
8. Active modes—roles and popularity	Active modes constrained somewhat by extreme climate.
9. PT system overview	Single light rail line with substantial underground segments. Trolleybuses discontinued in 2009. Bus network operates on timed transfer system with a lattice of interconnected transit centres.
10. Train system	No heavy rail transit.
11. Tram/LRT system	One light rail line, extending northeast and south from the city, serving both downtown and the University of Alberta. Substantial expansion planned.
12. Bus system	Extensive bus network organised around timed-transfer centres throughout the city.
13. Fares and ticketing system/integration	Integrated fares with a city-wide flat fare, free transfers.
14. Institutions and organisational arrangements	Edmonton Transit is directly operated by the Transportation Department of the City of Edmonton.
15. Regulation, procurement, asset ownership, operators	All operations are direct by City of Edmonton employees.

TABLE A9: METROPOLITAN AREA PROFILE - OTTAWA

OTTAWA Metro area	
Aspect	**Summary**
1. Geographic setting/layout	On the Ottawa river, which divides the region into Ottawa (Ontario) and Gatineau (Quebec). Mostly flat or gentle undulating land except for narrow river valley. National government buildings scattered throughout the city but the core government area, Parliament Hill, is immediately south of the river adjacent to the CBD.
2. Urban development profile	Established in early 19c as a timber exporting centre, established as Canada's capital in 1866 with a formal capital plan developed in the 1910s. Ottawa has a compact pre-car core with a grid network of streets and many historic buildings. Surrounding this core is a largely car-oriented suburban fabric.
3. Population/demographics (densities)	Metro area pop (including Gatineau, Quebec) 1.22m in 2009. City of Ottawa 898,000 in 2008, with the OCTranspo service area covering a population of 785k. Position on English/French language border makes for a largely bilingual urban area. One of the wealthiest cities in Canada.
4. Employment centres—mono-centric v poly-centric etc.	Generally mono centric, with a strong downtown consisting of the central institutions of Canadian government and an adjacent business district.
5. Income/car ownership	Car ownership high.
6. Road system development—extent of motorways etc.	Fairly consistent grid of arterials occasionally interrupted by waterways and lakes. One major east-west freeway and a range of other highways.
7. Motoring costs, parking, other traffic restraints etc	All-day parking in the CBD is C$10-15 per day, much lower for the short term.
8. Active modes—roles and popularity	Active modes constrained somewhat by extreme climate, but an extensive network of bike paths is provided, including some on-street lanes and a network following the series of parklands alongside the river, lakes and the Rideau Canal.
9. PT system overview	Ottawa has had, since the 1970s, North America's most extensive separated busway system, including several stations integrated with dense residential and commercial development. Apart from one minor diesel light rail line, the network consists of buses.
10. Train system	No heavy rail transit.
11. Tram/LRT system	One fragmentary diesel light rail line, connecting two busway stations to each other via Carleton University. An extensive light rail network, including conversion of some busways to rail, is now planned.
12. Bus system	Frequent local bus routes cover the denser inner city, but the main feature of Ottawa is the busway network, extending four directions from the CBD. This network, which was the inspiration for Brisbane's, consists mostly of fully grade-separated running way with major stations, many featuring large bus interchanges or Park-and-Rides. Frequent services on the major busways connect with feeder routes at outer stations. During peaks, many feeder routes have through service to the CBD via the busways.
13. Fares and ticketing system/ integration	Both Ottawa (Ontario) and Gatineau (Quebec) have similar fare structures. Premium fare applies for peak express services only, but

	not for regular busway services. An even higher fare applies to low-patronage rural services. Fare integration between the two provinces is partial.
14. Institutions and organisational arrangements	OC Transpo is a department of the Ottawa-Carleton municipal government, which covers the entire urban area on the Ontario side. The transit agency for the Quebec side is Société de transport de l'Outaouais (STO).
15. Regulation, procurement, asset ownership, operators.	OC Transpo is directly operated by city employees. STO in Quebec is a freestanding agency, but all operations are by its own employees.

TABLE A10: METROPOLITAN AREA PROFILE - CALGARY

CALGARY Metro area	
Aspect	**Summary**
1. Geographic setting/layout	Located on the Bow River in the transition zone between the foothills of the Canadian Rockies to the west and the plains to the east – a setting quite similar to that of Denver. Scattered low hills occur in the western part of the city. River is of little importance to transport but an important shaping amenity for the urban form.
2. Urban development profile	Founded in the late 19th Century, the city's growth began with the completion of the railroad in 1883 and accelerated following the discovery of oil reserves in 1947. Except for downtown, most of the city dates from the era of car-dominated planning. Urban form, however, is more favourable to transit than this history would suggest. Many neighbourhoods have reasonably permeable pedestrian grids, and the downtown is exceptionally concentrated, its growth driven by the headquarters of natural resource companies and its unique position sustained by careful planning.
3. Population/demographics (densities)	Metro area popn 1.23M in 2009. The major part of the metro area is in the City of Calgary (pop 1.04M in 2008). A range of densities, with some remarkably high density around downtown.
4. Employment centres—mono-centric v poly-centric etc.	Calgary is highly mono centric, with both employment and commerce concentrated downtown.
5. Income/car ownership	A relatively affluent city with very low unemployment and frequent skills shortages. Car ownership high.
6. Road system development—extent of motorways etc.	One north-south freeway and a partial ring-road freeway around the north side of the city. Fairly consistent grid of major arterials.
7. Motoring costs, parking, other traffic restraints etc	Parking in the CBD is in the range of C$20 per day, much lower for the short term. Intentional constraints on parking supply help drive heavy transit use to the CBD.
8. Active modes—roles and popularity	635 km of multi-use bike-ped paths, plus 260km of on-street bike lanes or shared bikeways. Active modes constrained somewhat by extreme climate.
9. PT system overview	Calgary Transit operates two light rail lines, each radiating in two directions from downtown. Future light rail extensions are currently served with "Bus Rapid Transit" featuring distinctive vehicles and some signal preferences but not always exclusive lanes.
10. Train system	No heavy rail transit.
11. Tram/LRT system	Light rail is the main rapid transit mode. It consists of two lines, each with downtown in the centre, so it radiates in four directions. Very high mode share to downtown.
12. Bus system	Extensive bus network features a Bus Rapid Transit product in future light rail corridors, but is otherwise focused on coverage.
13. Fares and ticketing system/ integration	Integrated fares with a flat fare citywide, free transfers.
14. Institutions and organisational arrangements	Calgary Transit is directly operated by the Transportation Department of the City of Calgary.
15. Regulation, procurement, asset ownership, operators	All operations are direct by City of Calgary employees.

TABLE A11: METROPOLITAN AREA PROFILE - VANCOUVER

VANCOUVER Metro area	Summary
1. Geographic setting/layout	City of Vancouver is a peninsula lying between Burrard Inlet and the Fraser River North Arm. CBD is a smaller peninsula extending north from the main peninsula. Remainder of urban area is constrained by the wall of the Coast Range immediately north, and the US border to the south. Effectively, greater Vancouver can sprawl only eastward into the Fraser Valley. As this is British Columbia's best farmland, the urban edge in this area is highly controversial.
2. Urban development profile	Developed in mid-19c as a port for natural resource exports, it is still Canada's only major Pacific seaport. City centre and inner areas largely developed in late 19c/first half of 20c.
3. Population/demographics (densities)	Metro area population 2.33M (2009), with the TransLink service area covering virtually the whole metro area.
4. Employment centres—mono-centric v poly-centric etc.	The region has multiple activity centres, and while the CBD is the largest it is relatively small compared to North American cities of the same size. Employment is found throughout the urban area, but relatively little of it is in business park settings compared to US cities.
5. Income/car ownership	Relatively low car ownership in the City of Vancouver, where cycling and public transport compete effectively.
6. Road system development—extent of motorways etc.	The region's freeway network is fragmented and there are no plans to "complete" it. For example, there is no freeway connection between Interstate 5 from nearby Seattle and the Highway 1 extending east out of the city. The City of Vancouver has virtually no urban freeways within its borders, and relies on its grid of parallel arterials to manage cross-city traffic.
7. Motoring costs, parking, other traffic restraints etc	Parking in the CBD is in the range of C$23 per day. The two major universities constrain parking and instead offer a subsidised public transport pass. City of Vancouver has effective chokepoints on the north and south edges, with only two bridges across Burrard Inlet to the north and four across the Fraser River North Arm to the south.
8. Active modes—roles and popularity	Cycling is a major focus of policy. Recently, the City of Vancouver closed one lane on a bridge linking the CBD to the rest of the city, and turned this lane into a two-way bikeway. Complete network of urban bike boulevards routed along minor streets. Most of the city is highly walkable.
9. PT system overview	One of the most effective transit systems in North America for a city of its size, with a journey-to-work mode share of 17% across the whole urban region, much higher in the City. Network organised as a grid in the City of Vancouver ,and with timed-transfer interchange structures across the rest of the region, with rapid transit (bus or rail) into the city.
10. Train system	Minor role for heavy rail. A single commuter rail line extends east from Vancouver to serve a handful of eastern suburbs, peak only, peak direction only.
11. Rapid transit system	The backbone of most of the transit system is SkyTrain, a driverless metro (aka automated light rail) service achieving frequencies of 5 minutes or better across much of the day. The system now has three lines, with 47 stations on 68.7 km of track. It extends south and east of the city into adjacent suburbs, and has driven considerable densification around its stations.

12. Bus system	Trolleybuses feature prominently within the City of Vancouver. City is covered by a high-frequency grid, partly trolley bus and partly motorbus. Rapid-transit style "B-Lines" are very frequent services that make widely spaced stops. Suburban bus system is mostly feeders to trunk lines.
13. Fares and ticketing system/ integration	Integrated three-zone system with no connection penalty.
14. Institutions and organisational arrangements	TransLink is the public agency controlling all planning and operations, and also playing a role in major roads planning.
15. Regulation, procurement, asset ownership, operators	Operations are owned directly by subsidiaries of TransLink.

TABLE A12: METROPOLITAN AREA PROFILE - HONOLULU

HONOLULU Metro area	
Aspect	**Summary**
1. Geographic setting/layout	Located on O'ahu, one of the major volcanic islands of the Hawaiian chain, which is about 70 km long. The island is mountainous with narrow alluvial coastal plains (often only 2-4 km wide) on which most of the urban development has occurred. As a result, much of the urban coastal area has a very linear form, generating major travel demand along the coast but very little perpendicular to it. The major urbanised areas lie on the southern shore of the island, but the entire island is the incorporated city, including a range of rural and suburban areas.
2. Urban development profile	Developed mostly in the 20th century, including many areas with a car-dominated layout.
3. Population/demographics (densities)	Population was 905,000 in 2008, of which 718,000 lived in the urbanised area served by transit. Ethnic makeup differs dramatically from most of US, including 46% Asian and only 21% white. Relatively low average income by US standards.
4. Employment centres—mono-centric v poly-centric etc.	Compact CBD but with multiple other activity centres, mostly in a linear form along the southern coastal plain.
5. Income/car ownership	Car ownership somewhat below US average, with around 15% of households lacking a car.
6. Road system development—extent of motorways etc.	The major east-west freeway through the urban area is often heavily congested. Two north-south freeways cross the mountains to link the city to the north shore. In general, the urban area is heavily constrained by the narrowness of the coastal plain and numerous other water and topography barriers.
7. Motoring costs, parking, other traffic restraints etc	Congestion through the many chokepoints and low car ownership are the main barriers to motoring. Moderate parking costs.
8. Active modes—roles and popularity	Major investment has been made in the active modes in and around the CBD. Further out accommodation of bikes is more problematic due to terrain and irregular street pattern.
9. PT system overview	Buses only. Countywide bus system with the fourth highest ridership per capita in the US. Dense coverage of the urbanised area as well as links between all the populated centres of the island.
10. Train system	None. A driverless rapid transit system, similar to Vancouver's SkyTrain, is in planning stages and mostly funded.
11. Tram system	None.
12. Bus system	Intensive bus system with numerous interchanges. Frequent local services in the urban area along with a wide range of express services serving longer distance commuters. System extends throughout the island, including links to smaller communities.
13. Fares and ticketing system/ integration	Flat fare of US$2.50 for travel anywhere on the island, including one free connection.
14. Institutions and organisational arrangements	Entire transit system is directly operated by the City and County of Honolulu.
15. Regulation, procurement, asset ownership, operators	All assets are directly owned and operated by the City government.

TABLE A13: METROPOLITAN AREA PROFILE - PORTLAND

Aspect	Summary
1. Geographic setting/layout	Located on both sides of the Willamette River, which runs north-south. East side is relatively flat. West side has a high bank of hills immediately west of CBD. CBD is between these hills and the river. The high agricultural value of surrounding farmland was a major reason for the 1972 law imposing urban growth boundary.
2. Urban development profile	Developed in mid-19c as a port for natural resource exports. City centre and inner areas largely developed in late 19C/first half of 20C. Experienced typical suburban "sprawl" development until 1972 Oregon land use law imposed urban growth boundary. Space remains for growth within that boundary but strong regional government, supported by state law, encourages higher density and more efficient use of land.
3. Population/demographics (densities)	Metro area population was 2.21M (2008), of which 1.58M lived in the urban area served by transit. Portland is well-marketed as an attractive place to live, but slow job growth has constrained population growth.
4. Employment centres—mono-centric v poly-centric etc.	The CBD and adjacent areas form by far the dominant employment centre in the region. Western suburbs, however, are a centre for corporate headquarters in campus formats, with emphasis on high tech. Nike (athletic apparel) and Intel (computer hardware) are among the firms with headquarters there.
5. Income/car ownership	Typical of US.
6. Road system development—extent of motorways etc.	Grid arterial network covers the flat part of the city where density is also greatest. Major arterials are usually 4 lanes with parking strips. Freeway network is "complete," with a tight freeway loop around the CBD, a larger orbital freeway about 15 km east and south of the city, and radial freeways from the CBD in each of the four compass directions.
7. Motoring costs, parking, other traffic restraints etc	Parking in the CBD is in the range of US$10-20 per day, much lower for the short term. Chokepoints in road network are also helpful in driving mode shift.
8. Active modes—roles and popularity	Cycling is the big success story of the last two decades. Metro area cycling JTW is up from 1% to about 3% over the last decade, with almost all of this growth in the City of Portland. Aggressive cycling program is focused mostly on on-street lanes and "bike boulevards", formed from connected minor streets, and is beginning to include European-style bikeways adjacent to the footpath.
9. PT system overview	Network structure features four radial light rail corridors, which provide the trunk service between city and most outer suburbs. Suburban bus networks are oriented around stations, usually light rail, in town centres. City of Portland network dominated by a high-frequency grid of bus lines.. Metro area JTW mode share is 8% per the last American Community Survey, up from 5% over the past decade.
10. Train system	Minor role for heavy rail. One commuter express line created in 2009. It runs every 30 minutes peaks only, between the suburbs of Wilsonville and Beaverton in a western orbital function, feeding into light rail at Beaverton. It carries only 1200 pax/day.

11. Tram/LRT system	Light rail is the main rapid transit mode, accounting for almost a third of all PT trips. It focuses on links between the CBD and major suburban town centres. Four radial lines, 84 route-km, 84 stations, prevailing 15 minute frequencies, mostly surface with at-grade intersections but exclusive ROW. Entire network is recent; first line was opened in 1986.
12. Bus system	Extensive bus network with strong backbone of "Frequent Network" services running every 20 min or better all day. Portland made a major early investment in bus service quality through the CBD transit mall – two streets through the centre of the CBD exclusively for buses. The mall opened in 1978 and light rail was added to it in 2008.
13. Fares and ticketing system /integration	Portland's transit system has had integrated fares and ticketing since its creation in 1969. Three radial zones, free transfers, emphasis on monthly passes.
14. Institutions and organisational arrangements	The transit agency TriMet was founded in 1969 to replace failing private operators. It relies mostly on a payroll tax levied across its service area. Its governing Board is appointed by the Governor of Oregon. Long-range capital planning, such as light rail corridors, is done by the regional government, Metro, which has a directly elected board.
15. Regulation, procurement, asset ownership, operators	All operations are direct by TriMet employees.

TABLE A14: METROPOLITAN AREA PROFILE - SEATTLE

Aspect	Summary
1. Geographic setting/layout	In its isthmus setting, Seattle may be the most Auckland-like city in the world. The City of Seattle is on a narrow isthmus between Puget Sound and Lake Washington, and is further riven by interior water bodies such as the Ship Canal and Lake Union. Much of the city is on steep hills. The financial district in particular is so steep that people sometimes use building elevators to get from 2nd Avenue to 3rd Avenue. These factors combine to produce a remarkable concentration of chokepoints. Eastern and southern suburbs are gentler, but the two-way commute between Seattle and the high-tech eastern suburbs must go over one of two bridges over Lake Washington. There are no bridges extending west of Seattle over Puget Sound; all travel in that direction is by ferries, including large vehicular ferries (similar to the NZ Interislander). A key feature of Seattle that differs from Auckland is that while most Auckland hilltops are parks, Seattle hilltops are often densely developed, requiring large numbers of people to be carried up steep slopes.
2. Urban development profile	Developed in mid-19c as a port for natural resource exports, it is still a major deepwater seaport. City centre and inner areas largely developed in late 19C/first half of 20C. Explosive growth in suburban areas continues.
3. Population/demographics (densities)	The population of the entire contiguous three-county metro area was 3.35M (2008). 2.71M people live in the urbanised area (King County and beyond) served by transit.
4. Employment centres—mono-centric v poly-centric etc.	The CBD and adjacent areas form by far the dominant employment centre in the region. Western suburbs, however, are a centre for corporate headquarters in campus formats, with emphasis on high tech. Nike (athletic apparel) and Intel (computer hardware) are among the firms with headquarters there.
5. Income/car ownership	Typical of US in suburbs, somewhat lower in City of Seattle, where many older apartment buildings have no parking.
6. Road system development—extent of motorways etc.	Road network is riven by extreme topography. One north-south freeway, Interstate 5, runs through the city, with an orbital freeway, Interstate 405, running through the eastern and southern suburbs. Two freeway bridges link Seattle to the eastern suburbs over Lake Washington. Seattle's street network is generally gridded, but the numerous cliffs and water barriers create frequent interruptions to the grid.
7. Motoring costs, parking, other traffic restraints etc	Parking in the CBD is in the range of US$22 per day, much lower for the short term. Chokepoints in road network are also helpful in driving mode shift.
8. Active modes—roles and popularity	Aggressive cycling program is focused mostly on on-street lanes and "bike boulevards" formed from connected minor streets. As in San Francisco, the enthusiasm for cycling is high but the topographical barriers are serious.
9. PT system overview	Seattle lags behind almost all comparable North American cities in the development of rapid transit. The first rail transit line, between downtown and the Airport via dense inner south-east suburbs, opened only in 2009. Bus lanes on Interstate 90 and express lanes on Interstate 5 complete the picture. Suburban system is dependent on Park-and-

	Ride, which are often large-scale. Inner city Seattle has frequent local buses, including trolleybuses that climb the steepest hills. An unusual feature is the downtown Seattle bus tunnel, which opened in 1992 for buses and now carries a mixture of buses and light rail.
10. Train system	Minor role for heavy rail. The Sounder commuter rail system (not electric) links Seattle to northern and southern suburbs, but only involves a handful of peak-period services.
11. Tram/LRT system	Light rail is intended to be the main rapid transit mode, but it is at an early stage of development. It is, however, being built to "rapid transit" standards, with extensive grade separation and wide station spacing that will enable it to remain competitive for fairly long trips into the suburbs.
12. Bus system	Trolleybuses feature prominently in the inner city. Remainder of region has a large bus network including heavy peak express flows into Seattle – and secondarily to the University of Washington and major Eastside employers such as Microsoft. Downtown Seattle bus tunnel provides a fast trip under downtown for some suburban express routes, though these will gradually be replaced by light rail as this system expands.
13. Fares and ticketing system/integration	King County Metro has integrated ticketing, but each agency sets its own fares, limiting opportunities for integration.
14. Institutions and organisational arrangements	Vast bus system operated mostly by King County Metro within Seattle and its eastern and southern suburbs. Three-county Sound Transit developed light rail and also runs the minimal commuter rail system and the regional express bus network. Outer counties (Pierce and Snohomish) have their own agencies.)
15. Regulation, procurement, asset ownership, operators	County-level agencies are directly operated. Sound Transit, which spans the three counties, contracts with county-level operators for some services, and with private operators for others.