

Technical Report

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**THE CHANGING NATURE OF DEMAND FOR PUBLIC TRANSPORT IN
BRISBANE**

WORKING PAPER 1 - STATE-OF-PLAY AND FUTURE TRENDS

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1. BACKGROUND

This Working Paper reports on contract research commissioned by the Policy & Planning Unit of the Traffic & Transport Branch of the Brisbane City Council (BCC). Current BCC and Queensland Transport targets for the mode share of PT in Brisbane and the South East Queensland (SEQ) Region call for a substantial increase in PT usage in both absolute and relative terms. In order to assess the appropriateness of those targets, it is necessary to determine:

- (a) recent trends in Brisbane PT patronage levels;
- (b) the set of demographic, socio-economic and employment trends which directly or indirectly impact on PT markets;
- (c) the likely future trends in those factors; and
- (d) the network supply and technological changes which will impact on the performance of competing modes.

Decisions about the strategies and actions needed to bring about the desired PT mode share targets need to be informed by such an analysis. Sections 2, 3 and 4 of this Working Paper address the above issues in turn. Section 5 presents a discussion of the main implications of the findings for future PT demand in Brisbane. The strategies likely to be necessary to achieve the PT mode share targets set by the BCC for the next 10 years, are also discussed at this stage.

2. DEMOGRAPHIC TRENDS

2.1 General

The major trends in those demographic variables which most influence PT mode share are analysed in this section. Those variables include: population distribution; land use development patterns; household structure; household income and car ownership. Past trends for these variables are summarised and future projections are made using mainly available forecast from recent studies. The main focus is on implications to PT usage stemming from such trends.

Whilst Brisbane City (BC) is the main geographic area of interest in this research, the transport demands on this area from neighbouring regions make it necessary to analyse trends at the regional level. For this reason, trends from the Brisbane Statistical Division (BSD) and the SEQ region are also discussed here.

Figure 1 shows the definition used to distinguish between the inner, middle and outer areas of BC.

2.2 Population

2.2.1 Past Trends

Migration has been the critical demographic factor in the SEQ region as a whole. From 1991 to 1996, BC experienced the highest population growth of all capital cities in Australia, with

an increase of almost 55,000 to 820,000 in 1996, BCC (1998b). Population growth rates for the same period were:

- SEQ: 2.9% pa.
- Brisbane Metropolitan area: 2.3% pa.
- Brisbane City: 1.4% pa.

Figure 2 shows the population changes in the SEQ region for the period 1986 to 1996.

The Gold Coast (74,112) had the highest absolute population increase followed by BC (55,000) and Caboolture Shire (30,036). On a sector basis, the population growth showed marked differences, namely:

- Inner sector: 4523 representing 8.3 percent of BC growth;
- Middle sector: 8969 representing 16.4 percent of BC growth; and
- Outer sector: 41170 representing 75.3 percent of BC growth.

The population of the Central Business District (CBD) of Brisbane increased by 20 percent from 1451 to 1746 and the inner sector of BC showed a recovery since 1991 with major gains in the 20-24 age group. This trend has accelerated with net continuing net gains in this sector, where building approvals in 1996/97 registered a 48 percent increase, BCC (1998c).

Between 1991 and 1996, net migration was responsible for 2/3 of the population growth in BC. In the period 1986-1991, net interstate and international migration accounted for just over 50 percent of the population increase in BC (BCC, 1999) . Changes in net migration tend to be volatile due to their dependence on the relative levels of economic activity between the States. Given such volatility, future forecasts of population growth in BC should be seen as indicative only.

Despite urban consolidation policies by the BCC and the State Government, considerable population growth continues to take place in the outer suburbs with the outer sector registering the highest growth rates. In addition, there were net losses of around 4,500 population from BC to each of the surrounding shires of Pine Rivers; Redland and Caboolture (these Shires grew at 3.3 percent; 4.5 percent and 7.3 percent respectively between 1991 and 1996). The growth corridors to the north (Sunshine Coast) and south (Gold Coast) have seen the bulk of the regional growth.

2.2.2 Future Trends

Projected population of BC by 2011 is around 990,000. If the 1991-1996 growth rates continued, this forecast would be reached by 2003. This is very unlikely to be sustained due to reduced migration, lower fertility rates and higher death rates, (QDCILGP, 1998a). The BSD and the Moreton Statistical Division are forecast to grow at 1.3 percent pa. and 2.0 percent pa. respectively ('medium' forecasts, QDCILGP, 1998a). Major growth areas are projected to be Caboolture; Logan; Pine Rivers and Redland. BC is forecast to grow at 1% pa between 1996 and 2011. The BSD and Moreton Statistical Division are forecast to grow by 27 percent and 47 percent from 1996 to 2011, respectively.

2011 forecasts point to higher car ownership, higher incomes and lower average household size, leading to increases in travel demand of the order of 1.3% to 1.4% pa. However, up to 75

% of those increases will occur in the non-commuting and non-educational trip markets for which conventional PT is not primarily well suited.

Between 1991-92 and 1996-97 the outer sector made up 58 percent of all new dwellings; the middle sector 33 percent and the inner sector 9 percent. Cheaper house and land packages, lifestyle objectives and employment opportunities have all contributed to a population shift from the inner to middle to outer sectors. At December 1996 there was an estimated 6,336 hectares of broadhectare land available in BC (89 percent in the outer sector; 11 percent in middle sector and only 0.2% in the inner sector), BCC (1998c).

2.3 Socio-economic trends

For the 1986-1991 period, the BSD area had population growth of 2.7 percent pa. and households growth of 3.3 percent pa. This lowering of household size applies to most LGAs in the BSD area.

Early family formation age groups (25-44) had a net decrease in BC. These family types moved mainly to surrounding areas such as Caboolture, Logan, Pine Rivers and Redland. BC had a major net increase in high income households and a net loss in lower income households.

The outer sector experienced positive natural increase in population. This sector comprises mainly couples with dependents and one parent families, mainly in the 35-44 age group.

The population shift to the outer sector is likely to continue. The Outer sector is mainly made up of family households. The trend in in-migration of higher income white-collar workers to inner and middle sectors is also likely to continue, as are increased residential densities.

The percentage of females with a driver's license has increased from 40 percent in 1976 to 60 percent in 1996. The corresponding percentages for males are 65 percent and 72 percent, respectively.

The number of cars per 1000 population in the BSD area increased from 444 in 1986 to 462 in 1992 and is expected to reach around 500 in 2011. The percentage of households without a car has declined from 16 percent in 1976 to around 14 percent in 1996.

Data from the 1996 Census has been analysed and is shown in tabular and map form. Figure 3 shows the reference map used to analyse the data for the BSD area. Table 1 shows the corresponding reference table, listing each SLA and its map identifier. Table 2 shows the total population, number of females and males by SLA.

Figures 4 and 5 show, in map form, the percentages of females in the labour force and the percentages of females employed part-time, respectively. Table 3 shows the corresponding values for each SLA. The high labour force participation rates for women have been a continuing trend in the region. The percentage of part-time employed women has also continued rise.

The distribution of the proportions of household income in 1996, for the BSD, is shown in Figures 6, 7 and 8, for low, medium and high income households, respectively (defined here as <\$299; 4300-\$1499 and \$1500 weekly earnings, respectively). The tabular form of the same data is shown in Table 4. Low income households represent 19 percent of all households, with 16 SLAs having more than 30 percent of households in this category.

Car ownership data, in the form of proportions of households having 0, 1 or 2 or more cars, is shown in Figures 9, 10 and 11, respectively. Table 5 shows the corresponding values for each SLA. Zero car households make up 12 percent of the total, whilst 46 percent have more than 2 cars. Ten SLAs out of 225 have more than 30 percent of households without a car.

The implications for unsatisfied demand for transport due to low income levels; car unavailability and poor access to alternative transport modes, are discussed in section 5. There are significant differences in the housing markets. Non-professional/technical and lesser skilled workers being mostly housed in areas of lower cost land on the outer suburbs, with associated longer trips to work and reduced or non-existent levels of PT service.

There has been a trend to lower average household size in SEQ. The average of 3.1 persons per household in 1986 has decreased to 2.8 in 1996 and is estimated to reduce to 2.6 by 2011, QT (1999).

2.4 Residential densities

The SEQ region is characterised by dispersed, low density urban form. Population density in the BSD decreased from 3.4 to 2.7 residents/ha. from 1976 to 1991, despite population growth of 86 percent in the same period. There are very large differences in dwelling densities within the BSD, with the outer sector and adjoining Shires having significantly lower densities than the inner sector.

In Brisbane City, there has been a significant shift towards medium-density housing approvals which have increased at the expense of single detached dwelling approvals. This trend began in 1988/89 with medium density approvals increased from 26 percent to 37 percent. (50 percent in 1994-95 and 41 percent in 1996/97). Medium-density housing is expected to increase its overall share of the total housing stock, BCC (1998c). Such trends will improve the prospects for PT patronage and economic performance, by concentrating demand.

3. EMPLOYMENT TRENDS

3.1 General

The nature of work in Australian cities has been changing rapidly in the last three decades in a way which impacts significantly on the ability of fixed scheduled line-haul public transport systems to adequately meet the new employment related travel needs. Self-employment in Australia increased from 9 percent to 13 percent of all non-agricultural civilian employment since 1970; with part-time jobs increasing from 10 percent in 1965 to 23 percent in 1991. Female participation rates have increased significantly with full-time employment for women over 25 years old doubling since 1978. From 1970 to 1983 there was a 20 percent reduction in full-time jobs in Australia, DBIRD (1995).

In all Australian major cities, including Brisbane, there has been a shift to an information and knowledge based economy. In Brisbane, there has been increased concentration in the inner sector of 'high tech' and 'high touch' industries; personal services (tourism and recreational) and social services. This has led to increases in information based employment – managers, administrators, professionals, para-professionals with a reduction of blue-collar employment. Hours of work for full-time workers are also increasing. As in the other capital cities, income levels tend to decline with distance from the city centre; females have increased their share of employment in the centre and there has been a shift in work destinations from the CBD to the suburbs, Gipps et al. (1997).

In all capital cities, there has been a trend towards centralisation of higher income jobs and decentralisation of low income jobs to lower density residential areas away from the CBD and to smaller regional centres.

3.2 Employment in Brisbane

The Australian trend towards part-time and multiple job work has also applied to Brisbane. There has been an increase in:

- female participation rates (45 percent in 1996 in SEQ, compared with 43 percent in 1991);
- part-time employment (32 percent of employed persons in 1996 in SEQ compared with 28 percent in 1991. This is likely to continue to rise to 38 percent in 2007, QT (1999)); and
- Employment which is not fixed in one location.

This characterises the 'post-industrial' economy with an emphasis on small business, self-employment, part-time and the services sector.

Other major trends for the Brisbane metropolitan area:

- there is trend towards more diverse and more geographically dispersed employment;
- increases in employment in residential areas are taking place, together with increased concentration of jobs in regional and sub-regional centres;
- there is an increase in self-employment and small business which is reflected in the higher proportion of workers who work from home;
- those in full-time employment are working longer hours;
- the low levels of employment self-containment in the outer areas of the metropolitan region have continued throughout the 1990s. There is continuing spatial mismatch of work places and places of residence, as a result of the growth in the outer areas from cheap land and growth in employment elsewhere; and
- increasing growth in services based industries (recreational, personal and other services).

From 1986 to 1991 the Brisbane Metropolitan area has seen an increase in jobs of 34 percent, mainly in the services sector of the economy. Having a small industrial base has meant that Brisbane has not suffered significantly from the impacts of globalisation and 'downsizing' in the traditional industrial regions of Australia, Stimpson, et al. (1997).

The CBD and adjoining suburbs (Spring Hill, Milton, South Brisbane, Fortitude Valley), form the dominant employment node with high job densities and high proportions of managers; professionals; para-professionals; and women workers (the highest rate of full-time employment for women is in the inner city areas). The CBD has almost ¼ of all employment destinations in Brisbane City.

Other significant business and retail centres include Upper Mt.Gravatt, Toowong, Indooroopilly, Carindale and Chermside. These and other dispersed employment nodes have mainly part-time, casual, lesser paid jobs in the retail and personal services sectors. This type of worker has commuting needs which are not easily met by conventional PT services.

Outer suburbs have higher labour force participation rates, with the northern outer suburbs having the highest rates (well above national average). The inner city suburbs, with high concentration of elderly/retired, have lower participation rates, Stimson et al. (1997). Some of the same areas have high rates of unemployment and lower skilled blue-collar workers. Inner Brisbane SLAs rates of unemployment are significantly above the average for the region.

In general, the closer a LGA is to Brisbane City the greater the loss of workers away from their LGA of origin. The percentage of workers who live & work in the same LGA range from around 84 percent in Brisbane City, to 40 percent in Caboolture and 25 percent in Pine Rivers.

More than 50 percent of employed residents of Pine Rivers (61%); Logan City (51%); Ipswich (54%); and Redland (50%) work in BC.

Although population growth generates local employment, mainly in the retail and personal services sectors, there is usually a significant time lag between shifts in population and shifts in employment. Some evidence from Sydney suggests that the lag may be of the order of 20 to 25 years, QDHG&P (1993). Implicitly, the newer housing areas are likely to exhibit low rates of self-containment, with commuting to regional centres and the CBD being required.

3.3 Telecommuting

Australia is moving towards an age of telecommuting as business and government look at ways to reduce office and operational overheads, and improve employee productivity. The extent and nature of telecommuting in Australia is not well understood, especially its impact on regional transportation planning and policy. The South East Queensland (SEQ) region has been experiencing rapid growth in small suburban-based information technology and producer services businesses which depend on communications. Many large companies and the Queensland public sector are set to embrace telecommuting as part of more flexible work practice.

The nature of telecommuting jobs is intrinsically tied to the manipulation of information. Today, the 'digital revolution' is triggering structural changes comparable to those which occurred in the Industrial Revolution. Australia is well placed to embrace telecommuting, especially as Australians are also among the largest per capita users of the Internet system. By the year 2000, around 3 million on-line users are anticipated.

In Queensland, the Office of the Public Service (OPS) is investigating the development of a policy framework for telecommuting in recognition of the desire of employees to move towards more flexible work practices.

Although early research would suggest that telecommuting can have positive benefits for transportation, its long-term impacts cannot be easily predicted. As telecommuting is still in its infancy, it is somewhat difficult to accurately define the transportation impacts. For example, while telecommuting may accrue positive benefits at a regional level, the journey to work may be replaced by more local non work-related trips, thereby contributing to local traffic congestion and associated pollution. Such patterns would reduce congestion on major arterials at the expense of increased emissions elsewhere.

The growth rates in telecommuting will be affected by increased government pressure, increases in technological and network enhancements, changes in human resource management practices, increases in regulatory incentives (eg. taxes, parking fees in inner city areas), faster than anticipated implementation of enhanced technology, and increases in direct incentives. The decision to adopt telecommuting is made in light of economic, environmental, legal, political, social, technical and productivity considerations, as well as demographic characteristics and trends. Its continuing prominence is made possible by technological advances, the changing nature of work, workers and the workplace, traffic congestion and its consequences, and environmental legislation.

1996 Census data

In Queensland, over 50000 workers, or 5.1 percent of employed residents, reported that they worked from home in 1996. In Brisbane City, the corresponding proportions of all employed residents were 5.9 percent in the CBD and 4.1 percent in the remainder of BC. This represents an increase of 18 percent from 1991 to 1996, QDCILGP (1998b).

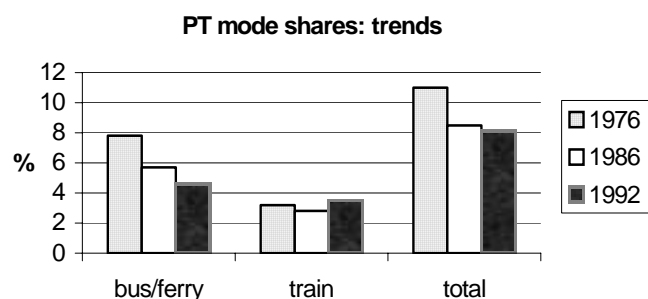
4. TRAVEL DEMAND

4.1 General

The importance of the trip to work has declined relative to other types of travel. The share of commuting trips in Brisbane has declined from 20 percent of all person daily trips in 1976 to 15 percent in 1992, Queensland Transport (1995). Home-based other and non-home based trips have increased from 20 percent in 1976 to 35 percent in 1992. In 1992, only 20 percent of all trips in the am peak (7am-9am) were commuting trips with a further 20 percent being home-based education trips.

Radial person trips to the CBD of Brisbane make up only 6 percent of total SEQ person trips and the percentage of non-radial trips is expected to continue to increase in the future.

PT patronage for all trips in the Brisbane metropolitan area has



continued its decline in relative terms during the last 20 years, from around 11 percent in 1976 to 8 percent in 1992, as shown in Table 6. The only period of consistent relative and absolute increases took place in rail trips following electrification in 1979.

Table 6: Trends in PT Modal Shares in the Brisbane Region

Mode Trip Purpose	Bus/ferry (%)			Train (%)			Total (%)		
	1992	1986	1976	1992	1986	1976	1992	1986	1976
HBWork	5.4	5.9	9.5	7.6	8.5	8.4	13.0	14.4	17.9
HBShopping	4.6	4.7	7.7	1.5	1.7	1.6	6.1	6.4	9.3
HBEducation	9.2	18.3	22.6	5.6	5.3	5.8	14.8	23.6	28.4
HBRecreational	3.3	2.6	2.2	3.1	1.3	0.8	6.4	3.9	3.0
HBOther	1.9	0.6	0.0	1.3	0.3	0.1	3.2	0.9	0.1
NHB	3.2	4.4	4.3	1.2	0.9	1.2	4.4	5.3	5.5
TOTAL	4.6	5.7	7.8	3.5	2.8	3.2	8.1	8.5	11.0

In 1992, the average trip length to non-CBD employment/retail centres was about the same as for CBD trips (around 5-6 km). Both the CBD and the non-CBD centres have lost market share to the rest of the urban area, in terms of percentage of trips attracted.

Even if the preferred pattern of land use for SEQ is fully implemented, the average trip length is estimated to increase from 12.6 km to 14.3 km by 2011. The average trip length for commuting trips is predicted to be 10.6 km and work based business trips 8.3 km.

The inner suburbs of Brisbane have lower car ownership and higher PT use. Spring Hill, New Farm and South Brisbane have a PT mode share of around 10 to 12 percent and less than 1 cars per household. Outer suburbs with lower residential densities and high car ownership levels have very low PT mode shares (eg: Daisy Hill; Loganholme; Shailer Park: 2 cars per household and less than 2 percent of all trips by PT).

The levels of PT service reduce significantly with distance from the CBD (eg: 8000 bus services/day in 1992 in Brisbane City. This compares with 450 in Pine Rivers; 400 in Logan; Redland 340; 320 in Ipswich; and 150 in Albert). Whilst 58 percent of the population in the SEQ region is estimated to be within 400 m of a PT stop, the corresponding proportion for Brisbane City is 88 percent, Murray, et al. (1998).

4.2 Commuting trips

Some general trends for work related travel in Australian cities from 1981 to 1991, include: (Gipps et al., 1997)

- over 70 percent of work trips have suburban destinations;
- only managers and professionals increased their share of PT use for commuting trips, with blue-collar workers having reduced their use of PT;
- the proportion of inter-suburban commuting trips is increasing;
- the proportion of females using private vehicles to commute increased dramatically but is still substantially less than males;
- females have shorter commute trips and rely more on PT; and
- job growth has taken place mainly in areas not well served by PT.

Commuting in Brisbane

Between 1991 and 1996 in the BSD, PT decreased its share of commuting trips from 11.6 percent to 10.8 percent. During the same period the total trips by private transport increased by 19 percent, whilst PT trips increased by only 4.5 percent. Walk and bicycle trip mode shares also reduced slightly.

In 1996 there were 354000 work trip origins and 461000 work trip destinations in Brisbane City (BC), or 30 percent more workers than employed residents. Some 108000 destinations were in the CBD of Brisbane (23 percent of all BC destinations). Almost 50 percent of those who lived in the CBD worked in that area, QDCILGP (1998b).

Ninety-two percent of employed residents in BC worked within Brisbane, whilst 33 percent of destinations in BC originated from other LGAs, BCC (1998d).

The CBD and Frame areas were the destination for 34 percent of all commuting trips to BC. The other major employment and retail centres attracted a further 6 percent of BC commuting trips.

As noted in section 3.2, the surrounding Shires contribute significantly to trips to work with destinations in BC. Forty-two percent of the 99100 origins from Caboolture, Pine Rivers and Redcliffe had destinations in those areas, whilst 12 percent worked in the CBD and 39 percent in the remainder of BC. A similar pattern applied to those origins from Logan and Redland. Whilst the CBD of Brisbane attracts over 10,000 work trips from surrounding Shires, most commuters from those Shires into Brisbane have destinations in regional centres and industrial areas.

Thirty-nine percent of the commuting trips whose destination was the CBD used PT (22 percent used train; 16.5 percent used bus and 0.6 percent used ferry). Only 6 percent for those destined for the remainder of BC used PT. Commuting trips which started in neighbouring Shires had the following shares of PT usage:

	<u>PT (%)</u>
Caboolture/Pine Rivers/Redcliffe	2.1
Logan/Redland	2.0
Ipswich	3.0
Beaudesert/Boonah	0.6

4.3 Trends in PT traditional competitive markets

Person trip markets for which fixed route/scheduled PT offers a viable alternative to the private car include:

- Home based trips to the CBD (mainly work and education related);
- Home-based work and shopping trips to major employment/retail centres outside the CBD; and
- Non-CBD home-based education trips.

For most other markets, such as recreational and non-commuting person trips, PT finds itself generally unable to compete effectively on convenience, flexibility, trip times and reliability.

In 1992, around 33 percent of all person trips in the BSD were home-based work (HBW) and home-based education (HBE), whilst the same proportion were non-home based (NHB). Home-based other (HBO) trips made up 16 percent of the total. Even allowing for differences in trip definitions and survey boundary issues, there is a clear trend emerging when the results of the 1976, 1986 and 1992 household surveys are analysed, namely:

- The growth rates of HBW trips have declined from 2.7 percent pa. between 1977 and 1986 to 0.6 percent pa. from 1986 to 1992.
- HBO and NHB trips are the only purposes showing absolute increases of 7.6 percent and 1.6 percent from 1986 to 1992, respectively, ARUP (1996). Those two trip purposes have increased for both CBD and non-CBD travel. All other trip purposes have declined in the same period.

These results point to a shrinkage in the PT contestable markets in the BSD area in general. This is reflected in the downward trend of PT mode share (2.6 percent reduction between 1986 and 1992). When the CBD and non-CBD trips are analysed separately the reduction in PT traditional markets becomes even more evident.

There is a trend towards more trips being made to/from non-CBD areas, with 81 percent of such trips being made by car. HBW, HBE, HB Shopping and HB Recreational trips to/from the middle sector as a proportion of the total BSD trips are trending upwards.

HBW and HBE trips are declining as a percentage of all trips to the CBD and this trend is likely to continue, as employment opportunities spread outwards and tertiary institutions growth occurs mainly in the middle sector. Between 1986 and 1992 there has been an increase in HBO and NHB trips to the CBD, markets which are traditionally difficult to serve by conventional PT.

Table 7 shows the proportion of trips by trip purpose for CBD and non-CBD trips, from the 1992 travel survey results. Whilst HBW trips to the CBD make up 27 percent of all CBD oriented trips, the corresponding non-CBD proportion is 15 percent. NHB trips make up 50 percent of all non-CBD trips and 28 percent of CBD trips.

Table 7: Trips by Trip Purpose: CBD and Non-CBD Trips in 1992 (Percentage)

Trip Purpose	CBD (%)	Non-CBD (%)
HBWork	28	14
HBShoping	10	18
HBEducation	14	4
HBSocial	5	11
HBOther	13	3
NHB	30	50
All Trips	100	100

Source: ARUP (1996)

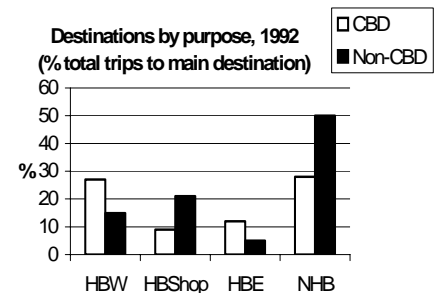


Table 8 compares 1992 and 1986 data on the proportion of trips made by bus for each trip purpose, for CBD and non-CBD trips. Table 8 shows that bus travel has a small market penetration for non-CBD trips and the trend is for a decline in bus mode shares for most trip purposes, with a steady HBW proportion at only 0.2 percent mode share.

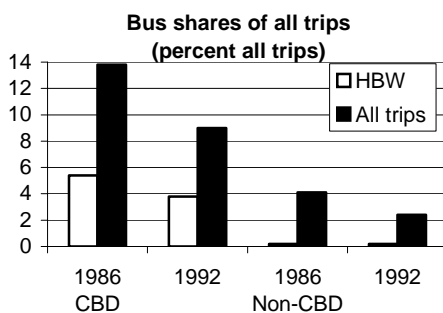
For non-CBD trips, bus accounts for around twice the train trips. Overall train mode share has remained static, whilst bus has declined for both CBD and non-CBD markets.

For the sections of the market showing some growth, namely HBO trips, car trips (as driver and passenger), have increased market share from 11 percent in 1986 to 14.2 percent in 1992.

Table 8: Bus Trips as Percentage of All Trips by Purpose.

Trip Purpose	CBD		Non-CBD	
	1992	1986	1992	1986
HBWork	3.8	5.4	0.2	0.2
HBSshopping	2.0	2.5	0.3	0.7
HBEducation	0.8	1.2	1.3	2.1
HBSocial	0.5	1.0	0.1	0.2
HBOther	0.1	0.1	0.1	0.0
NHB	1.7	3.6	0.5	0.9
All Trips	9.0	13.8	2.4	4.1

Source: ARUP (1996)



Given the level of ‘captive’ riders, as well as the perceived advantages of private car use, traditional fixed route/schedule PT with adequate levels of service is likely to be able to compete effectively only in around 30 to 40 percent of CBD trips and no more than 10 percent of non-CBD trips, assuming the following market penetrations:

(1) CBD trips

- a significant proportion of HBW trips, say 60% - 70%;
- a significant proportion of HBE trips, say 60% - 70%;
- a small proportion of HBSshopping, say 20% - 30%;
- a small proportion of HBSocial, HBOther, say 10% -15%.
- a small proportion of NHB, say 3% -5%.

(2) Non - CBD trips

- a small proportion of HBW trips, say 10% - 20%;
- a small proportion of HBE trips, say 15% - 30%;
- a small proportion of HBShopping, say 5% - 10%;
- a small proportion of HBSocial, HBOther, say 2% -5%.
- a small proportion of NHB, say 1% -3%.

5. IMPLICATIONS FOR PUBLIC TRANSPORT DEMAND

5.1 General

There is no single market for PT with uniform characteristics and constant elasticities with respect to either price or service levels. PT needs to be seen as being made up of several differentiated products catering for the various types of markets. The latter can be described in terms of tripmaker characteristics, as well as types of trip (eg: trip purpose; trip chaining; and time of day). Tripmakers can be classified as:

- (a) 'captive to PT in terms of lack of car availability or inability to access a car;
- (b) 'choice' riders for which PT may be seen as being contestable; and
- (c) 'captive' to competing modes. For example, the availability of a company car or the unavailability of PT within easy access may be seen as either actual or perceived captivity to a mode.

The degree to which individuals fall into each market will vary with the type of trip, its destination and its start time and the characteristics of the tripmaker. That tripmaker should, therefore, be seen as being part of the potentially contestable PT market for at least some of his/her trip types. The need to cater for these distinct markets will grow in significance, given the trends identified in earlier sections. In particular, in order to cater for those market segments showing a growth trend, PT will need to focus on home-based shopping; home based recreational; home-based other and non-home based trips.

Intelligent Transport Systems (ITS), when applied to PT, can be a major factor in moving PT to a more demand responsive, convenient and user-friendly system. Applications to passenger information systems; computer aided matching of trip origin/destination pairs; multi-modal ticketing systems; and bus priority systems (eg: passive and active signal priority; transit lanes, busways, etc.), could play a major part in a future PT system for Brisbane.

5.2 The main issues

The changing nature of work

The continued rise in part-time employment (from 32% in 1996 to 38% in 2007), female workforce participation rates (from 45% in 1996 to 51% by 2007) and working hours for full-time workers (ie. peak spreading), will mean that the commuting markets will become increasingly more difficult to serve using a fixed-route CBD oriented radial PT system, based on high frequencies at peak times and low off-peak frequencies.

Dispersion of trip origins and destinations

The continuing dispersion of employment, shopping, health and other services, will increase the demand for inter-suburb, inter-regional and cross-town trips for both commuting and other trip purposes (around $\frac{3}{4}$ of the employment in Brisbane City is outside the CBD). Such markets need to be catered for by PT systems which are more demand responsive in terms of start trip times, transit times, frequencies and door-to-door convenience. Such services need to approach the characteristics of private transport rather than those of fixed routes and fixed scheduled services.

The population of Brisbane City is forecast to grow at 1% pa between 1996 and 2011. 2011 forecasts point to higher car ownership, higher incomes and lower average household size, leading to increases in travel demand of the order of 1.3% to 1.4% pa. However, up to 75 % of those increases will occur in the non-commuting and non-educational trip markets for which conventional PT is not primarily well suited. This is due mainly to trends in the proportion of trip purposes by main origin-destination sectors, as discussed in section 4.3.

Urban 'sprawl' impacts

The higher growth rates of population in the outer areas of metropolitan Brisbane (mainly areas with a lower level of employment containment), will continue to turn those areas into 'dormitory' suburbs, relying almost exclusively on the use of the private car to access employment, shopping, and other services. Since here is normally a lag of employment following residential development of as much as 20 years, the lack of self-containment is likely to continue well into the future.

The lower land and housing costs in those outer areas are attracting mainly young families with dependents. In addition, those households also have higher potential to increase average household car ownership levels in the future, given their current stage in the family life-cycle and their current average income levels.

Past trends show that, if the provision of PT at an adequate level of service lags behind such population growth, car dependent communities are quickly established. Such dependency, once entrenched, becomes very difficult to arrest or reverse.

CBD commuting

Commuting trips to the CBD of Brisbane will continue to decline as a percentage of all commuting trips, as well as a percentage of all person trips. However, in 1996, CBD bound commuting trips represented 23 percent of commuting trips to Brisbane City and will continue to form a significant PT market.

Road network performance

Average morning peak period vehicle speeds on the 10 major arterials in Brisbane, have reduced from 37 km/hr. in 1990 to 29 km/hr. in 1998. The corresponding reduction in the evening peak was from 37 km/hr. to 32 km/hr, BCC (1998e).

As peak period average speeds on radial arterial roads continue to reduce gradually, there will be a competitive advantage to rail and bus for line-haul services. Assuming that significant bus priority systems are implemented, such an advantage is likely to be felt in the next 5 to 10 years. However, the PT markets mostly affected by such impacts are likely to be restricted to commuting trips to and from the inner sector of Brisbane.

In the next 10 years, the level of service provided by the road system for most of off-peak cross-suburb, inter-regional and cross-town trips is unlikely to deteriorate to a level which will significantly affect private vehicle travel times for the majority of such trips.

The introduction of new technology and the adoption of existing technology, such as Intelligent Transport Systems (ITS), is likely to lead to a gradual improvement in the efficiency of the road system, through better driver information, traffic signal control and co-ordination systems and incident detection systems. It is likely that such improvements will partly offset travel time reductions due to continued traffic growth. However, access routes to the CBD and other major employment centres in peak periods will become increasingly congested.

Private vehicle pricing

Strategies to alter pricing and supply of parking in and around the CBD of Brisbane have the potential to significantly affect modal-split decisions for peak period trips to those areas. This is a necessary condition to achieving the PT targets set by the BCC. However, such strategies leave unaffected the growing number of trips which do not begin nor end in the inner areas of the city.

The use of variable road pricing of selective road links to reduce demand at peak times, is likely to become acceptable to the community at large when the level service provided by the road network reaches levels of congestion which are significantly higher than those prevailing at present. At that stage, variable road pricing could be an effective tool to achieve PT targets. This would need to be coupled the introduction of a new single and integrated PT system, which would see significant improvements to existing PT levels of service for the growing non-commuting CBD markets.

Social justice

The increasing inability of the current PT system, with its emphasis on radial, line-haul services catering mainly for the full-time commuting market, to meet the basic transport needs of local communities is likely to lead to strong political and social pressures on social justice grounds. If, as is increasingly the case, the PT system is unable to meet basic community needs, such as access to employment, education and health, there may be a case for subsidisation of more responsive PT services. The latter may have, in some cases, attributes closer to the private car, in terms of flexibility, convenience and travel times.

In this context, it is useful to distinguish between social and geographic disadvantage. Social disadvantage indicators include the proportion of those: with low incomes; who are single parents; who are aged; who lack qualifications; people with disabilities; with high unemployment; and with high youth unemployment. Geographic disadvantage relates to the inability to access the transport system due to poor levels of PT service; total lack of PT

services; unavailability of a car; no drivers' licence; lack of information on PT services and on how to use them; or lack of personal security.

Socially and geographically disadvantaged areas in the metropolitan region, have been identified as parts of the Inala/Ipswich corridor; parts of Logan and North Albert; and some areas in Redcliffe, northern Pine Rivers and parts of Calbottle, QDHLG&P (1993).

Working Paper 3 in this series deals with the development of an appraisal methodology to assess the PT needs of a geographic area. A set of criteria and associated threshold levels are developed to allow an assessment to be made of the relative needs of an area in terms of mobility; access to transport services; PT route coverage and frequency.

Funding

The funding gaps identified in recent State Government and BCC transport planning studies are well documented, Queensland Transport (1998) and BCC (1998a). Whilst there is widespread community support for PT initiatives, there is also a strong lack of support for restrictions to the use of the car. This is particularly the case if those restrictions related to increased road user charges which go into general revenue or which are used to finance increased road building. The use of increased road user charges (eg; parking or road pricing), to directly finance improvements to the PT system has gained some acceptance in European and North American cities.

Long-term strategies

Urban form

Land use planning which reduces car dependency and encourages PT, walking and cycling, can be introduced at the level of residential developments, commercial/retail developments close to PT nodes, as well as regional centre developments. The Queensland Transport Guide to reducing car dependency through urban planning ('Shaping Up'), provides examples of how such principles can be put into practice.

Education Campaigns

Campaigns are needed which emphasise the adverse health impacts of vehicle emissions, as well as the more visible environmental damage such as the 'greenhouse' impacts. For example, the human health impact of fine and ultra-fine particles emitted by diesel vehicles in particular, are likely to result in increased pressure to upgrade freight and bus fleets with 'cleaner' vehicles. Such PT upgrading also offers an associated opportunity to move to a higher level of in-vehicle service to passengers.

The use of education/information efforts directed at school students is likely to have long-term benefits in terms of public awareness of environmental and social justice issues. However, the experiences of those students in the use of the existing PT system, tend to have long-lasting effects on their future perceptions of the system. School students, who are mainly transport disadvantaged, tend to rely on the PT system for most of their trips. When the latter involve non-CBD destined trips, students tend to be poorly served by the existing system. This, coupled with the lack of through ticketing and multi-modal co-ordination, presents students with poor PT images which may be difficult to erase.

6. CONCLUSIONS

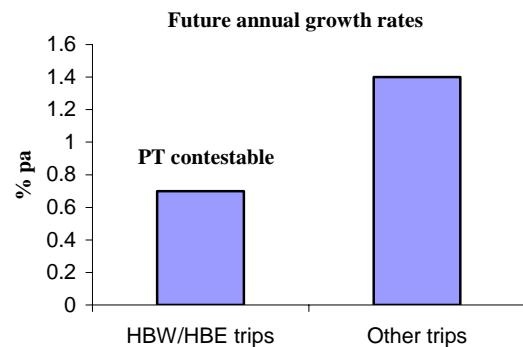
Fixed route, scheduled PT offers a competitive alternative to the private car only for a small and diminishing proportion of all trips. The contestable PT markets include:

- (i) Home based trips to the CBD (mainly work and education related);
- (ii) Home-based work and shopping trips to major employment/retail centres outside the CBD; and
- (iii) Non-CBD home-based education trips.

For most other markets, such as recreational and non-commuting person trips, PT finds itself generally unable to compete effectively on convenience, flexibility, trip times and reliability. The continued increase in part-time employment, as well as the increase in working hours for full-time workers, will mean that even the CBD commuting market will become increasingly more difficult to serve using a fixed-route CBD oriented radial PT system.

Given the level of ‘captive’ riders, as well as the perceived advantages of private car use, traditional fixed route/schedule PT with adequate levels of service, is likely to be able to compete effectively only in around 30 to 40 percent of CBD trips and no more than 10 percent of non-CBD trips.

Based on recent trends and population forecasts, the likely annual growth rates by travel market, for the next 5 years, are around 0.6 to 0.8 percent for traditional PT contestable markets and around 1.3 to 1.5 percent for other markets.



Such differential growth rates have major implications for the feasibility of recently set PT targets to be achieved. Future total trip demand levels will be less propitious for PT, since most of the new trips will required personalised flexibility in terms of trip purpose, start times and destinations.

Therefore, there is a need to:

- (a) continue to improve current service levels in order to ensure that existing PT users are not ‘lost’ to the private car; and
- (b) provide a new range of more personalised services to cater for current and future market demand in the non-CBD commuting and education markets.

PT, either conventional fixed route/schedule systems or more demand responsive alternatives, will benefit from the implementation of Intelligent Transport Systems applied to all modes. Internet based use and dissemination of information to enable trips to be pre-planned from home, coupled with the ability to match travelers needs, will provide operators with new opportunities. PT systems will need to adapt to take advantage of those opportunities, by offering a range of ‘products’, from ride sharing to demand responsive door-to-door services.

For example, the introduction of smart card technology for fare collection, offers the opportunity for commercial partnerships and passenger loyalty schemes which will help retain existing markets and attract new ones.

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