Free public transport for all?

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Abstract

Free public transport has recently been canvassed, in the context of environmental concerns, after being dormant as a policy issue during the "subsidy conscious" 1980's. This paper examines the arguments for free public transport and discusses likely impacts with reference to the local South Australian economy, and, in particular, metropolitan Adelaide. Travel time benefits and fare savings for public transport users represent the chief beneficial effects. On the debit side, free travel would have a significant impact on net government outlays which would require funding either through increased taxes or reduced services in other areas. Specific environmental and equity improvements alleged to flow from free travel could be more efficiently achieved through other means. The paper concludes that the case for universal free travel would not appear to be strong.

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1. Introduction

> "We must make cities car hostile. – We must make it possible to get to and from work taking public transit. My recommendation to the city of Vancouver, to the Mayor, *is make public transit free* (applause). And I believe the returns on that both environmentally as well in terms of health and every other way will be massive, if public transit is free."
>
> David Suzuki
> Public Lecture, Apollo Stadium, Adelaide
> Monday 2nd April, 1990.

After nearly two decades of dormancy, free travel on public transport services is now working its way back onto the political agenda. Recent environmental concerns championed by Professor Suzuki (quoted above) have brought the issue of free travel back into public forums and it is now the subject of community debate in Australia's major urban areas. The South Australian Government has introduced free travel for children and secondary students from January, 1990.

This paper provides an assessment of the likely impacts of free travel with reference to the local South Australian economy. Given Adelaide's dominance within South Australia, comprising more than 70% of the population and attracting 95% of all public transport subsidies, the paper has a strong focus on the Adelaide public transport system, which is essentially provided by a government funded statutory authority, the State Transport Authority.

In order to facilitate the assessment of free travel impacts on users and the wider community, an extensive literature review was conducted. The lack of substantial references in the 1980s provides an interesting comment on the shift in public policy emphasis to subsidy reduction during this decade. Evaluation of the impacts of free travel on the State Transport Authority was conducted from first principles, supplemented by detailed examination of the avoidable cost of activities and boarding time surveys.

The paper is structured to allow for an initial brief discussion of the rationale for pricing of public transport followed by a detailed assessment of impacts on the community, including users, taxpayers and the public transport operator. Equity, environmental and congestion effects are evaluated, prior to presentation of an evaluation summary and general conclusions. More detailed discussion of particular issues are contained in separate papers prepared by the authors (Office of Transport Policy and Planning, 1990 and State Transport Authority, 1990).

2. Rationale for charging fares

2.1 Pricing as an indicator of market preferences

The role of user contributions to the cost of providing government services should not be underestimated as an important mechanism for managing demand, revealing consumer preferences and determining appropriate investment programmes. As noted by Duldig (1989, p222):

> "In general, direct user charges (prices) enable transport user demands to flow through to investment decisions, whilst budget funding clouds the nexus between transport investments and the value users place on the resulting services. Charging has the added advantage that users are aware of the costs of the use of their transport services and infrastructure."

In South Australia, user contributions only cover around 20% of the total cost of providing metropolitan public transport, rising to 25% if ownership costs (interest, depreciation etc) are excluded. The State Transport Authority does, however, use its fare structure to encourage travel at times when it is more cost effective to provide services. For example, Weekday Interpeak fares (9am - 3pm) are discounted by an average of 33% compared to peak fares. However, even with these generous discounts the operating subsidy, excluding ownership charges, on interpeak services ($0.93 per passenger in 1988/89) is lower than on peak services ($1.17).

2.2 Economic considerations

In a non-distorted market situation it would be economically desirable for the price of a public transport trip to equate to the marginal cost of producing that trip. With a significant proportion of fixed infrastructure in total costs, as is typically the case in public transport systems, this would result in a need for some subsidy, as marginal cost is less than average cost. The understatement of full social costs in the pricing of private transport also provides a further "second best" rationale for subsidisation of public transport, to ensure a balanced allocation of resources between the two modes. Finally, government social welfare objectives frequently require the provision of generous concession fares to particular groups, which provide a third source of "leakage" from the achievement of 100% user cost recovery.

The "correct" level of fares and resultant subsidy is therefore subject to a number of influences and will vary depending upon the relative impact of the factors outlined above. In the Adelaide context Amos and Starrs (1984) have

suggested that the "justified" deficit is only about half of the actual deficit, implying that significant fare increases are therefore appropriate. Free travel would, however, rely for its justification on the validity of the opposite conclusion, that the combined impact of external and welfare factors is in fact greater than the existing deficit.

While the appropriate level of subsidy remains a matter of debate, it is arguable that subsidisation of public transport per se leads to leakage of benefits away from users in the form of greater operator inefficiency. Turk and Sullivan (1987) concluded, on the basis of an analysis of 18 British systems, that for each 10% rise in the proportion of total costs covered by subsidy, a long run rise in unit operating costs of 4.5 to 5% occurs. However, by underwriting higher levels of service provision, (economies of scale) subsidy also provides user benefits in terms of reduced total journey times.

3. Community impacts

3.1 Impacts on users

3.1.1 Public transport usage rates

Public transport usage in Adelaide over the past decade has been of the order of 60 million journeys per annum, which represents around 60 trips per resident per year. This is low compared to the corresponding car trip rate of 560 trips per year and reflects the low density urban nature of Adelaide which has few impediments to car usage. Apart from the central city commuter market, public transport has a minor share of journeys. This is reflected in the majority group of patronage (60%) who are concession users and generally considered to be public transport "captives". Against this background the intuitive assessment is that free travel, of itself, is unlikely to cause a revolution in transport habits. A more rigorous assessment of the actual magnitude of the expected patronage increase is undertaken in the following paragraphs.

For Australian public transport, the elasticity of demand with respect to fare reductions has been found to be less than the international standard ($E = -0.3$), with $E = -0.2$ being a common estimate. On this basis, free travel, which is equivalent to a 100% fare reduction, would lead to a 20% patronage increase. However, free public transport would be expected to generate a greater patronage response, simply because it is free. The exact magnitude of the patronage response is an area of major uncertainty as there are virtually no sustained cases of universal free transit in any large city in the world.

International studies, including Domencich and Kraft (1970), suggest

that a patronage increase of the order of 30% could be expected. A greater response is assumed from off peak, as opposed to peak passengers, reflecting more flexibility regarding time of travel and destination choices. Limited experience with free travel schemes in Adelaide supports this assessment. The provision of free travel for pensioners during the weekday interpeak period between 1980 and 1986 produced a sustained patronage gain of 40% for this patronage group. System wide off peak patronage generation could therefore be of the order of 40% with peak patronage increases assumed to be less, of the order of 25%. Based on the Adelaide experience post-1980, a lead time of 1-2 years may be required to achieve the full projected build-up of patronage.

3.1.2 Financial savings

All existing fare paying users would experience a direct financial benefit equal to the fare currently paid. This benefit would vary depending on the frequency of usage and level of fare paid. On STA services, it would range from less than $1 per week for infrequent concession users to nearly $20 per week for high frequency outer suburban commuters. An average full-fare paying commuter would save $12 per week in fares. The cumulative annual value of free travel, in terms of existing fare revenue would be $36m (1989/90).

However free travel is not free, in the sense that the resultant requirement for increased subsidy must be financed from another source. As an illustration, a nominal increase in State petrol tax of around 100% (4.5c per litre) would be required to make up this revenue gap. Distributional implications are further explored under Section 3.3 (Equity Considerations).

There would also be a welfare benefit for new passengers which represents their consumer surplus at the zero fare level. In practice this may represent the saved costs of alternative travel or the benefit derived from a generated trip. An annual valuation of $5m has been calculated, based on an average value of 50% of the current average fare. It should be noted that this benefit may be offset by efficiency losses in raising additional taxes.

3.1.3 Public transport network and service levels

The increased demand generated by free travel (+25% peak:+40% interpeak) would be expected to lead to an improved frequency of service and, to a lesser extent, improved network density. The opportunities for easy transfer between vehicles without lengthy waiting times would be enhanced. Overall, a 15% increase in bus service provision and a 20% increase in tram and train service provision are predicted, based on existing capacity utilisation.

Appendix 1 (case study) provides more details on the derivation of these figures.

In the immediate short-term, say up to 3 months, patronage increases could be accommodated on existing services through utilisation of vacant capacity (unoccupied seats) or increasing the number of standing passengers per vehicle. However, as patronage builds up to the full predicted increase, possibly over a 1–2 year period, continuation of this policy would lead to severe overcrowding, increasing delays and subsequent service unreliability and related industrial problems. User, union and political pressure would be such that service increases will have to be provided, so as to broadly maintain the pre-existing service quality. Indeed, some additional services have already been provided in Adelaide to cater for increased demand generated by free child/student travel.

3.1.4 Travel time impacts

Each public transport journey consists of out of vehicle time (walking, waiting and transfer time) as well as in-vehicle time. With a policy of providing additional services in response to increased patronage (as assumed in Section 3.1.3) free travel would furnish travel time benefits for public transport users. This would occur both through reductions in average waiting times and transfer times and reduced in-vehicle travel times associated with faster passenger boardings. While the individual savings are low as outlined below, the combined annual valuation amounts to half of the existing fare revenue base. The methodology employed assumes that average waiting times are half of the vehicle headway (service frequency). In practice this would tend to overstate savings in Adelaide where low service frequencies mean that most passengers plan travel using timetables, rather than randomly arrive at a stop. Against this, it may be argued that improved service gives a benefit of greater flexibility in travel options, even if an actual waiting time saving is not realised.

Given average Adelaide peak service frequencies of 10 minutes and interpeak frequencies of 30 minutes, the reduction in waiting time associated with a service improvement of 15–20% would be of the order of 1 minute in the peak and 2.5 minutes in the interpeak. In addition faster boarding times would be expected to generate peak journey time savings of 1.0 minute per passenger and interpeak savings of 2.0 minutes per passenger. Evening and weekend services have been excluded from these calculations on the basis that travel time benefits will be insignificant.

Application of updated Hensher (1989) estimates of travel time values leads to an annual value of travel-time savings of $18m. The majority of these calculated benefits relate to reduced waiting time ($13m) while faster in-

vehicle journey times are valued at $5m. This result reflects the greater value assumed to be placed by passengers on out of vehicle time. Given the methodological riders outlined above and the very small unit time savings involved, these estimates should be viewed as the upper limit of the value of travel time savings.

Travel time savings for generated patronage have been valued at half the rate of that for existing passengers. Appendix 1 provides full details of the calculations employed for valuation of the travel time savings presented in this section.

3.2 Impacts on the public transport agency

With the assumed patronage and service changes outlined in Section 3.1, the State Transport Authority would undergo a period of transition to adjust to the new public transport task. The major findings of a detailed case study which focuses specifically on STA operations (State Transport Authority 1990) are briefly summarised below:–

- A range of revenue related functions (ticket selling, revenue accounting, revenue inspection and ticket system maintenance) would be abolished, leading to operating cost savings estimated at $12m per annum (8%) and a net reduction in employment of 160 positions (5%).
- The new expanded service task would require a net increase in the peak vehicle fleet of nearly 100 vehicles, (77 buses, 3 trams and 16 railcars) after allowing for a reduction of 18 buses due to journey time reductions caused by faster boarding times. Additional capital expenditure on depot facilities would also be required to cater for the expanded vehicle fleet. The associated increase in operating costs ($33m) and employment (355 staff) is more than double the projected savings in revenue functions.
- Since September 1987, the Crouzet electronic ticket system has allowed the collection and analysis of patronage data by route, passenger group and time of day to a level of detail and accuracy not widely available to public transport operators. While this information has been affected by the introduction of free child and student travel in January, 1990, it would be completely lost under free travel. Alternative data sources, probably at a significantly greater cost, would need to be developed to provide essential data for service planning and patronage monitoring.
- A net increase in government subsidy of $57m per annum (37%) would be required. The STA's funding relationship with the government would probably shift more towards the model of a welfare department as opposed to a business enterprise, in the absence of a significant user

revenue source. Performance targets and corporate planning strategies would need to be reviewed.

3.3 Equity considerations

One of the cited objectives for free public transport, which is particularly strong in the American literature (see for example Connor 1982) is to improve mobility for disadvantaged groups in the community, including the poor, old, non drivers and young people. Although American systems, and to a similar extent the smaller Australian systems (Adelaide, Perth, Hobart, Canberra) tend to have a predominantly welfare-based clientele, there are three issues of concern raised by this objective:-

- to what extent is the level of existing fares a barrier to travel, given that the mobility of many target groups is not well accommodated by the existing system?
- universal free travel appears to be a coarse method of bestowing a welfare benefit to particular target groups and must, by its very nature, spill over to other groups such as commuters who have no particular financial need; and
- it may also discriminate against low income non-users and areas without good transport within a city or state. Redistribution of income from public transport poor areas to wealthy commuter belts is implied.

Practical experience of sustained universal free travel in public transport systems is difficult to locate. However, off-peak free fare experiments conducted in the United States, in Denver and Trenton, New Jersey, in the late 1970s, were assessed in detail against a number of objectives, including equity. Doxsey and Spear (1980, p48) found no clear evidence of greatly improved mobility in either experiment and concluded that "it does not appear that system wide free fare represents a well focussed policy tool for the provision of mobility to specific population segments."

In the Adelaide context, options for better targeting the socially disadvantaged include free travel for concession holders only, at all times or during the interpeak (9am-3pm) period only. The cost of these measures in terms of fare revenue forgone would be $7.5m and $3.0m respectively, with only a minimal associated requirement for service increases. Compared to universal free travel, the cost would be at most only 20% of the full estimate.

It is also worth considering special needs of certain groups. Conventional public transport generally only caters for a certain type of concession rider, the able-bodied. For many aged persons and others with limited mobility, a transport system consisting of taxis and private cars would be more relevant than a fare free proposal covering only conventional public transport (Baum, 1973, p17). In addition, in the fringe suburbs of Adelaide the commu-

nity is concerned with local access to a range of facilities which conventional public transport is not equipped to provide effectively. Free public transport is less likely to satisfactorily meet these transport needs than provision of equivalent funding for local community transport (Fielding, 1988, pp 53 and 61).

On balance, if an improvement in equity and social justice is the desired outcome, universal free travel is not the appropriate policy instrument.

3.4 Environmental and road congestion impacts

Public transport is around four times as energy efficient per passenger kilometre as the private motor car based on average vehicle occupancies in Adelaide (Srinivasan, 1989), and also contributes significantly less to greenhouse gas emissions. Encouragement of public transport usage must therefore be considered as a component of an overall strategy to conserve energy and reduce greenhouse pollutants. By inducing higher patronage levels estimated in this paper to be of the order of 30% in metropolitan Adelaide, *free* public transport indirectly contributes to the realisation of environmental objectives.

How effective a contribution can free travel be expected to make? In a city such as Adelaide where the public transport component of total metropolitan travel is less than 10%, a 30% increase on such a small base figure is unlikely to cause dramatic changes in road use or pollution. The actual magnitude of the changes would also depend on the former travel habits of new public transport users. The US Department of Transportation (1981, p252) has suggested on the basis of a literature review that no more than 50% of new riders are likely to be former car drivers, with significant proportions of generated trips, being diverted trips from car passengers and additional trips by existing passengers.

Application of these findings to the Adelaide context would result in an overall reduction in car usage of less than 2% and a reduction in transport carbon gas emissions of around 1.5%. As transport emissions comprise only 30% of total carbon gas emissions in South Australia, the net overall reduction is less than 0.5%. Free travel as a key policy instrument to achieve environmental goals would therefore not appear to be a cost effective means of reducing emissions. Other measures which are likely to have a greater impact in the transport sector include more intensive use of existing private vehicles (eg through car pooling, high occupancy vehicle lanes) greater use of fuel-efficient vehicles including bicycles, implementation of a carbon tax on fuel use and the development of alternative fuels.

By implication, road congestion impacts are also likely to be marginal. While the overall reduction in road usage is expected to be less than 2%, the reduction will be greater, of the order of 6%, on key arterial roads serving the

central city where public transport has a greater mode share (40%). These estimates are broadly consistent with the modelling work conducted by Domencich and Kraft (1970) on the effects of free travel in Boston, where a reduction in peak hour car traffic of 6-9% was estimated.

In the local context the North-East Busway (Stage 2) has generated a peak patronage increase of 9% but has had no demonstrable impact on city-bound road traffic in the corridor (Pak-Poy & Kneebone Pty Ltd, 1990). The South Australian Office of Transport Policy and Planning has further suggested that traffic reductions of the order of 20% would be required to have significant impacts on road user amenity.

At best, the estimated reduction would allow major road projects to be deferred by one or two years. It is also contended that in the absence of appropriate road pricing, more efficient alternatives than free public transport exist to reduce road congestion, namely travel demand management techniques such as parking restraints, flexible work and school hours, and land use measures (Travers Morgan, 1988). Indeed, without complementary restrictions on car use, free travel may not affect traffic congestion at all, as new car users are attracted by the marginal improvement in road conditions.

3.5 Other objectives

Other objectives/benefits cited for free public transport include promoting CBD development (by reducing transport costs) reducing parking requirements, and (as a short-term scheme) marketing/service promotion.

For most Australian cities, revitalisation of CBD precincts is not a major issue although there is some concern to slow the drift of business to non CBD locations. Even here the evidence of the impact of fare free public transport is somewhat conflicting, with Atherton and Eder (1982) suggesting a positive impact on business and Connor (1982) finding no evidence of benefits. Studenmund and Connor (1982, p266) found that, in relation to the American off-peak experiments in Denver and Trenton, "many merchants complained of increased loitering and shoplifting, particularly by youths, during free service hours; some supported free service only for senior citizens."

Dillon (1970, p22) suggests that the most significant contribution of a free public transport proposal is the indirect parking capacity effect, assisting availability of short term parking. Kemp (1974, p11) also identified a reduction in the need for CBD parking requirements. In relation to reducing parking requirements, however, direct charging and supply management would be more effective alternatives.

Free public transport may have a role as a short term promotion or marketing tool, as US experiments indicate that when fares were reintroduced a significant proportion of a free fare public transport induced ridership was

retained Several authors, including Signell and Schifferli (1983, p470), Studenmund and Connor (1982, p267), and Connor (1982, p6) have raised this issue Limited local experience of free travel days, often in association with special events, indicates large patronage increases, implying that many non-users may gain exposure to the system that could lead to more regular use

4. Evaluation

The objective of this section is to draw together the various areas of discussion by highlighting the expected impacts of free public transport on net government outlays and the general community. Figure 1 summarises these impacts.

A net cost to government of around $70m (1.5%) is implied, representing a cost per household of $140 pa. Of this, 80% represents the increase in subsidy payments for metropolitan public transport with the remainder composed of increases in non-metropolitan transport payments (16%) and a reduction in road user revenue (4%) How will this additional expenditure be funded? In the absence of specific Federal Government payments, the choice is either through increases in State taxation or reductions in other State expenditure programmes. If the former path is pursued, a 50% increase in road user charges would generate the required funds, while if the latter is chosen, expenditure reductions greater than the annual operating cost of the Adelaide Children's Hospital must be implemented. Both possible funding options would, in the words of Sir Humphrey Appleby, be "politically courageous" given the doubtful case in terms of community benefits.

We now turn to the community side of the balance sheet. The direct ("cash in pocket") benefits to metropolitan and country users would be of the order of $50m per annum. These benefits would be augmented by the travel time and new user savings associated with a no fares system and associated improved service frequencies, valued at around $20m per annum. There would be minor improvements in environmental amenity and traffic congestion, not quantified in dollar terms in this paper, and a reduced level of road accidents, valued at $3m per annum. There may also be a longer term reduction in car purchases, although the magnitude is difficult to estimate.

In order to fund the free travel package, most taxpayers and citizens would be worse off, either through increased taxes or withdrawal of other government services. There would be a large spillover of benefits to particular groups (eg affluent white collar commuters, residents in areas well served by public transport) for whom there is no case in terms of social justice. Paradoxically, by virtue of the free pricing, the image of public transport as a

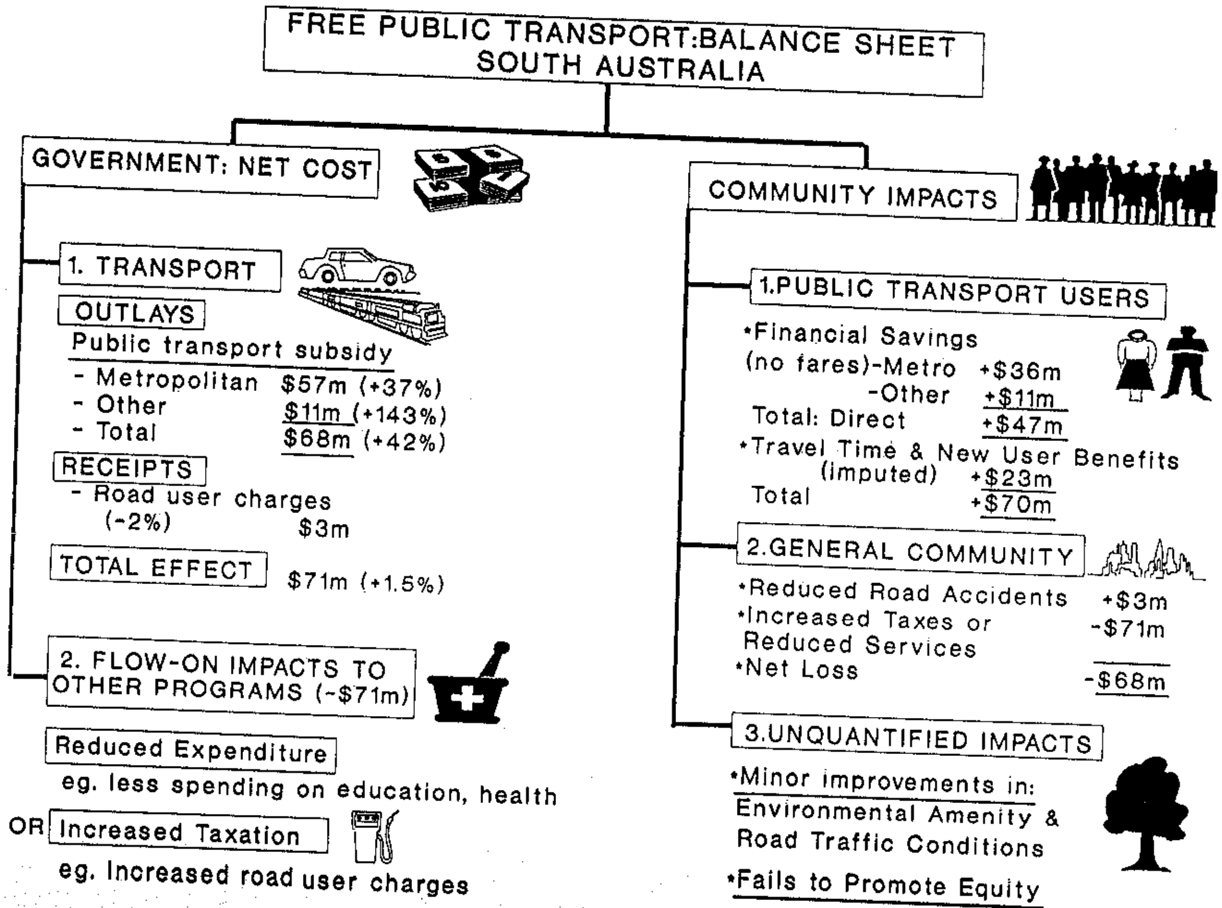
FREE PUBLIC TRANSPORT:BALANCE SHEET
SOUTH AUSTRALIA
GOVERNMENT: NET COST
1. TRANSPORT
OUTLAYS
Public transport subsidy
- Metropolitan $57m (+37%)
- Other $11m (+143%)
- Total $68m (+42%)
RECEIPTS
- Road user charges
(-2%) $3m
TOTAL EFFECT $71m (+1.5%)
2. FLOW-ON IMPACTS TO
OTHER PROGRAMS (-$71m)
Reduced Expenditure
eg. less spending on education, health
OR Increased Taxation
eg. Increased road user charges
COMMUNITY IMPACTS
1.PUBLIC TRANSPORT USERS
•Financial Savings
(no fares)-Metro +$36m
-Other +$11m
Total: Direct +$47m
•Travel Time & New User Benefits
(imputed) +$23m
Total +$70m
2.GENERAL COMMUNITY
•Reduced Road Accidents +$3m
•Increased Taxes or
Reduced Services -$71m
•Net Loss -$68m
3.UNQUANTIFIED IMPACTS
•Minor improvements in:
Environmental Amenity &
Road Traffic Conditions
•Fails to Promote Equity

FIGURE 1.

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Appendix 1

Calculation of travel time benefits

1. Improved headways

1.1 Existing Users

1.1.1 Peak Periods

Existing Headway/Waiting Time	=	10 mins/5 mins
New Headway/Waiting Time	=	8 mins/4 mins
Time Saving per passenger	=	1 min
Value of time		
(Out of vehicle , Adelaide)	=	($6.99 x .8 Bus) +
(Source–Hensher, 1989, p228)		($11.39 x .2 Train
	=	$ 7.87 / hour ($1987)
	=	$ 9.05 / hour ($1989)
Annual Value of Savings	=	$9.05 X 1 / 60
		x 36m journeys
		= $ 5.4m

1.1.2 Off–Peak Periods

Existing Headway/Waiting Time	=	30 mins/15 mins
New Headway/Waiting Time	=	25 mins/12.5 mins
Time Saving per passenger	=	2.5 mins
Annual Value of Savings	=	$9.05 x 2.5/60
		x 16m journeys
		=$6.0m
Total: Existing Users		$11.4m

1.2 New Users (Benefits calculated at 50% of existing user rates

Peak $5.4m x 25% x .5	=	$ 0.7m
Off–Peak $6.0m x 40% x .5	=	$ 1.2m
Total: New users	=	$ 1.9m
Total: Improved Headways	=	$13.3m

2. Faster journey times

2.1 Existing Users

2.1.1 Peak

Time Savings Per Vehicle Trip	= 1.5 mins
Per Passenger Trip	= 1.0 mins
Value of Time (In Vehicle, Adelaide) (Source Hensher, 1989, p228)	= ($3.51 x .8 bus)+ ($2.13 x .2 train)
	= $3.23/hour ($1987)
	= $3.72/hour ($1989)
Annual Value of Savings	= $3.72x1.0/60x36m
	= $2.2m

2.1.2 Off Peak

Time Savings Per Vehicle Trip	= 2.5 mins
Per Passenge Trip	= 2.0 mins
Annual Value of Savings	= $3.72 x2.0/60x 16m
	= $2.0m
Total: Existing Users	= $4.2m

2.2 New Users

2.2.1 Peak:	$2.2m x 25% x .5	= $0.3m
2.2.2 Off Peak:	$2.0m x 40% x .5	= $0.4m
2.2 Total: New Users		= $0.7m
Total: Faster Journey Time		= $4.9m

3. Grand total

(Improved Headways & Faster Journey Times)		= $18.2m
Benefits	– Existing Users	= $15.6m
	– New Users	= $ 2.6m

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