Australasian Transport Research Forum 2013 Proceedings
2 - 4 October 2013, Brisbane, Australia
Publication website: http://www.patrec.org/atrf.aspx

The financial cost of transport in Adelaide: estimation and interpretation

Dr David Bray[1]

[1]Adjunct Associate Professor, University of Queensland

Email for correspondence: d.bray1@uq.edu.au

Abstract

An estimate is made of the total financial cost of transport in Adelaide in around 2007 based on the value of depreciable transport assets at the time and taking account of their economic lives, the cost of capital and annual operating and maintenance costs. Costs are identified separately for each public transport mode, various classes of public roads, traffic policing and various categories of road vehicle. The results show that private investment in road vehicles is three times the value of depreciable public assets. Private expenditure on owning and operating vehicles accounts for an even greater 85% share of the total average annual $7.0 billion financial cost (in December 2006 prices) of sustaining road and public transport in Adelaide. Nonetheless, the total financial cost to the government of providing public transport and road assets and services was substantial, at $0.43 billion and $0.63 billion respectively per annum. An associated indicative analysis estimates the cost of providing public transport in Australian capital cities to be around $10 billion per annum. A little over half of this cost is for capital related costs and the remainder for operations. Average annual investment of $1.5 billion is needed to replace life expired public transport assets.

1. Introduction

Considerable assets are involved in the provision of urban transport. Public assets are costly for governments to provide and operate[1]. Given the magnitude of investments by governments in urban transport, it is unsurprising that they attract considerable attention. However, the value of private investment in urban transport assets and the cost of operating them are also considerable. This is important for two reasons. Firstly, while the benefits of urban transport projects in economic evaluations are dominated by savings in personal travel time, this may reflect the under-estimation of savings in vehicle related costs that result from the projects rather than such savings being small. The second matter is that motorists do not take account of even the full financial cost of their travel when they make their travel decisions and thus make sub-optimal travel decisions (Bray and Tisato, 1997).

This paper reports on an attempt to establish the total financial cost of transport in Adelaide to provide a broad understanding of, for example, the relative scale of capital and recurrent costs, of government and private costs and of the cost of public and private transport. Given the scope of the infrastructure covered and some methodological issues that are discussed, the cost should be taken as indicative rather than being precise. In considering only financial costs, it recognizes that both private and public transport produce negative externalities such as noise and air pollution and also positive externalities in facilitating business and social activities. While important, these are not the focus of the current analysis. The financial cost of other infrastructure such as off-street car parking and crash costs that are not compensated through insurance are also acknowledged, but not estimated in the current analysis.

[1] In this paper, “operate” is taken to include maintenance as well as other ongoing recurrent costs. It includes both routine and periodic maintenance, but does not include replacement of existing assets at the end of their economic lives.

2. Review of Past Work

There appears to have been little work undertaken to identify the total cost of transport in urban areas in Australia. Several areas of work are evident. Hutubarat et al (1999) identified a range of cost indicators (e.g. the provision of bus and train services, road expenditure and car operating costs) and examined the relative scale of each indicator for 14 areas in Sydney, though they did not establish the total cost of transport infrastructure and services.

Diesendorf (2002) provides a more complete analysis of transport costs in Sydney, with an estimate of the annualised total cost of road, rail and bus transport in 1996 of $21.6 billion using a discount rate of 7%. The total cost comprised $8.0 billion for land, $3.2 billion for infrastructure, $3.0 billion for the vehicle fleet and $7.4 billion for operating costs. By mode, the annualised cost was estimated at $19.4 billion for car transport, $1.5 billion for rail and $0.7 billion for bus. This estimate includes financial costs and the cost of land, but excludes the cost of freight transport and ferries. It was based on lifetimes for land, infrastructure, bus fleet and train fleet of 25, 25, 20 and 35 years respectively.

More information on the methodology used is presented in Diesendorf et al (1999). For example, the value of land was based on an average market value of all land. While it was acknowledged that the value of land was affected by accessibility, the implication of the methodology is that land retains its value independent of accessibility and that withdrawal of a road or train line would allow the land to be sold at the average market value of all land. The use of a 25 year life for land as indicated in Diesendorf (2002) further increases the cost of land in the analysis.

The other area of work has been estimates of the cost of congestion in Australian cities. This work has to varying degrees considered the value of added travel time, increased vehicle avoidable social cost of congestion in Australian capital cities in 2005 to be $9.4 billion, with around three-quarters of this being travel time.

The current analysis most closely follows that of Diesendorf (2002), though differs in several significant respects, as discussed in following sections.

3. Deriving the Financial Cost of Transport in Adelaide

3.1 General Approach

The focus of the current analysis is the financial cost of all modes of transport in the Adelaide metropolitan area. It considers the transport system as a continuing concern, taking account of neither expansion of the system nor any diminution of it over time. The latter is a distinguishing feature from the approach by Diesendorf.

The underpinning logic for the approach is that dismantling of even a part of an urban transport system is rare and, where it occurs, some assets from the former system cannot be used or sold for some other purpose. Land and ‘sunk’ assets are examples of such assets.

As examples, the only significant instances in Adelaide where transport infrastructure has been removed in the last half century are the closure of most of the suburban tram system in the 1950s and closure of some sections of the suburban rail system in the 1970s and 1980s. In both cases, relatively little of the land freed was sold for some other purpose. Indeed, it is still possible to see the land in aerial photographs, for example the Northfield train line. Likewise, assets that once implemented do not need replacement over time are of no further consequence for the ongoing cost of the current transport system. Examples of such sunk assets are the cost of design and supervision, earthworks and service relocation.

Accordingly, the current analysis only considers the cost of depreciable assets, i.e. assets that deteriorate over time through weathering and use and hence need periodic replacement. While governments may not borrow explicitly to finance these assets, government borrowing in general means that, at the margin, these assets involve an opportunity cost of capital.

Features of the methodology used are:

- the analysis reflects the quantity of road infrastructure at the end of June 2007, motor vehicles at the end of March 2007 and public transport infrastructure at the end of June 2008 – as the quantity of public transport infrastructure does not change substantially over short periods, the analysis may be considered to reflect, on balance, a situation for 2006/07;
- costs are expressed in 2006/07 prices, which can be taken to be end-2006 prices;
- where price units need to be adjusted to take account of inflation, the consumer price index has been used;
- the cost of capital is taken to be 7%;
- the analysis is for the Adelaide metropolitan area, covering the MetroTicket region with regard to public transport and the statistical division for road transport;
- the source of information on the quantity of public transport assets in Adelaide is the then Passenger Transport Board, with public transport operating costs and patronage taken from the 2006/07 Annual Report of the SA Department of Transport, Energy and Infrastructure;
- the unit value of public transport assets has been derived based on an analysis of data for all Australian capital cities - this is discussed in Section 3.2;
- the costs for public transport reflect the former tram line, i.e. prior to an upgrading and extension that was opened in April 2007, but with operating costs for 2006/07 including 3 months of operating costs for the revised line;
- the quantity of road assets, the value of roads and annual operating and maintenance costs were provided by the then South Australian Department of Transport, Energy and Infrastructure;
- the cost of traffic enforcement and road safety was derived from the 2006/07 Annual Report of the South Australian Police;
- the number of registered vehicles in South Australia and the share of vehicle-kilometres of travel undertaken in Adelaide were taken from the Survey of Motor Vehicle Use (ABS Cat. No. 9208.0) and Motor Vehicle Census (ABS Cat. No. 9309.0). The estimated number of vehicles in Adelaide was based on the share of population in the city relative to the state;
- the average life of assets associated with roads was taken as 50 years for roads, 80 years for structures, 25 years for street lighting, 15 years for traffic signals and 13 years for police assets;
- the average life for road vehicles was taken as double the average age of the vehicle fleet as indicated in Motor Vehicle Census (ABS Cat. No. 9309.0); and
- road vehicle capital and operating costs are based on Austroads (2008).

An issue for debate is the treatment of GST. Virtually all transport infrastructure is provided by the state government and GST is excluded because the state government receives a credit for the GST cost it incurs. The matter is less clear in the case of road vehicles. It is likely that GST for vehicles used for business purposes will be offset by credits. This will affect some cars and most commercial vehicles. However, the precise extent to which this offset occurs has not been investigated in the current analysis, and GST has therefore been included in the case of all road vehicles.

The general methodology was to:

- identify the quantity of various categories of depreciable asset;
- establish an average unit replacement cost and average life for each asset;
- calculate the equivalent annual capital cost for assets;
- identify the average annual cost of operating and maintaining the assets.

3.2 Public Transport Costs

There is no comprehensive public information on the value of assets currently in use in the formal public transport system in Adelaide. This system excludes services such as community public transport and charter services. Annual Reports of government agencies in Adelaide and also in other states contain information on government owned public transport systems. However, the data is often aggregated with other activities of the concerned agencies, thus disguising the cost of urban public transport. A review of the available data indicates considerable variation in the implied depreciable value of similar classes of asset in different locations.

The current analysis is concerned with public transport assets in Adelaide. However, given the incomplete published information on the value of assets, a review was undertaken of the value of assets in other capital cities and typical values appropriate to Adelaide derived. This data is described in Appendix A. The process adopted indirectly provides information on the value of public transport assets in other capital cities, which is also shown in Appendix A.

The general approach was to:

- Establish the quantity of public transport assets in each capital city, including:
  - drawing on publicly available information (in particular annual reports for agencies responsible for urban public transport) to the greatest extent possible and supplemented by other information available to us; and
  - in the case of the TransLink and Greater Sydney regions, data was disaggregated to establish assets related to the provision of public transport in the respective city statistical divisions;
- drawing on implied unit values for various public transport assets in annual reports and drawing on other sources, make a judgement of the most likely replacement unit cost for the assets, establishing common values for use in all capital cities (e.g. the replacement cost of buses) but also allowing for differences between the cities where there were reasonable ground for variations to occur (e.g. the unit cost of rail lines);
- multiply data on the replacement value of public transport assets per unit of each asset and the quantity of each asset to estimate the replacement value of public transport assets that deteriorate over time and need to be replaced periodically in each capital city;
- draw on data in annual reports and other sources to establish the average life of public transport assets; and
- estimate the average annual cost of providing and financing public transport assets in each city.

Following sections present this analysis. It is limited by the information that is formally available. It is possible that a more detailed analysis based on data available only within government would identify slightly different values to those established here. However, the analysis has been based on an approach that draws on the best available current information and which is consistent between the cities.

There is considerable variation in the implied life of various public transport assets as indicated by the ratio of replacement value divided by annual depreciation allowance presented in annual reports. It is judged that reasonable values are 50 years for fixed train and tram infrastructure, 40 years for the North East Busway, 30 years for public transport depots, 35 years for trains and trams and 20 years for buses.

Public transport operating costs in Adelaide were derived from the annual reports of TransAdelaide and the Department of Transport, Energy and Infrastructure and information provided by the Public Transport Division.

3.3 Results

The total estimated cost of transport in Adelaide in mid-2007 is shown in Table 1. The replacement cost of depreciable government public transport assets is $2.9 billion, around a quarter of which is for vehicles and the remainder for fixed assets. The replacement cost of depreciable government road assets is almost double this, at $5.9 billion. These assets are, however, dwarfed by the $25.9 billion replacement value of road vehicles – for ease of discussion, these will be described as costs directly incurred by the community because most vehicles are owned by individuals and private companies (with the remainder being government-owned). Excluding GST from the value of road vehicles would reduce their value to $23.5 billion.

The second part of Table 1 presents an estimate of the annualised financial cost of owning and operating the transport system, again based on the depreciable assets. This shows even more strongly that the community bears most of the cost of transport through their ownership and use of vehicles, incurring 85% of the total $7.0 billion annual cost of transport in Adelaide compared with 75% of the total replacement value of depreciable transport assets.

The share of costs involved in providing public transport is, at 6%, marginally higher than the mode share of public transport based on the number of passenger journeys made. However, the expenditure on roads and road vehicles includes freight transport. In the case of road vehicles, light commercial vehicles and trucks account for 34% of the total $5.9 billion cost.

Of the estimated at $437 million financial cost of providing public transport on a continuing basis in Adelaide in 2006/07, a little over half was for capital related costs and the remainder for operations. There were around 50.3 million boardings on bus and 14.7 million boardings on train and tram in the year, with 49.4 million journeys (i.e. after allowing for trips that involve multiple boardings). This results in an average cost of carrying passengers of $3.80 per person boarding a bus and $15.75 per person boarding a train or tram (see Table 2).

The total average cost of carrying passengers on public transport in 2006/07 was therefore $8.55 per passenger journey. Total fare revenue for the year excluding GST was $70.8 million, equal to $1.43 per journey. This gives an operating cost recovery of 34%, recovery of operating costs and the cost of depreciable assets of 17%. No recent data on average trip length by mode is available, but data for 1991/92 (STA 1992) indicated 8.6 km for bus and 15.9 km respectively for boardings made on train and tram services. When account is taken of the average length of travel by published passengers on bus and rail, the average total cost for rail based travel is $0.99/passenger-km compared with $0.44/passenger-km for bus. The relatively flat fare structure in Adelaide results in cost recovery for rail based services being substantially less than for bus.

Table 1: Financial Cost of Transport in Adelaide for 2006/07 (in 2006/07 prices)

	Quantity		Replacement Cost			Annual Cost ($m)			
	Units	Qan-tity	Cost/-Unit ($m)	Total Cost ($b)	Share	Equiv. Annual Capital Cost	Oper-ating & Maint. Cost	Total	Share
A. Formal Public Transport									
Train									
Lines	km	142.0	12.3	1.74		126		126	
Depots	no.	1	21.3	0.02		2		2	
Other infrastructure				0.11		10		10	
Train cars	no.	99	3.0	0.30		23		23	
Sub-total (Train)				2.18		162		162	
Tram									
Lines	km	11.4	8.6	0.10		7		7	
Depot	no.	1	7.1	0.01		1		1	
Other infrastructure				0.01		1		1	
Tram cars	no.	16	4.7	0.07		6		6	
Sub-total (Tram)				0.19		14		14	
Sub-total (Train & Tram)				2.36		176	62	238	
Bus									
North-East O-Bahn	km	12.6	8.5	0.11		8		8	
Depots	no.	6	12.4	0.07		6		6	
Other infrastructure				0.01		1		1	
Buses	no.	809	0.44	0.35		33		33	
Sub-total (Bus)				0.54		48	127	176	
Management & joint costs						-	20	20	
Total (Public Transport)				2.90	8%	224	209	433	6%
B. Roads									
National roads	km	91	2.49	0.23		16	8	25	
State roads									
Road pavement				1.46		106			
Structures				0.30		21			
Traffic signals				0.15		17			
Street lighting				0.09		7			
Sub-Total (State roads)	km	942	2.12	2.00		151	82	232	
Local roads	km	6,895	0.52	3.61		262	69	331	
Traffic enforcement				0.02		2	42	44	
Total (Roads)	km	7,928	0.74	5.85	17%	431	201	631	9%
C. Road Vehicles									
Cars and station wagons	'000	640	0.027	17.20		1,555	2,211	3,766	
Light commercial vehicles	'000	106	0.036	3.80		338	580	918	
Light rigid trucks	'000	5	0.045	0.21		18	65	83	
Heavy rigid trucks	000	15	0.145	2.20		171	618	788	
Articulated trucks	'000	4	0.300	1.34		126	77	204	
Private buses	000	2	0.440	1.03		90	55	145	
Motor cycles	'000	25	0.004	0.10		11	14	24	
Total (Road Vehicles)	'000	799	0.032	25.87	75%	2,309	3,620	5,929	85%
TOTAL				34.62	100%	2,963	4,030	6,993	100%

Source: see text

Table 2: Average Financial Cost of Carrying Passengers by Public Transport in Adelaide in 2006/07 (December 2006 prices)

	Bus	Rail (train & tram)[1]	Total
Total cost ($ million)			
Operating cost[1]	143	67	210 (49%)
Rollingstock capital cost	33	29	62 (15%)
Depot capital cost	6	2	8 (2%)
Other fixed infrastructure capital cost	9	133	142 (34%)
Total cost	191	231	422 (100%)
Less fare revenue (net of GST)			71 (17%)
Net cost			352 (83%)
$/passenger boarding			
Operating cost	2.84	4.54	3.22
Operating cost and all capital costs	3.80	15.75	6.50
$/passenger journey			
Operating cost	-	-	4.24
Operating cost and all capital costs	-	-	8.61
Fare[3]			
$/passenger boarding	-	-	1.09
$/passenger journey	-	-	1.43

(1) Includes management and related joint costs (e.g. for contact management, ticketing, information, etc.). These costs are allocated between bus and rail in proportion to patronage.

Source: Table 1 and 2006/07 Annual Report of the Department of Transport, Energy & Infrastructure.

4. Discussion and Implications

4.1 Limitations and interpretation

Some judgement has required in assembling the data to support Tables 1 and 2. Some key matters that need to be taken into account in interpreting the data are discussed in following paragraphs.

- There is marked variation in the categorisation of public transport assets in the accounts of agencies responsible for public transport in Australian capital cities. The value of public transport assets also differs considerably, with often divergent implied depreciation periods and unit values for what appear to be similar assets. While assets are included in annual reports at 'fair value' and depreciation is adjusted accordingly, it is possible that the values do not fully reflect the replacement value of assets. Accordingly, the analysis presented in Appendix A and which is used with regard to the cost of transport in Adelaide presented in the previous section needs to be treated as indicative.
- In seeking to provide a standardised presentation for the cost of public transport for Australian cities, there is a risk that local circumstances will affect costs in a specific location to a greater degree than has been taken into account. Even so, the method used also allows potential differences in the accounting treatment of assets by locations to be 'averaged out'.
- Capital items only include depreciable assets. Development of a transport system with similar length and capacity would be substantially higher given a need to incur the cost of land acquisition and investment in assets such as earthworks that need no further re-investment. Hence, the analysis cannot be used to identify the costs or merit of some

extension to fixed infrastructure. In this case, the full extent of costs involved would be identified as part of planning work and taken into account in cost-benefit analysis. The data can, however, be used as input to an analysis of a reduction in the extent of the transport system because the only costs that can be avoided are the extent to which current depreciable assets can be used for some other purpose and the purchase of depreciable in the future can be avoided.

- It is likely that operating and maintenance costs include all routine expenditure because they are incurred on an annual basis. However, there is potential for periodic maintenance costs to not be fully included. Given the length of the road network, it is likely that some period maintenance will always occur in any given year, and hence likely that the costs are included to a substantial extent in the analysis The lesser frequency of periodic maintenance of public transport infrastructure (e.g. mid-life refurbishment of rollingstock) makes it less likely that these costs will be evident in the accounts for any given year. It is also possible that periodic maintenance may be capitalised and hence be included with depreciation of assets with longer lives, but annual reports provide no information on this matter. Hence, there is room for doubt regarding the extent to which periodic maintenance costs are fully reflected in the analysis.

4.2 Comparison with previous work

Other than Diesendorf (2002), there appears to have been no other published attempts to estimate the cost of transport in an Australian city. The current analysis differs from this previous study by treating land as a sunk cost and including freight transport as well as cars. Assuming that the previous analysis was expressed in mid-1996 prices (this is not indicated in the paper) and using the consumer price index, its estimates should be increased by 30% to end-2006 prices. Both analyses used a discount rate of 7%.

Drawing on data in Table A.5 in Appendix A, the current analysis estimates the annualised capital cost of the bus and train fleets in Sydney at $0.12 billion and $0.26 billion respectively, compared with inflation adjusted estimates by Diesendorf of $0.03 billion and $0.14 billion respectively. The relative greater difference in the valuation of buses than trains may be explained by the inclusion in the current analysis of privately operated buses involved in the provision of scheduled services. Even so, the differences are substantial. Similarly, the current analysis estimates the annualised value of all public transport assets (i.e. both fixed infrastructure and rollingstock) also at around double that of the previous work (i.e. $0.23 billion for the bus system and $1.79 billion for the rail system, compared with inflation adjusted estimates by Diesendorf of $0.12 billion and $0.88 billion respectively). There is, accordingly, scope for further research on the matter to refine the cost estimates.

4.3 Interpretation and use

The current analysis is intended to provide an indication of the annual financial cost of the current transport system in Adelaide on the basis of the system continuing in its current form. In doing this, it has drawn on data on the unit value of public transport assets in other Australian cities to provide a more reliable estimate than seems likely based on the implied value for the accounts of one city alone. Three matters follow with regard to interpretation and use of the results of the analysis:

- The data has been drawn from a range of sources. As it is difficult to verify much of the data from independent sources, it is possible that methodological practices may vary between the sources and hence make some data not as directly comparable as would be desired.

- The costs do not include all financial costs that have been incurred in developing the current transport system and do not reflect the cost of expanding the current system. However, additions to the current transport system over time tend to be small relative to

the scale of the current system, and so the data provides a reasonable indication of the continuing financial cost of the current transport system and even small increments to it. When compared with the cost of planning and implementing new infrastructure, the analysis illustrates the extent of the costs involved that become 'sunk' capital.

- The value of public transport in Australian capital cities is based on a high level analysis rather than a detailed examination of all individual assets. Given the variability between reporting jurisdictions, it is likely that access to more detailed information on physical assets, their replacement value and the treatment of periodic maintenance than is possible in public accounts is needed to obtain a more precise valuation.

These matters indicate a need for some caution in use of the results of the analysis, both with regard to their intent and the quality of information that is available to support their derivation.

4.3 Extrapolation of public transport costs

A broad insight to the total cost of providing the current public transport system in Australian capital cities can be obtained by extrapolating from the data for Adelaide. Assuming the ratio of operating costs to capital costs is constant[2], the total annual cost will be $9.2 billion for the city areas (comprising $4.7 billion for capital costs and $4.4 billion for operating costs), and $10.4 billion when the capital regions are used for Brisbane and Sydney (comprising $5.4 billion for capital costs and $5.0 billion for operating costs). Extrapolation of fare revenue on the same basis indicates potential annual fare revenue for all capital cities of $1.5 billion and $1.7 billion inclusive of the capital regions for Brisbane and Sydney.

The analysis indicates there are $63 billion of depreciable public transport assets in the capital cities based on their replacement value. With an estimated average life of 41 years, this requires average annual capital expenditure of $1.5 billion to replace life-expired assets. The value of public transport assets rises to $72 billion when the Brisbane and Sydney regions are used in the place of their city areas.

An alternative, more recent estimate of the cost of operating public transport in the five main capital cities (i.e. excluding Canberra, Darwin and Hobart, which are included in the current analysis) was $5.2 billion per annum, with fare revenue estimated at $1.9 billion, (L.E.K. 2010). The date of the cost units is not indicated, nor is the extent of the regions covered for Brisbane and Sydney. Notwithstanding the actual and potential differences between the two sets of data, the estimates of the current study and those prepared by L.E.K. are broadly similar.

5. Conclusions

Governments are rightly concerned about the financial cost of sustaining their current urban transport assets and providing services on them because the costs are considerable. In the case of Adelaide, the government had around $2.9 billion of public transport assets and $5.9 billion of road assets that deteriorate over time and need periodic replacement in around 2007 based on the cost of replacing them with new assets and expressed in December 2006 prices. On an annualised basis, the total financial cost to the government of providing public transport and road assets and services was $0.43 billion and $0.63 billion respectively. The current analysis indicates that this cost is, however, small compared with the $5.9 billion incurred by the community on the provision and use of road vehicles. The actions that governments take have a significant consequence for this private sector expenditure.

---

[2] This is a simplifying assumption for two reasons. Firstly diseconomies of scale relative to population will lead to higher unit costs in Melbourne and Sydney and lower unit costs in the smaller cities relative to Adelaide, all other things being equal. Similarly, the competitive tendering of bus services has substantially reduced bus operating costs in Adelaide (Bray and Wallis 2008), with unit costs likely to be higher in other cities where competitive tendering has not occurred.

Expansion of the current transport system involves substantially higher costs than have been taken into account in the current analysis due to the extent of capital costs that, once expended, do not need further re-investment.

The cost of providing public transport in Australian capital cities is substantial, at around $10 billion per annum based on an indicative analysis. A little over half of this cost is for capital related costs and the remainder for operations. Average annual investment of $1.5 billion is needed to replace life expired assets.

Appendix: The Value of depreciable public transport assets in Australian capital cities

Table A.1: Estimated quantity of public transport assets in capital cities (circa June 2008)

	Adel-aide[1]	Trans-Link[2]	Bris-bane[3]	Can-berra	Dar-win	Hob-art	Melb-ourne[4]	Perth[5]	Great-er Syd-ney[6]	Syd-ney[7]	Unit
Train											
Line length	142	329	256	na	na	na	714	173	952	758	km double track equivalent
Train cars	99	477	372	na	na	na	993	189	1,520	1,210	no.
Tram											
Line length	12.27	na	na	na	na	na	249	na	na	na	km double track equivalent
Tram cars											
Rigid	5	na	na	na	na	na	267	na	na	na	no.
Articulated	11	na	na	na	na	na	232	na	na	na	no.
Total	16	na	na	na	na	na	499	na	na	na	no.
Bus											
Length of busway	12.6	21.2	21.2	na	na	na	na	na	31.0	31.0	km
Govt. buses											
Rigid	592	937	937	363	24	123	0	1,022	1,933	1,933	no.
Articulated	142	14	14	33	8	18	0	102	94	94	no.
Subtotal	734	951	951	396	32	141	0	1,124	2,027	2,027	no.
Private buses											
Rigid	68	1,014	462	na	41	na	1,420	na	1,982	1,139	no.
Articulated	10	54	25	na	0	na	52	na	73	42	no.
Subtotal	78	1,068	487	na	41	na	1,472	na	2,055	1,181	no.
Total buses											
Rigid	660	1,951	1,399	363	65	123	1,420	1,022	3,915	3,072	no.
Articulated	152	68	39	33	8	18	52	102	167	136	no.
Total	812	2,019	1,438	396	73	141	1,472	1,124	4,082	3,208	no.
Ferry											
Vessels	na	22	22	na	na	na	na	2	28	28	no.

(1) For MetroTicket region.
(2) Includes train services to Robina in the south, Nambour in the north, Moreton Bay in the east and Rosewood in the west.
(3) Includes train lines to Caboolture in the north and Beenleigh in the south.
(4) Includes the train network operated at the time by Connex and the tram network operated at the time by Yarra Trams.
(5) Includes service region between Two Rocks in the north, Wundowie in the east and Mandurah in the south.
(6) Includes Main Western Line (to Katoomba), Main Northern Line (to Newcastle), Main South Line (to McArthur), South Coast/Illawarra Line (to Wollongong), and Airport and East Hills Line, Bankstown Line, Carllingford Line, City Circle, Cronulla Line, Eastern Suburbs Line, North Shore Line, South Line, Olympic Park Line and Richmond Line).
(7) Includes train lines to Cowan (on the Main North Line) and Sutherland (on the Main South Line).
na = not applicable (i.e. there is no such infrastructure in the city)
Source: Annual reports, web sites and other sources.

Table A.2: Reported value of public transport assets for selected agencies

Agency	Value of capital assets ($m)[1]		Ratio: Depreciated value/replacement value (%)
	Replacement value	Depreciated value	
TransAdelaide	1,055	639	61%
Brisbane Transport	450	147	33%
ACTION	88	62	71%
Darwin Bus Service	13	5	40%
Metro Tasmania	41	32	77%
WA Public Transport Authority	5,030	3,550	71%
NSW State Transit Authority	982	339	35%
Sydney Ferries	313	108	34%
RailCorp (NSW)	20,016	12,693	63%

(1) In current prices at 30 June 2008 except for TransAdelaide and ACTION for which data in 2006/07 provides a better understanding. All values exclude the value of land. Replacement value is intended to reflect the capital cost that would, in June 2008, be incurred in replacing current capital assets. Depreciated value takes account of assets generally being part way through their service life.

Source: Annual Reports

Table A.3: Adopted unit value of new assets ($m per unit, in 2006/07 prices)

	Stand-ard val-ue[1]	Exceptions								Unit ($m per)
		Ade-laide	Bris-bane/-Trans-Link	Can-berra	Darwin	Hobart	Mel-bourne	Perth	Sydney/ Greater Sydney	
Train										
Track infrastructure		12.28	15.70				15.70	15.70	21.73	km double track equiv.
Buildings	1.13						2.34		3.55	train car
Plant & Equipment	0.19									train car
Rollingstock	2.75	3.03								train car
Tram										
Track infrastructure	8.50									km double track equiv.
Buildings	0.28									tram car
Plant & Equipment	0.09									tram car
Rollingstock	4.65						3.90			tram car
Bus										
Busway infra.		8.50	28.34						17.95	track-km
Bus route infra.	0.02									bus
Buildings	0.08									bus
Plant & Equipment	0.03									bus
Buses		0.43	0.40	0.41	0.42	0.42	0.40	0.41	0.40	bus
Ferry										
Wharves			1.51					0.07	1.30	vessel
Buildings									0.84	vessel
Plant & Equipment									0.72	vessel
Vessels								0.87	7.71	vessel

(1) Used for all cities other than where other specific values are used. The values are typically based on the average value for all cities. Specific values reflect data from annual reports where it is judged there seems to be a reasonable case for a value that differs from the average value.

Source: Derived from Annual Reports and judgement.

Table A.4: Estimated Replacement Value of Depreciable Public Transport Infrastructure in Australian Cities in June 2008 ($m, 2006/07 prices)

	Capital cities									Metropolitan regions	
	Adelaide	Brisbane	Canberra	Darwin	Hobart	Mel-bourne	Perth	Sydney	Total	TransLink	Greater Sydney
Train											
Track infrastructure	1,744	4,025	-	-	-	11,209	2,718	16,476	36,172	5,165	20,691
Buildings	112	422	-	-	-	2,324	214	4,292	7,365	541	5,392
Plant & Equipment	19	71	-	-	-	190	36	232	548	91	291
Rollingstock	300	1,024	-	-	-	2,734	520	3,332	7,910	1,313	4,185
Subtotal (Train)	2,175	5,543	-	-	-	16,458	3,489	24,332	51,996	7,111	30,560
Tram											
Track infrastructure	104	-	-	-	-	2,117	-	-	2,221	-	-
Buildings	5	-	-	-	-	141	-	-	146	-	-
Plant & Equipment	1	-	-	-	-	47	-	-	48	-	-
Rollingstock	74	-	-	-	-	1,946	-	-	2,021	-	-
Subtotal (Tram)	185	-	-	-	-	4,252	-	-	4,436	-	-
Bus											
Busway infrastructure	107	601	-	-	-	-	-	987	1,695	601	987
On-street bus route infrastructure	13	22	6	1	2	23	17	48	132	31	62
Buildings	63	111	31	6	11	114	87	244	667	157	310
Plant & Equipment	21	38	10	2	4	38	29	82	225	53	105
Buses	353	574	163	30	59	590	464	1,256	3,489	806	1,598
Subtotal (Bus)	557	1,346	210	39	76	765	598	2,617	6,208	1,648	3,061
Ferry											
Wharves	-	33	-	-	-	-	2	36	329	33	36
Buildings	-		-	-	-	-		24			24
Plant & Equipment	-		-	-	-	-		20			20
Vessels	-		-	-	-	-	24	216			216
Subtotal (Ferry)	-	33	-	-	-	-	26	296	329	33	296
Total	2,917	6,922	210	39	76	21,475	4,113	27,245	62,997	8,792	33,917

Source: Product of previous tables.

Table A.5: Equivalent average annual cost of existing public transport infrastructure in capital cities ($ million, 2006/07 prices)

	Capital cities									Metropolitan regions	
	Adel-aide	Bris-bane	Can-berra	Dar-win	Hob-art	Mel-bour-ne	Perth	Syd-ney	Total	Bris-bane	Syd-ney
Train											
Track infra-structure	127	294	-	-	-	818	198	1,202	2,640	377	1,510
Buildings	8	30	-	-	-	164	15	303	521	38	381
Plant & Equip-ment	2	9	-	-	-	23	4	28	67	11	36
Rollingstock	23	79	-	-	-	211	40	257	611	101	323
Subtotal (Train)	161	411	-	-	-	1,217	258	1,792	3,839	528	2,250
Tram											
Track infra-structure	8	-	-	-	-	152	-	-	160	-	-
Buildings	-	-	-	-	-	10	-	-	10	-	-
Plant & Equip-ment	-	-	-	-	-	6	-	-	6	-	-
Rollingstock	6	-	-	-	-	150	-	-	156	-	-
Subtotal (Tram)	14	-	-	-	-	318	-	-	332	-	-
Bus											
Busways	8	45	-	-	-	-	-	74	127	45	74
On-street bus route infra.	2	3	0.9	0.2	0.3	3	2	7	19	4	9
Buildings	5	8	2.2	0.4	0.8	8	6	18	48	11	22
Plant & Equip-ment	2	4	1.0	0.2	0.4	4	3	8	22	5	10
Buses	33	54	15.4	2.9	5.6	56	44	119	329	76	151
Subtotal (Bus)	50	114	19.5	3.6	7.1	71	55	225	546	142	266
Ferry											
Wharves	-	4	-	-	-	-	0	3	34	4	3
Buildings	-		-	-	-	-		2			2
Plant & Equip-ment	-		-	-	-	-		2			2
Vessels	-		-	-	-	-	3	23			23
Subtotal (Ferry)	-	4	-	-	-	-	3	30	34	4	30
Total	224	530	19.5	3.6	7.1	1,606	316	2,047	4,753	674	2,546
Total average annual cost of depreciation	77	179	9.9	1.8	3.6	502	108	643	1,524	229	799

(1) As reported by states to the CGC and adjusted as described in Appendix B and summarised in Table B.12 of that appendix.

Source: Previous tables and a real cost of capital of 7%.

References

Austroads (2008). *Update of RUC Unit Values to June 2007*. (Report No. IR-156/08). Sydney: Prepared by Julie Perovic, Caroline Evans, Bob Lloyd & Dimitris Tsolakis. June.

Bray, D. J. (1995). Tr*ansport Strategy for Adelaide: Background Report (Working Document)*. Adelaide: Transport Policy Unit. September.

Bray, D. J. & Tisato, P. (1997). Broadening the Debate on Road Pricing. *Papers of the 21st Australasian Transport Research Forum*. Adelaide, September

Bureau of Transport and Regional Economics. (2007). *Estimating urban traffic and congestion cost trends for Australian cities (Working Paper) (Report No. No. 71*). Canberra: Department of Transport and Regional Services.

Diesendorf, M. (2002). The effect of land costs on the economics of urban transport systems*. Papers of the Third International Conference on Traffic and Transportation Studies*.

Diesendorf, M., Hutubarat, R., & Banfield, K. (1999). Sydney's Passenger Transport: Accounting for Different Modes*. Papers of the 23rd Australasian Transport Research Forum*.

Hutubarat, R., Banfield, K., Göllner, A., & Diesendorf, M. (1999). Social Sustainability in Passenger Transport*. Papers of the Australian Environmental Engineering Conference*. Auckland: July

L.E.K. Consulting. (2010). *Meeting the Funding Challenges of Public Transport*. Sydney: Tourism & Transport Forum.

State Transport Authority (1992). *Performance Indicators Report - 1984/85-1991/92: Eight Year Time Series*. Adelaide: Strategic Services Branch. December.

Bray, D. J. & Wallis, I. P. (2008). Adelaide bus service reform: impacts, achievements and lessons. *Research in Transportation Economics*, *22*, 126-136.