Australian Government
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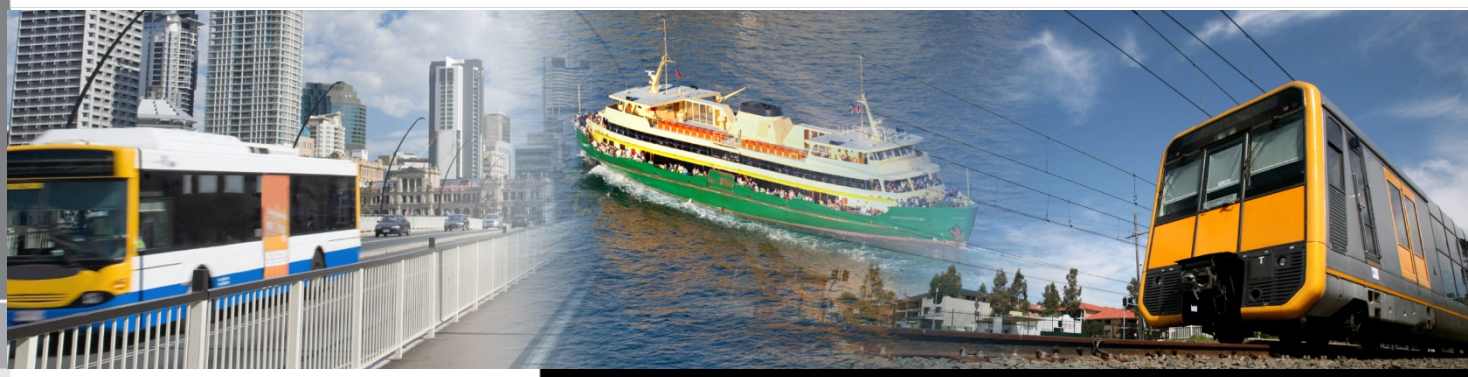
Bureau of Infrastructure, Transport and Regional Economics



Urban public transport: updated trends

At a glance

This Bureau of Infrastructure, Transport and Regional Economics (BITRE) information sheet presents summary statistics dealing with current trends in urban passenger transport, and contrasts recent growth in patronage on our cities' urban public transport (UPT) systems with the corresponding levels of private road vehicle use. (Note that annual values given herein refer to years ending 30 June.)

Over the last decade or so, some of the main developments in Australian urban passenger transport include:

- The aggregate task performed by UPT has increased; such that the average UPT mode share has tended to climb, averaging national growth of about 1.2 per cent per annum since the end of the twentieth century. The aggregate modal share of urban mass transit (summed across all capital city travel on buses, trains, light rail and ferries) had averaged close to 9 per cent (in terms of the proportion of total motorised passenger travel within the 8 capital cities) over the last decade of the twentieth century, but increased to about 10.4 per cent of motorised passenger-kilometres (pkm) by 2013.
- Despite recent increases in the UPT task, urban passenger travel remains dominated by private road vehicles; with such vehicles (cars, motorcycles and the non-freight use of commercial road vehicles) accounting for about 169 billion pkm across the 8 capitals in 2013 (89.6 per cent of motorised travel).
- Recent times have seen substantial rises in passenger numbers across many Australian public transit systems, partially due to periods of higher than average fuel prices and to various infrastructure or service expansions. Aggregate UPT patronage levels (capital city rail, bus and ferry passengers) grew at an average rate of about 2.5 per cent per annum between 2002 and 2013 (appreciably higher than metropolitan population growth, which averaged around 1.75 per cent per annum over this period).
- This occasionally quite rapid growth has not been uniform, either over time or by region. For example, the years between 2005 and 2009 saw particularly strong growth in total UPT patronage (summed across all 8 capitals), with an average increase of about 4.7 per cent per annum; while growth has tended to slow over the last few years, averaging around 1.3 per cent per annum between 2009 and 2013.
- Some transit systems have had substantially greater patronage increases than others – with passenger numbers across UPT in Melbourne (average growth of about 3.7 per cent per annum between 2002 and 2013), Brisbane (about 3.8 per cent per annum, 2002 to 2013) and Perth (about 5.2 per cent per annum, 2002 to 2013) exhibiting notable rises.
- Based on reported patronage levels from the various urban transit operators, BITRE estimates that during the 2013 financial year around 1.56 billion passenger trips were undertaken across the UPT systems of the 8 capital cities – with approximately 659 million train passengers, 191 million on light rail, 692 million on route buses (including estimated school services) and 23 million on ferries (both private and public operators) – up from about 1.2 billion passengers during the 2002 financial year.
- Factoring in estimated average trip lengths for the various modes yields a derived passenger task for UPT route services (rail, bus and ferry), totalled across the capital cities, of approximately 18 billion passenger-kilometres (pkm) over 2013. Slightly widening the scope to all *mass transit* – i.e. including all capital city bus travel (both on route services and by charter/hire vehicles) – yields an estimate of around 19.6 billion pkm for 2013 (10.4 per cent of motorised metropolitan travel).

The results presented here revise and update those previously provided in Information Sheet 31 (BITRE 2009a), Information Sheet 33 (BITRE 2009b) or earlier releases of the BITRE Infrastructure Yearbook (such as Table 3.3 of BITRE 2013a), and provide some more recent data than the detailed rail comparisons in BITRE 2012a. Though the data values presented in this information sheet are primarily displayed graphically (or in highly summarised form, as per Table 1), tabulations of detailed historical information, on passenger movement within Australian cities, are provided in an accompanying information sheet, *Long-term trends in urban public transport* (Information Sheet 60, BITRE 2014). As well, long-term numerical time-series on urban transport patterns, for each State and Territory capital city, are available in spreadsheet form on the BITRE website. Estimation and collation of the passenger task values given in these updated information sheets are based on methods discussed in a BITRE conference paper (Cosgrove 2011) on long-term UPT trends.

Trends in capital city passenger travel

In the almost seven decades since the end of the Second World War, many Australian cities have gradually transformed from quite tightly knit layouts (typically with 'core-and-spoke' configurations, well suited to passenger movement by mass transit systems), to more sprawling suburban (generally low-density) configurations. This transformation of urban form – as the major cities have tended to grow ever outwards, often leading to longer and longer average trip lengths – has been accompanied, and assisted, by considerable improvement and spread of road systems and an even faster expansion in car ownership.

The example of the post-war expansion of Sydney is suitably illustrative. The city had remained very compact throughout the nineteenth century, and by 1900 had reached a population of around half a million. By 1945, Sydney's population had grown to almost 1.8 million – yet even though the metropolitan area had also spread, the urban edge still remained reasonably close to the original city core. Sydney at the end of the Second World War still had most built-up areas well serviced by the rail network. However, by the 1970s, urban spread had added almost twice the city area to that in 1945. By 2006 another two such areas had been added (with many districts now far from or sparsely covered by rail services), leaving Sydney by 2006 covering around five times the post-war area (after a corresponding population increase, 1945-2006, of about 2.4 times).

In recent years there has been a trend towards increasing density in central city areas – BITRE (2013b) Report 142 observes that, due to redevelopment with higher density housing, the central business districts of the larger capital cities experienced rapid population growth between 2001 and 2011 (averaging more than 3 per cent per annum). However, even though the larger capitals all recorded density gains in their established inner and middle suburbs between 2001 and 2011 (see BITRE 2013b), their outer suburbs still accounted for a substantial portion of the aggregate population growth over the period. The outer city areas contributed about 46 per cent of Sydney's total population growth from 2001 to 2011, with 53 per cent for Brisbane, 62 per cent for Melbourne and 68 per cent for Perth; signalling continuing pressures for cities to spread towards the urban fringe.

Alongside the city expansions, total metropolitan travel in Australia has increased immensely over time (see Figure 1 for the annual passenger task across the capital cities, displaying growth from an estimated pkm level of only about 3.5 billion in 1900 to almost 197 billion for 2013). Motorised passenger travel within the capital cities has grown almost ten-fold since 1945, with most of that post-war growth coming from cars and other road vehicles (such as motorcycles and light commercial vehicles used for non-freight purposes). This has led to the existing dominance of private motor vehicle travel, which currently accounts for close to 90 per cent of the motorised pkm task within our capital cities (see Figure 1 and Figure 2)[1]. At the end of the Second World War, urban public transport still held the dominant share of total pkm within the Australian capital cities. However, as post-war car travel grew rapidly (especially following the cessation of war-induced petrol rationing by the end of the 1940s), aggregate UPT mode share gradually declined, reaching around 10 per cent (roughly equivalent to current levels) by about 1980.

When the component of total travel due to *commuting* is considered, the share of UPT is usually considerably higher than for this *all-day travel* modal split – with Australian Bureau of Statistics (ABS) Census values for journey-to-work (JTW) travel behaviour implying a current UPT commuting share of about 18 per cent, averaged across motorised trips within the eight capital cities (see Table 1).

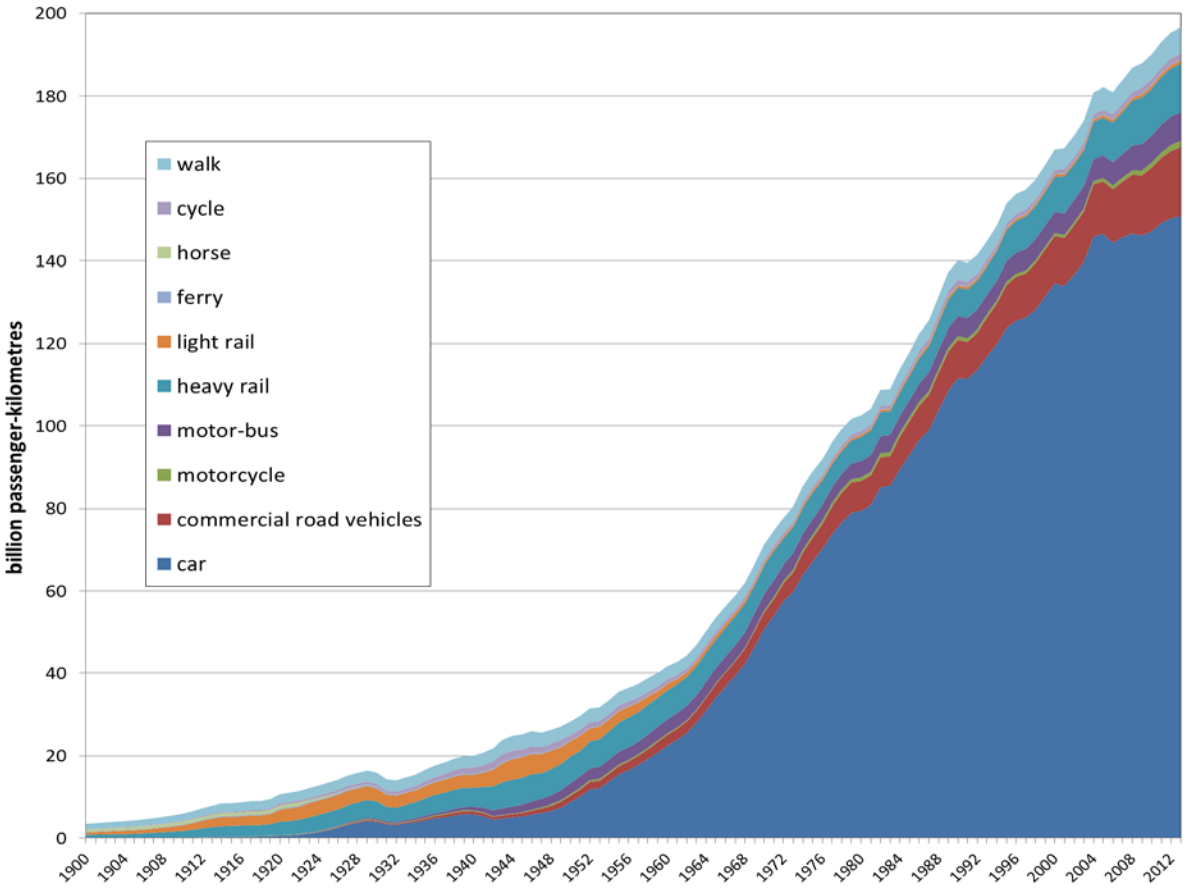
[1] Light motor vehicle share for 2013 estimated as about 90.0% of aggregate (8 capitals) motorised passenger trips and 89.6% of aggregate motorised pkm. In terms of total pkm (i.e. both motorised and non-motorised), estimated 2013 private light road vehicle share becomes about 86% for metropolitan (8 capitals) travel and 87% for all Australian urban travel (i.e. including provincial city travel as well as the capital cities).

Table 1: Commute and all-day mode share estimates for urban mass transit, 2011

Task	Sydney	Melbourne	Brisbane	Adelaide	Perth	Hobart	Darwin	Canberra	8 capitals
Mass transit commute share (% of motorised JTW trips)	24.9	17.5	15.8	10.4	13.6	7.1	5.6	8.4	17.9
Mass transit all-day share (% of all motorised pkm)	13.6	11.0	8.6	6.1	7.1	3.6	6.0	4.3	10.3

Note: 'Mass transit all-day share' values include specific allowances for *all* bus travel pkm (on both route and private buses).
Sources: ABS (2012), BITRE (2014) and BITRE estimates (see Table 6).

Figure 1: Total metropolitan passenger task for Australia, across all modes, 1900–2013



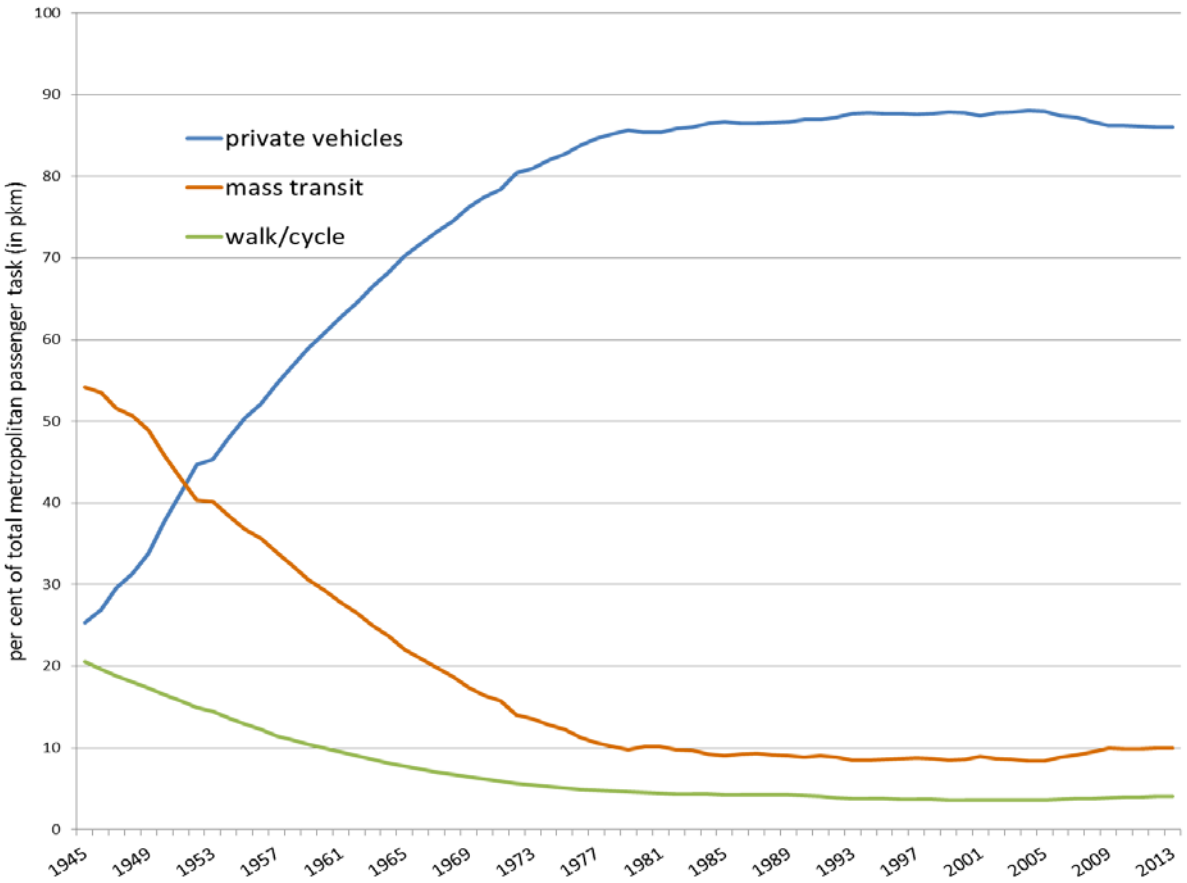
Notes: Includes total annual passenger travel (for years ending 30 June) within the 8 State and Territory capital cities, across all available transport modes (including rough estimates of non-motorised travel).

Values for 'motor-bus' include all motor vehicles with 10 or more seats (i.e. charter/hire buses and other private buses/minibuses, as well as UPT route buses). Values for 'commercial road vehicles' relate to non-freight use of such vehicles (primarily due to travel by light commercial vehicles such as utilities and panel vans).

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

Following high war-time demand levels, total UPT passenger volumes fell for over three decades (see table 2). By the 1980s, UPT patronage had started to increase again, but at an average growth rate slightly lower than for light vehicle travel. This resulted in the share of urban public transit, from 1980 onwards, still generally in slow decline, until about 2005 (see Figure 2). After this, particularly up to around 2009, it appears rising cost pressures on households saw some switching to more affordable UPT modes, and the aggregate transit share started to increase for the first time in decades. In fact, recent years have seen substantial rises in passenger numbers across many Australian public transit systems, partially due to periods of higher than average fuel prices and to various infrastructure or service expansions (see BITRE 2013c).

Figure 2: Aggregate modal shares for passenger task within Australian capital cities, 1945–2013



Notes: Based on total passenger task (in pkm for years ending 30 June) within the 8 State and Territory capital cities, across all available transport modes (including rough estimates of the contribution from non-motorised travel).

Values for 'mass transit' include all bus travel (i.e. charter/hire buses and other private buses/minibuses as well as UPT route buses) and all other UPT modes (trains, light rail and ferries). Share due to 'private vehicles' is mostly from passenger cars, but also has contributions from other road vehicles such as light commercial vehicles (when used for non-freight purposes) and motorcycles.

Sources: Cosgrove (2011), Cosgrove & Gargett (2007), BITRE (2014) and BITRE estimates.

After 2009, with some of the cost pressures starting to ease, the UPT mode share has tended to flatten out, at around 10 per cent of passenger travel in the capital cities (see Figure 3 for the modal detail of his trend). During 2013, mass transit accounted for about 10.4 per cent of motorised pkm for metropolitan Australia (or about 10 per cent of total pkm, if including non-motorised travel as well). Even though the current number of metropolitan travellers carried on Australian buses, railways and ferries is still considerable (at over 1.5 billion UPT trips per annum, see table 2), it is well below the aggregate levels reached during public transit's peak years (in the mid-1940s).

Further growth prospects

Historically, there have been two main components to the growth in urban transport use:

- Growth in *population* (and implicitly employment) in our cities
- Growth in income per person, serving to generate *extra travel per head of population*.

These aggregate factors, serving to produce a greater volume of annual trips over time, along with gradual city expansions (as mentioned previously) leading to increasing average trip lengths, has resulted in the escalation of metropolitan passenger-kilometres displayed in Figure 1. Urban travel per person, averaged across the capitals, was only around 2.5 thousand pkm per annum at the start of the twentieth century; and grew to a level of about 6 thousand by the start of the 1950s. Then much of the 1960s to 1990s saw a generally rapid climb in the overall rate of urban transport generation, with average travel per person reaching a high of close to 14 thousand pkm per annum by 2004 (see Figure 4).

Table 2: Total patronage on public transit, Australian capital cities, 1900–2013

Year ending 30 June	Sydney	Melbourne	Brisbane	Adelaide	Perth	Hobart	Darwin	Canberra	Metropolitan total
				(millions of passengers)					
1900	120.3	103.2	27.4	23.8	10.2	3.2	..	..	288.0
1910	271.9	157.6	46.7	39.9	19.3	5.0	..	..	540.4
1920	456.9	336.5	95.5	72.3	35.9	10.8	..	..	1 007.7
1930	527.6	382.7	96.0	78.4	50.4	15.0	..	0.5	1 150.6
1940	557.7	396.3	117.2	80.1	58.8	16.1	..	1.8	1 227.9
1945	832.9	630.6	202.3	124.9	89.8	31.5	0.2	3.3	1 915.6
1950	791.2	535.4	173.4	109.6	85.1	34.4	0.3	4.6	1 734.0
1960	588.5	447.2	164.6	84.9	69.7	25.3	0.6	3.9	1 384.7
1970	574.1	361.8	119.1	71.1	67.6	16.1	1.4	7.7	1 218.9
1980	478.7	280.5	89.3	73.6	63.8	13.9	1.2	18.7	1 019.7
1990	540.3	292.9	100.4	63.3	63.9	10.0	2.9	25.1	1 098.8
2000	582.3	339.5	98.2	55.2	78.6	7.5	3.5	22.4	1 187.2
2005	559.8	369.6	117.4	60.9	95.1	7.6	4.0	21.9	1 236.2
2010	603.3	498.9	154.2	68.4	131.6	7.8	4.7	23.6	1 492.6
2013	635.4	526.2	153.8	63.2	149.7	7.8	5.0	23.5	1 564.7

Notes: UPT (or 'public transit') refers in this document to any shared urban passenger transport services that are available to the general public (such as by buses, trams, trains or ferries, typically running over specified routes to scheduled timetables); as distinct from shared travel that is privately arranged (such as for taxis, car pooling or bus hire). In contrast, when the term 'mass transit' is used in this document, it refers to UPT use plus the private use of multi-passenger vehicles (such as chartered buses).

Values in this table denote total UPT passenger trips (including concessions and transfers) on heavy rail, light rail, public route buses (i.e. does not include charter/hire operations) and ferries (including private operators, but not purely cruising/recreational services).

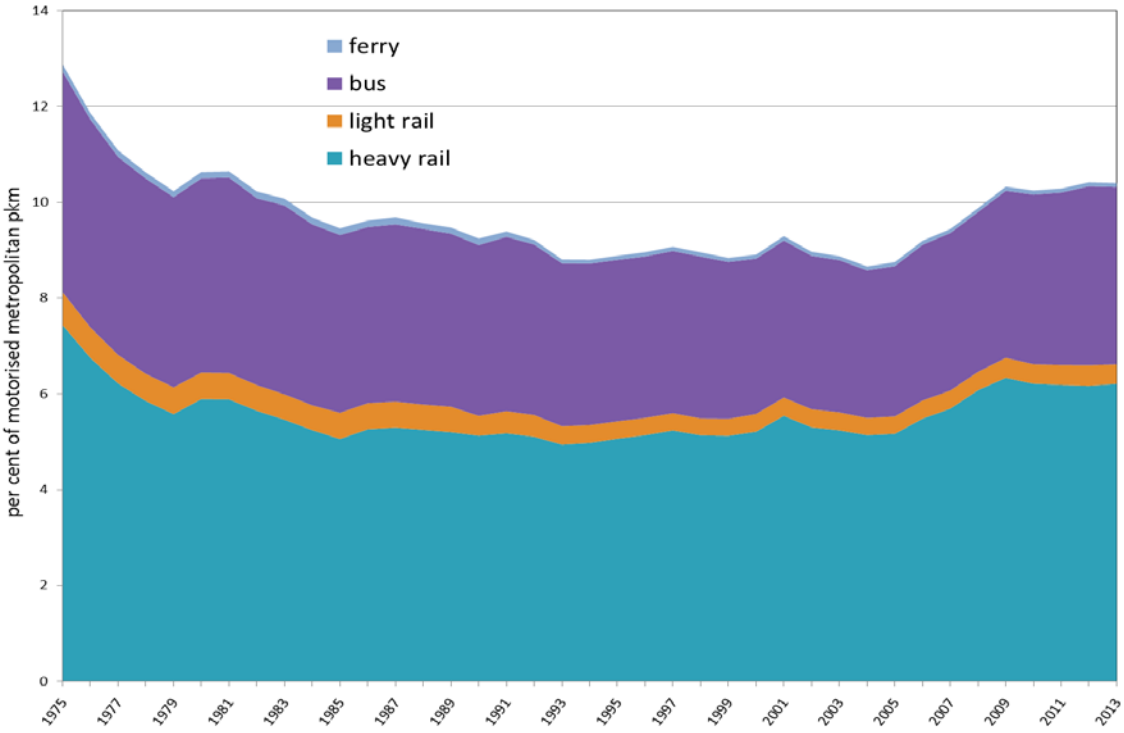
Sources: Cosgrove (2011), BITRE (2014) and BITRE estimates (based on various transit authority/service provider annual reports).

Since the respective mode shares of car travel and UPT became roughly stable after 1980, such underlying aggregate factors have probably accounted for roughly comparable contributions to the ensuing growth rates (in pkm levels) for both sectors.

Figure 4 shows that the second of the main aggregate factors – travel growth per head of population – had started to level off by about the late 1990s. Basically, eventual *saturation* in personal travel intensity tends to come about through limited daily time budgets. Even though increasing income levels will typically allow a greater range of travel choices – initially leading to increasing average pkm per person – there are constraints on how far this growth can continue. Eventually, people are spending as much time on daily travel as they are willing to commit, and are loath to spend any more of their limited time on yet more travel, even if incomes do happen to rise further. The average time spent travelling for metropolitan Australia was slightly above an hour per day (time per capita, relative to whole residential population of the capitals) for much of the twentieth century; and BITRE estimates for the period of 1900 to 2013 show no year averaging greater than an hour and a half per day (with the highest value so-far being about 88 minutes per day per capita for 2004, while the 2013 average was a bit lower at about 84 minutes per day).

Saturating tendencies (in average daily travel per capita, such as displayed in Figure 4) are evident in many jurisdictions, both in Australia and worldwide (see BITRE 2012b and BITRE 2012c). Therefore, future increases in Australian urban passenger-kilometres, as each city reaches its effective saturation level, would be expected to depend more directly on the rate of population increase, and be less dependent on increases in general prosperity levels. In other words, the second of the two main factors (increased daily travel per person) has largely dropped out of the present pkm growth equation, leaving only the first (population, and associated employment, increase) as the sole remaining *driver* of urban passenger travel growth; implying that growth in aggregate urban travel is likely to be lower in the future than for the long-term historical trend.

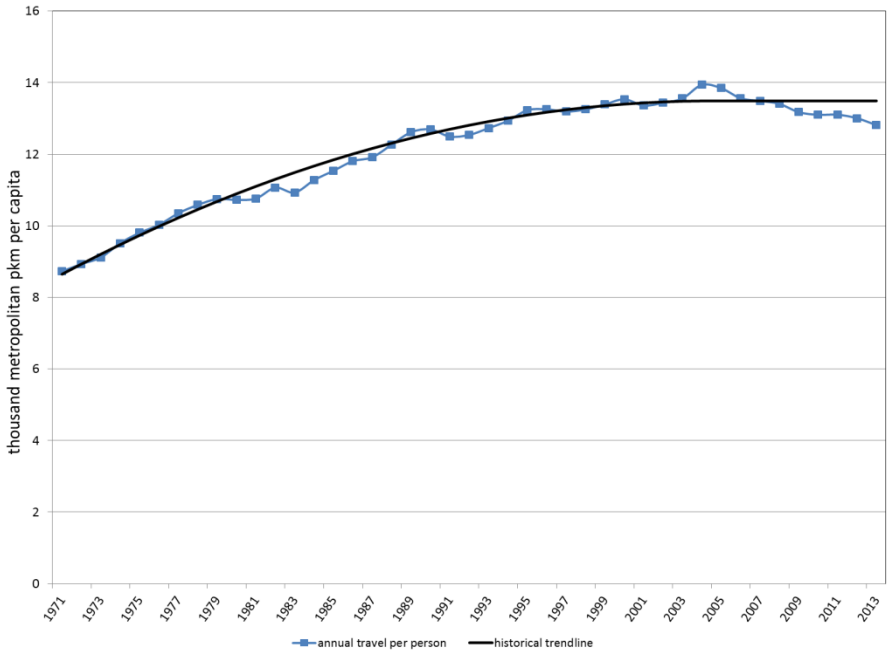
Figure 3: Modal shares for passenger task by mass transit, Australian capital cities, 1975–2013



Note: Calculated relative to aggregate motorised passenger task (in pkm for years ending 30 June) within the 8 State and Territory capital cities. Values for 'mass transit' modes include all bus travel (i.e. charter/hire buses and other private buses/minibuses as well as UPT route buses) and all other UPT use – on heavy rail (trains), light rail (such as trams and the Sydney monorail) and ferries (including private operators, but not purely cruising/recreational services).

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

Figure 4: Saturating trend for per capita urban travel, Australian capital cities, 1971–2013



Note: Calculated values refer to total annual passenger travel (in pkm) within the State and Territory capital cities, divided by the resident metropolitan population (as at each year ending 30 June) totalled across ABS Greater Capital City Statistical Areas (GCCSAs).

Sources: ABS (2014), Cosgrove (2011), BITRE (2014) and BITRE estimates.

Despite average city travel behaviour having generally followed the identified saturating trend for many years, making medium-term projections of future urban pkm levels may not, however, necessarily be clear-cut. Significant structural changes to urban transport systems[2] or large enough shifts in underlying price and income levels are capable of displacing such trends. For example, after aggregate pkm per person peaked somewhat above the long-term trend, during 2004-2005 (see Figure 4), rising fuel prices contributed to falls over subsequent years. Then the economic slowdown following the Global Financial Crisis (GFC, in late calendar 2008) caused average travel volumes to shift further downwards; such that per capita values for recent years are now well below the previous trendline.

Going forward, the main possibilities over the next few decades essentially comprise: 1) average urban pkm per capita gradually returns to the pre-GFC trendline, perhaps by about 2020, as any residual socio-economic effects on travel behaviour fade over time; 2) per capita pkm continues over the medium to longer term at about current levels (close to 13 thousand pkm per annum), with the post-GFC slowdown period having changed Australian social composition enough to effectively establish a new (lower) saturation level; or 3) the downwards movement of recent years persists, and urban pkm per capita (especially for car travel) continues falling for some time yet, before reaching a new (even lower) equilibrium level.

BITRE currently regards the first two of these alternatives as more likely than the third, though some researchers consider various social developments – such as younger people tending to delay (or even refrain from) getting a driver's licence; replacing some travel with the communication options allowed by modern information technologies; and commonly preferring modes, such as public transit, more compatible with mobile IT/social media use than vehicle driving – as capable of decreasing overall urban car use. More widespread adoption of recent innovations in vehicle sharing/booking options or ultra-light (typically electrically-assisted) vehicles also have the potential to radically change existing patterns of car ownership and urban travel behaviour.

As well as this uncertainty concerning likely growth in aggregate passenger demand levels, there is also the question of whether the stability of recent years' modal split (right hand side of Figure 2) will continue unchanged into the future. If we were to make the simplifying assumptions that both overall mode share and per capita travel remain at current levels (akin to saturation trend alternative 2 above) then both car and UPT pkm in our cities would be expected to grow by the same rate as future population growth. However, this would be implicitly assuming: a constant relationship between future population growth and various other factors influencing modal choice (such as employment patterns, urban parking supply or UPT service levels); and that major price effects (such as the cost of vehicle fuel or UPT fares) will not change enough to substantially alter travel behaviour. It could well be that future changes in household costs (such as for fuel, food or accommodation), as well as changes in wider economic circumstances, could dislodge the current mode share equilibrium (as, after all, occurred in the period around 2005 to 2009 – see Figure 3).

Investment in urban transit supply capability (often in lagged response to previous demand changes) can also affect the ability of *latent* demand for UPT to be expressed (for example, as occurred with the southern rail line in Perth, and is likely to be the case for the north-west rail line under construction in Sydney). Additionally, traffic congestion impacts, particularly if peak period delays worsen, are capable of encouraging shifts from road vehicle travel to UPT.

With regard to urban passenger transport in Australia, many of such factors have been in play over the last decade. Between 2004 and 2013, aggregate metropolitan UPT passenger-kilometres grew by close to 30 per cent; a rate almost five times that of private motor vehicles, with a roughly 6 per cent increase over this period (see Table 5). At this stage of the travel saturation curve, total pkm tends to increase by about 1.5 to 2 per cent per year in times of normal fuel prices (i.e. roughly at the rate of population growth); so the UPT task could have been expected to increase by around 18 per cent (growth in resident metropolitan population 2004-2013) over this period, even in the absence of any mode share gain. Thus the almost 30 per cent UPT increase (2004 to 2013) represents something like a 12 per cent *additional* increase – as a result of factors like higher consumer costs, extra service provision or CBD employment growth – above that due directly to city-wide population growth.

[2] One conceivable example of a large structural change, that could potentially be significant enough to alter the expected saturation path, is the possible future availability of driverless road vehicles – where infrastructure allowing autonomous vehicle movement will both increase the motorisation participation rate (with the possibility of more vehicle use by persons currently not capable of driving) and support easier long distance trips. Though a substantial amount of driverless vehicle technology already exists (especially at the prototype stage), large-scale deployment of such systems on Australian road networks is still likely to be well into the future.

Mid-range projections of metropolitan population (ABS 2014) have recent growth levels (of about 2 per cent per annum) expected to continue till about 2020, and averaging about 1.5 per cent per annum over the longer term. Thus, over the medium term, the three possibilities considered above for the per capita saturation trend are likely to encompass an average growth range of between about 1 to 2.5 per cent per annum for aggregate capital city pkm (with trend alternative 1 typically producing values towards the upper end of this range, alternative 3 the lower end, and alternative 2 roughly in the middle). Future economic conditions, and developments in transport cost levels, will have a bearing on what part of this pkm growth range actually transpires.

Resulting mode share for UPT from this aggregate growth will also depend on future movements in the sorts of underlying factors discussed above (particularly around costs to motorists); and even though the most probable outcome, at least over the medium term, is for relative stability in modal split to continue, UPT growth will be quite sensitive to any changes in standard driving activity. For example, if some structural change or high enough oil prices were to deliver a version of trend alternative 3 where an approximately 1.5 per cent per annum aggregate increase in future urban pkm was split equally between more private vehicle use and increased UPT patronage (as opposed to a typical year in the past, where the bulk of any annual travel increase would have been performed by cars), then current UPT volumes would be doubled in little more than a decade. Moreover, the current car task is so much larger than public transit's, that even such an extensive expansion of UPT use, as this particular scenario implies, would still leave light road vehicles accounting for more than 80 per cent of urban motorised pkm by 2030.

UPT: Cost and service level considerations

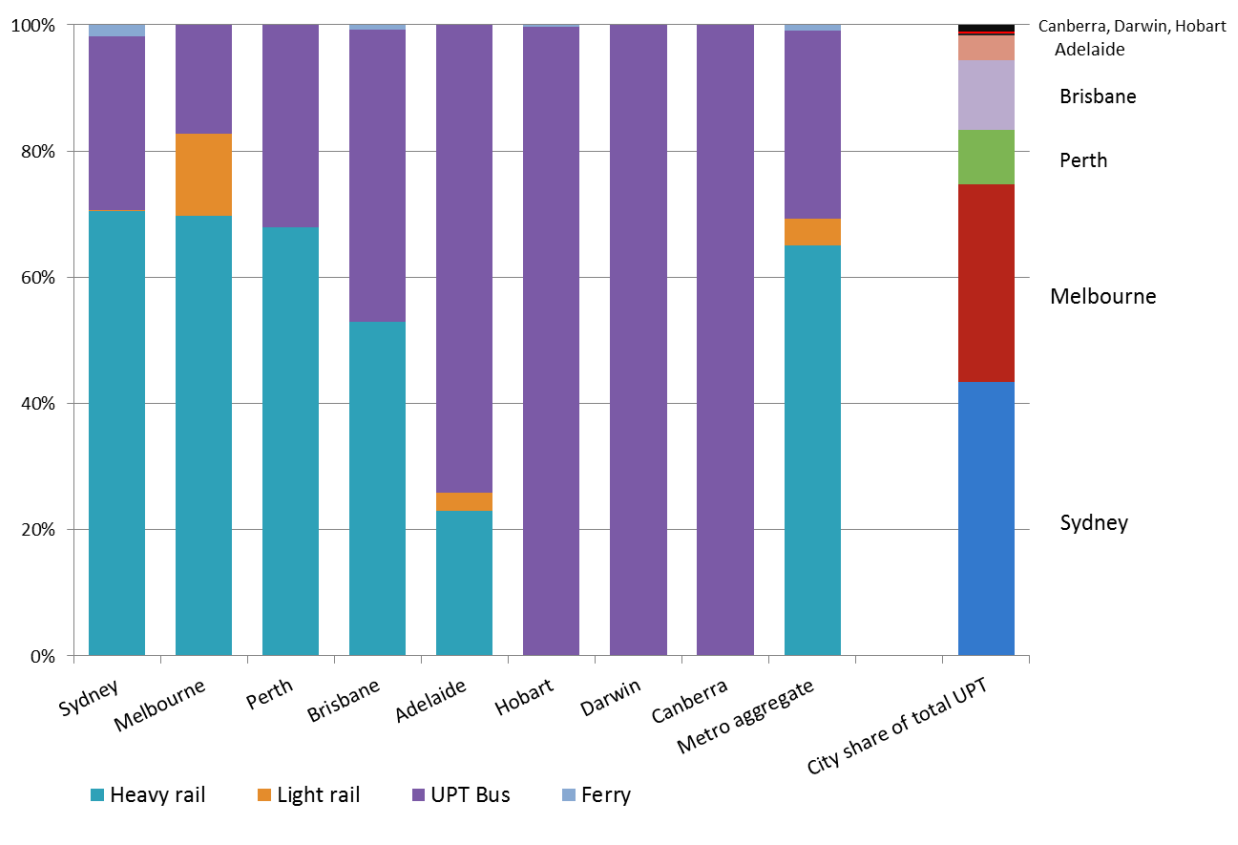
There is considerable variation in the scale and composition of the different cities' transit systems, as well as the size of their overall passenger tasks. The two largest cities, Sydney and Melbourne, have by far the largest tasks, with motorised transport performing an estimated 58.8 and 56 billion pkm respectively in 2013 (see Figures 6 and 8) within their Greater Capital City Statistical Areas (GCCSAs). This equates to current annual transport generation levels of approximately 12.4 thousand motorised pkm per capita for Sydney and 12.9 thousand for Melbourne. With fairly similar light motor vehicle travel levels (both approaching 17 billion pkm per annum), Sydney has a higher public transit task (at about 7.8 billion pkm for 2013)[3] than Melbourne (UPT of about 5.6 billion pkm for 2013)[3], with significantly greater patronage recorded on metropolitan heavy rail (about 306 million train passengers in 2013 compared with about 226 million for Melbourne).

Next in size rank, Brisbane and Perth also have roughly similar overall motorised passenger travel (27.6 and 23.5 billion pkm respectively for 2013 – giving transport generation rates of about 12.3 and 11.9 thousand motorised pkm per capita) and private light vehicle levels (at 25.3 and 21.7 billion pkm for 2013; see Table 6, or Figures 10 and 12). As with Sydney and Melbourne, Brisbane and Perth both have substantial rail networks that perform a considerable portion of their aggregate UPT tasks (see Figure 5, which arranges the cities in descending order of heavy rail's current UPT share). Brisbane had a total UPT task in 2013 of close to 2 billion pkm, compared with Perth at an estimated 1.6 billion pkm.

Adelaide (Figure 14) has substantially less overall travel (with motorised pkm in 2013 of about 13.8 billion) than Perth and Brisbane, but still accounts for more than one and half times the aggregate pkm of the remaining, smaller capitals – Canberra, Hobart and Darwin (with respective 2013 urban passenger tasks of 5.2, 2.5, and 1.3 billion motorised pkm; see Figures 16, 18 and 20) – put together. Adelaide has a smaller rail network than the larger capitals, and bus has the dominant share of its current UPT total (of about 0.7 billion pkm for 2013). Canberra, Hobart and Darwin (see Figures 17, 19 and 21) are currently serviced almost entirely by buses (with 2013 estimated UPT task levels of 0.191, 0.059 and 0.055 billion pkm respectively). Despite the present reliance of the smaller capitals on bus systems, some jurisdictions (such as Canberra) are currently planning or assessing light rail developments.

[3] Does not include charter/hire buses. Estimated 2013 values for total mass transit task (i.e. if including all private bus use) are slightly higher, at approximately 8.2 billion pkm for Sydney and 6.1 billion pkm for Melbourne – see Table 6, as well as Figures 7 and 9.

Figure 5: Share of UPT task by mode, Australian capital cities, 2013



Note: Values denote share of each city's total UPT passenger-kilometres (including concessional and transfer trips) on heavy rail, light rail, public route buses (i.e. does not include charter/hire operations) and ferries (including private operators, but not purely cruising/recreational services). Results for Sydney include rough allowance for school travel on the bus network.

Sources: BITRE (2014) and BITRE estimates (based on various transit authority/service provider annual reports).

In total, route buses and trains currently account for roughly equivalent amounts of annual metropolitan passenger journeys (taking account of all free, concessional or transfer trips – see Table 4). In terms of passenger-kilometres, heavy rail is the most significant of the UPT modes for Australia; performing about 65 per cent of the current pkm total by public transit in our capital cities (Figure 5), compared to the route bus share of close to 30 per cent. This difference in relative share is essentially due to the significantly longer trip length of most train journeys (with urban heavy rail estimated to have a national average passenger trip length around 2.3 times that for metropolitan route buses). Note that even in the larger cities, where heavy rail dominates UPT share, buses typically have key roles in providing UPT access to lower-density areas, not well serviced by the rail network, and in providing connections to that rail network. Light rail and ferries, though providing important services for certain areas/routes, only account for relatively small shares of the metropolitan aggregate (with roughly 4 and 1 per cent respectively of total UPT pkm across the 8 capitals).

Though only around 10 per cent of the current metropolitan passenger task, in aggregate pkm terms (see Figure 2), urban public transport is still generally a major component of peak hour travel into inner city areas, particularly into central business districts. For example, of peak period travel to and from work in the Sydney CBD, around three quarters of journeys are by UPT (Transport for NSW 2013). Nationwide, as shown by Table 1, the amount of urban journey-to-work travel accounted for by public transit is considerably greater than the overall UPT mode share, meaning UPT is likely to be a more important player in the area of congestion alleviation than the size of that (all-day) mode share suggests.

As well as congestion mitigation, UPT systems typically help perform a range of social services, particularly around maintaining equitable access to urban mobility. Public transit networks, offering coverage well-spread both in terms of city areas serviced and time-of-day operation, are important for improving transport access to particular parts of the community, such as those with low incomes or less ability to use private motor vehicles. To help meet the needs of passengers with limited access to other transport modes, transit authorities generally put in place targeted concession programs as part of their fare schedules – such that a

considerable proportion of Australian UPT users travel on some form of concession fare. For example, currently only around 36-37 per cent of Sydney route bus trips are made by passengers paying the full fare; with over 30 per cent made by school students or other groups travelling for free, and around a further 30 per cent by pensioners or other concessional fare types (IPART 2013, BTS 2013). Concessional travel accounts for a lower proportion on other Sydney UPT modes (with free or discounted trips at about 35 per cent of total Sydney train use, and about 41 per cent for ferries), but is still at significant levels (BTS 2013).

Partly through having to maintain such community service obligations, and due to the difficulty of covering many low-density suburban areas, Australia's UPT systems have relatively low levels of cost recovery and generally require significant levels of public subsidy. As reported in *State of Australian Cities 2012* (Department of Infrastructure and Transport 2012), average fare recovery for mass transit systems in Australia, particularly railways, are quite low by international standards (with aggregate UPT farebox revenues in our capital cities typically only about a third or less of annual operating costs).

Cost recovery estimates

Cost recovery rates for Australia's public transit systems tend to differ somewhat between cities, and over time; and are far from uniform across different regions/localities within greater urban areas. For example, recent years' overall cost recovery rate for Sydney 'metropolitan' buses has been around the order of 30 per cent, while that for bus operators under 'outer metropolitan' contracts (largely servicing outlying, less-dense suburbs or regional urban areas) can be as low as 10 per cent (Department of Infrastructure and Transport 2012, also see Table 3). In South East Queensland, as another example of route-specific variability, around five per cent of bus routes in 2012 fully recovered their running costs, while around 14 per cent had cost recovery of less than 10 per cent (Department of Infrastructure and Transport 2013). To give some further indication of such variability over time and service location, Table 3 gives a set of time-series example values (2009-2011) for cost recovery levels of various UPT operations funded by the New South Wales government transport authority (Transport for NSW).

Table 3: Sydney UPT revenue and cost recovery example, 2009–2011

	Year ending 30 June			2011 shortfall
UPT Service	2009	2010	2011	in revenue
CityRail				
Net costs ($ million)	2 325	2 672	2 994	..
Revenue from fares ($ million)	638	652	661	..
% costs recovered from fares	27.4%	24.4%	22.1%	$2 333 million
Capital expenditure ($ million)	3 217	1 199	1 274	..
Metropolitan Bus System Contracts				
% costs recovered from fares	41%	38%	32%	$648.1 million
Outer Metropolitan Bus System Contracts				
% costs recovered from fares	14%	13%	11%	$167.4 million

Notes: 'Net costs' are an estimate of total annualised costs associated with providing the particular UPT service (less non-farebox revenue); and include not only direct operating costs but also allowances for asset depreciation (spreading the capital cost of a range of assets used in supplying passenger services – including rolling stock/vehicles, maintenance facilities, depots/stations and other infrastructure – over their estimated lifetimes) and for an annual 'return' on these assets (that is, recognition of the opportunity cost of the capital invested in them, essentially by the NSW Government). For 2011, CityRail operating costs formed around three quarters of the net costs. The largest component of CityRail annual capital expenditure usually relates to infrastructure spending (such as for rail line construction or enhancement, forming around 70% of the 2011 total). In mid-2013, the brands of 'CityRail' and 'CountryLink' within RailCorp (the rail statutory authority for the state of NSW) were superseded by 'Sydney Trains' (taking over responsibility for suburban services) and 'NSW TrainLink' (for intercity/regional services).

For buses, the state government authority (Transport for NSW) currently provides funding for UPT services throughout 14 contract regions in the Sydney 'metropolitan' area and 10 contract regions in 'outer metropolitan' areas (which basically cover Newcastle, Wollongong, Central Coast, Blue Mountains, and Lower Hunter districts – i.e. substantial services outside the Sydney Greater Capital City Statistical Area). The government-owned bus operator (the State Transit Authority) accounts for roughly 60% of current metropolitan services, the remainder being provided by privately-owned operators.

Sources: IPART (2011), Department of Infrastructure and Transport (2012), Transport for NSW (2013), RailCorp (2013).

Adding to the Sydney metropolitan rail and bus results (primarily the upper two sections of Table 3) an allowance for Sydney Ferries (which over the period covered by the table had costs averaging close to $130 million per annum, at farebox cost recovery ratios of about 36 per cent, IPART 2012a) implies Sydney public transit in 2011 recovered close to 31 per cent of aggregate annual operating costs (or around 25 per cent of total net costs, i.e. if including allowances for infrastructure spending and other capital costs[4]). The most recent annual financial statements for the state government authority (Transport for NSW 2013)[5] quote overall expenses for UPT operation in 2013 of similar magnitudes to those in Table 3, with the NSW Auditor-General (2013) reporting average cost recovery for 2013 (from the state's public transport users) of about 29 per cent for bus services, about 28 per cent for ferries and about 20 per cent for passenger rail.

For Victoria, the state transit authority, Public Transport Victoria (PTV), reports recent annual payments to UPT service providers (to cover operating costs and the further development of train, tram and bus networks) of almost comparable magnitude to NSW levels (see PTV 2013)[6]. Metropolitan train and tram providers received 2013 service payments, for total operating expenses and capital projects, of close to $1.30 billion (about $931 million to Metro Trains and $345 million to Yarra Trams). Including payments to metropolitan bus services brings the Melbourne UPT total to almost $2 billion for the 2013 financial year, with farebox revenue recovering approximately 28 per cent of these expenses – in rough accord with recent analyses of Melbourne's UPT cost recovery levels typically deriving values of close to 30 per cent (Tourism and Transport Forum 2012, Department of Infrastructure and Transport 2012).

For an indication of Brisbane's levels, the Queensland Government reports recent average cost recovery of around 24 per cent (TransLink 2013), on aggregate expenses of around $1.5 billion per annum, across the public transport services (rail, bus and ferry) within South East Queensland (SEQ)[7]. Translink (2013) summary data imply service contract expenses of over $920 million per year for Queensland Rail's *CityTrain* services; over $280 million per year for greater Brisbane bus operators (Brisbane Transport and Brisbane Bus Lines); and about $16 million per year for Brisbane City Council's ferry services (*CityCats* and *CityFerries*); with approximately a further $270 million per year for Translink regional bus contracts throughout SEQ (with close to half of this component being due to the Gold Coast and Sunshine Coast service regions).

For Perth, the Public Transport Authority of Western Australia describes (in their 2013 *Annual Report*) total expenditure on Transperth UPT services during the 2013 financial year of $847.9 million (split roughly equally between metropolitan train operations and metropolitan bus and ferry operations) – including not only direct operating costs but also annual capital expenses (such as asset depreciation). UPT operating costs formed approximately 75 per cent of this total expenditure. Transperth total revenue for 2013 was $214.5 million (of which $194 million was fare revenue). Perth UPT thus had aggregate farebox cost recovery for 2013 of slightly above 30 per cent of annual operating costs (or close to 23 per cent of total transit system expenditure) – up from fare recovery of about 28 per cent of operating costs during 2009 (PTA 2013).

Regarding Adelaide's situation, South Australian Department of Planning, Transport and Infrastructure (DPTI) annual reports give disaggregated financial statements for the various business sections it administers. Values for total expenses (less grants and subsidies, but including depreciation) of the Public Transport Services division[8] are reported as about $301 million for the 2010 financial year and $316 million for 2011 (DPTI 2011). Total reported incomes (less grants and subsidies) for the division during this period were about $88 million in 2010 and $89 million in 2011 (i.e. incomes averaged about 29 per cent of expenses for these years). The most recent annual report (DPTI 2013) has total expenses (less grants and subsidies) for Public

[4] Excluding here ongoing construction expenses for extensions to the Sydney Light Rail network.

[5] Transport for NSW (2013, *Annual Report 2012-13*, Financial Performance Summary): "During 2012-13 Transport for NSW (TfNSW) funded transport services and infrastructure provided by Government-owned and private sector entities to achieve equitable transport outcomes for the community of NSW… Grants, subsidies and service contract payments were the major expense items in 2012-13. This expenditure included $4,208.2 million provided to Roads & Maritime Services for the roads program; $101.8 million for ferry services and related expenditure and $3,348.8 million for rail improvements, maintenance and services provided to RailCorp. An amount of $900.2 million was also provided to the State Transit Authority and private transport operators for bus services in metropolitan and outer metropolitan areas of Sydney, with a further $389.9 million provided for bus services in rural and regional areas of NSW." For 2013, RailCorp reports state-wide cost recovery for passenger rail of approximately 20% of total expenses (RailCorp 2013).

[6] Public Transport Victoria (2013, *Annual Report 2012-13*): "PTV's total operating expenses in 2012-13 were $4.2 billion. The majority of PTV's expenditure was for payments to transport service providers including $1.6 billion for rail system operations and services, $1.4 billion for the Government's capital assets charge for rail infrastructure, and $0.9 billion for bus services."

[7] The resident population of Brisbane (GCCSA) currently accounts for about 70% of the total for South East Queensland (SEQ); with around 85% of UPT trips within SEQ involving travel on the greater Brisbane portion of the network.

[8] Within the Department of Planning, Transport and Infrastructure, Public Transport Services is responsible for the operation and regulation of the South Australian passenger transport network, including bus, train and tram services and the regulation of the state's taxi industry.

Transport Management of about $456 million during 2012 and $468 million during 2013; with total incomes (less grants and subsidies) of about $102 million and $94.5 million respectively (i.e. net incomes averaging about 21 per cent of expenses).

For levels associated with Hobart, the Tasmanian UPT operator – Metro (which conducts bus services across the urban areas of Hobart, Launceston and Burnie) – has over 70 per cent of its routes in Hobart, and reports recent cost recovery of about 22 per cent (OTTER 2014). That is, Metro's total expenses for the 2013 financial year were approximately $47.3 million (including depreciation, and operating costs of around $41.6 million) – while farebox revenue was about $10.5 million (OTTER 2014, quoting a Metro Submission to the Office of the Tasmanian Economic Regulator).

For Canberra, ACTION buses had previously averaged farebox cost recovery of about 21 per cent (calculated over the period from 2003 to 2007, ACT Government 2007). More recently, ACTION reports (TAMS 2013) farebox revenue of close to $22 million per annum and total annual expenses of close to $130 million (including depreciation and capital works in progress); that is, fare recovery of total UPT costs of around 17 per cent for 2013.

The Darwin Bus Service (DBS) operates the Northern Territory Government bus fleet, providing scheduled urban and school bus services for the greater Darwin area, typically accounting for something like half of Darwin's route services. Under the 'DarwinBus' brand, the NT Department of Transport allocates schedules for two operators (DBS and Buslink) over the Darwin urban routes; and reports (DoT 2013) estimated costs for 2013 of about $22.7 million, on bus ticket sales of just over $2 million (i.e. UPT cost recovery by fares of less than 10 per cent).

The Tourism and Transport Forum quotes (TTF 2012) results for 2009, finding that – averaged across the five largest capital cities – approximately 36 per cent of annual public transport operating costs were recovered from fare revenues. The more recent UPT financial information discussed here implies that, on average, such cost recovery levels are currently somewhat lower (at around 31 per cent of annual UPT operating costs, across the five larger capitals). *Total* expenditure on Australian metropolitan public transit systems – adding in all the cities' operating contributions and allowances for infrastructure spending or other capital costs (such as asset depreciation) – probably now stands at roughly $10 billion per annum; of which well less than 30 per cent is currently recovered by passenger fares.

This typically makes UPT systems, and their required levels of government subsidy, significant budget items for state treasuries. High UPT subsidies can pose significant problems, not only due to recurrent financial pressures placed on state governments, but also because they can lead to less than optimal investment decisions regarding UPT service provision (particularly as demand grows and new infrastructure may be required). As noted by the *State of Australian Cities 2012* report (Department of Infrastructure and Transport 2012): "The current mass transit financial model of large Australian cities is not sustainable and presents serious challenges for future growth. Low levels of cost recovery in the context of the fiscal priorities of governments mean that, in the absence of new revenue, it will be difficult to fund any new investment in transport infrastructure or operations."

However, by itself, low farebox cost recovery does not *necessarily* imply fares should be higher. Improving the economic efficiency and/or operational performance of a transit operator could involve a range of developments: such as changes to workplace arrangements, management/administration reform, technical or customer service innovations, enhanced ticketing systems or route optimisation. Some options may well involve changes to existing fare schedules, but any moves to radically increase overall fare levels have to be balanced against UPT's community service obligations (especially concerning concession ticketing) and whether the range of socio-economic benefits it delivers will be affected. For example, if a particular fare increase were to lead to significant patronage declines, then returns on existing assets would tend to worsen. Furthermore, any measure found capable of using UPT spare capacity, such as by boosting off-peak occupancy levels, will typically offer more marked improvements in average rates of operating cost per passenger.

Explicit UPT subsidies and grants can be contrasted with the implicit subsidy offered to road vehicle use from construction and maintenance of the road network. As well, some of the main beneficiaries of public transit provision make little direct contribution to its funding levels (apart from general taxation) – such as car drivers (especially on inner-city roads) benefiting from reduced traffic levels; or property-owners and

businesses located close to major train stations or UPT interchanges benefiting from ease of access – which raises the prospect of conceivably using means other than the farebox to adequately capture the value of public transport services to the community.

The Independent Pricing and Regulatory Tribunal of New South Wales (IPART) periodically conducts evaluations of efficient cost recovery levels for UPT operations. In a recent review (IPART 2013) they note: "It is relatively easy to identify the direct benefits that passengers receive from public transport services. For example, access to their place of work, essential services and shopping and leisure facilities. However, the external benefits of public transport services – those that accrue to the wider community – can be difficult to quantify. If there was a system of road use pricing that made the cost of car travel equal to both the internal and external costs it imposes, then it would not be necessary take these costs into account in setting bus fares. However, without such a system, government subsidisation of buses (and other public transport services) is the next-best approach to encourage optimal choices between modes of transport."

Similarly, Infrastructure Australia (2013) states that, "The optimal approach to public transport charging depends on arrangements for road charging. For places where road users do not directly face financial and external costs, fares that seek to recover the full financial costs of public transport is not a viable option. Attempts to fully recover costs would reduce the significant benefits that public transport delivers to non-users of public transport."

When making travel choice decisions, people will typically consider their own direct (i.e. *internal*) costs and benefits from taking that trip – such as fuel use or probable time savings – but will generally not take into account the (*external*) costs and benefits to other people that are generated by their trip decision. The possible external benefits of public transport can include reduced congestion (from having less cars on the road), enhanced social inclusion, reduced costs of traffic accidents, overall fuel savings, potential agglomeration (arising from clustering city growth around activity centres) or landscape (arising from less road-intensive urban design) advantages, or reductions in air pollution and associated health costs. The lack of suitable pricing frameworks – which would have travellers consider *all* the costs imposed by each trip, both internal and external – will generally lead not only to sub-optimal mode choices but also to higher amounts of overall travel (and related costs of transport infrastructure and service provision) than would have otherwise occurred.

In the absence of such frameworks in Australia, IPART attempts to quantify the external costs avoided by UPT use when assessing suitable transit fare levels. Their most recent determination dealing with Sydney bus fares (IPART 2013) considers "that the level of the government subsidy should be linked to the value of the external benefits". Furthermore, once a bus service provider has had the efficiency of their operating procedures benchmarked to industry best-practice, and subsequently had the 'efficient' costs of providing those services calculated, IPART (2013) finds that it is currently economically appropriate that "fare-paying passengers contribute only 40% of the efficient costs of providing bus services, with government funding the remaining 60%, consistent with our estimated external benefits of bus services and the expected cost of school services and concession funding." In recent years IPART (2012a, 2012b, 2011) have applied similar fare determination processes to other Sydney UPT modes[9], finding that such worth to the community (in terms of external benefits and concession ticketing), of the city's total public transit services, probably exceeds $2.5 billion per annum (roughly comparable in magnitude to the shortfall in revenue identified in Table 3).

Service levels

Though current numbers of passenger trips undertaken each year on Australia's metropolitan public transit systems are not quite as high as during the 1940s (Table 2), increasing average trip lengths over time have led to substantial enough increases in UPT passenger-kilometres, over the last three decades, to reach historical highs in aggregate annual pkm levels. Using estimated average trip lengths for the various modes, BITRE derives a passenger task value for capital city UPT route services (rail, bus and ferry) of approximately 18 billion passenger-kilometres (pkm) over 2013 (for values by mode see Table 4), which is a larger total than for any previous year. The rapid rises in UPT use of recent times have seen increases in service levels across many metropolitan transit systems, with major service delivery operations summarised in the following.

[9] The most recent IPART review of metropolitan rail fares for Sydney (IPART 2012b) found that CityRail services had been below target cost recovery ratios (representative of passengers contributing a "fair share of the efficient costs", after allowing for IPART's estimation of rail's external benefits). For example, CityRail's actual farebox recovery for 2012 of about 22% (of net costs) was lower than the IPART estimate of appropriate "cost recovery of efficient costs" calculated for the operator, of 25% for that year (IPART 2012b, pg. 13).

Sydney

For Sydney bus travel, Transport for NSW currently manages bus service contracts throughout regions in the Sydney 'metropolitan' area and 'outer metropolitan' areas (including Newcastle, Wollongong, Central Coast, Blue Mountains, and Lower Hunter districts). During 2013 there was growth in both the number of timetabled bus services and in-service bus kilometres[10] across the contract regions, continuing a rising trend over several years. In 2013 there were about 8.4 million bus route services scheduled for the Sydney metropolitan bus regions (about 7 per cent increase since 2010) and about 1.4 million scheduled in the outer metropolitan bus regions (17 per cent increase on 2010) – accounting for around 129 million in-service bus kilometres for the metropolitan bus regions (about a 15 per cent increase on 2010 levels) and around 29 million kilometres scheduled in the outer metropolitan regions (17 per cent increase on 2010) – with the government-owned bus operator (the State Transit Authority) accounting for over half of current service levels (Transport for NSW 2013, IPART 2013).

The State Transit Authority bus fleet currently comprises over 2160 vehicles (approximately 92 per cent performing route services within the Sydney Greater Capital City Statistical Area). The combined fleets of all the privately-owned bus operators currently holding contracts with Transport for NSW probably total close to 3000 vehicles, with the authority reporting 1843 of those buses being used in 2013 for metropolitan or outer metropolitan route services (NSW Auditor-General 2013).

Sydney Ferries (the major ferry services provider for Sydney) has a fleet consisting of 28 vessels, which travel around 1.3 million service kilometres per year. Transport for NSW (2013) reports that Sydney Ferries had approximately 174 thousand scheduled ferry trips during 2013.

Regarding Sydney rail developments, CityRail increased its total number of timetabled services by 10.7 per cent between 2008 and 2012. The number of timetabled train and carriage service kilometres[11] also increased significantly over this period – train service kilometres increasing by 12.2 per cent (to close to 40 million per annum) and carriage service kilometres increasing 14.1 per cent (to about 250 million per annum) from 2008 to 2012 (IPART 2013b). The current Sydney heavy rail network has 176 stations, with a fleet of over 2 thousand electric rail-cars (and 560 diesel rail-cars if including both Sydney Trains and NSW TrainLink rolling stock) running across about 904 kilometres of (electrified) track – and performing in the order of 1 million timetabled train trips per year[12]. Sydney also has a light rail line, currently close to 13 kilometres long with 23 stops (with network expansions planned), carrying over 4 million passengers per annum[13].

Melbourne

There has also been recent increases in metropolitan train kilometre levels for Melbourne, predominantly due to additional weekly services introduced during 2012 and service extensions during 2013. The current Melbourne heavy rail network consists of 218 stations and a fleet of 407 three-car train sets[14], operating on 837 kilometres of track. There are over 700 thousand timetabled train services per year, accounting for about 22 million train service kilometres during 2013.

For Melbourne's light rail network, a fleet of 487 trams operate on 249 kilometres of double track (with around 1774 tram stops on its 29 routes), performing almost 25 million kilometres each year on timetabled services (with total scheduled tram services over the year numbering more than 1.6 million).

Metropolitan bus services in Melbourne are performed by a wide range of private operators, with a total network covering approximately 6250 route-kilometres (over its 346 routes). Total combined fleet size is

[10] 'In-service' kilometres refer to the distances travelled by UPT vehicles (such as buses) operating over their scheduled routes, excluding 'dead running' (i.e. vehicle movements where no passengers are being transported over a specified route, such as relocation of an empty bus between a depot and bus interchange).
[11] 'Carriage service kilometres' are the total kilometres travelled by all carriages on timetabled (revenue generating) rail services; essentially equivalent to train service kilometres times average train length (in number of cars/carriages).
[12] http://www.sydneytrains.info/about/facts (accessed August 2014).
[13] Sydney once had one of the larger tram networks in the world, carrying over 400 million passengers per annum during the mid-1940s. However, that system had closed by 1961. The Sydney Monorail (with eight stations on a 3.6 kilometre loop) operated between 1988 and 2013 (closing on June 30, 2013), and carried around 3-4 million passengers per year. In 1997, a new light rail line opened between Central and Pyrmont, which has since been extended twice (with the latest, a 5.6 kilometre extension to Dulwich Hill, opening during March 2014, taking the current line length to 12.8 kilometres). Significant further expansions to the Sydney Light Rail network are planned (including a second line, passing through the CBD, from Circular Quay to the south-eastern suburbs).
[14] The Victorian regional rail service provider (V/Line) also has a further 41diesel locomotives (and 267 carriages) and 21 Sprinter diesel rail-cars, carrying over 13 million passengers per annum (some of which could comprise suburban travel into the Melbourne metropolitan area).

currently around 1753 buses[15], which completed around 114 million scheduled service kilometres in 2013 (PTV 2013).

Brisbane

The State agency TransLink (previously a statutory transit authority, which has now transitioned into a division of the Queensland Department of Transport and Main Roads) is responsible for the delivery of passenger transport services within Queensland. For public transport services in South East Queensland (including Brisbane) TransLink has contractual arrangements with a range of UPT operators, both private and public. UPT services in SEQ are provided by business units of the Brisbane City Council (such as the bus operator Brisbane Transport; as well as running ferry services, using 19 high-speed CityCats and 9 Cross River Ferries to deliver almost 190 thousand service trips per annum), the statutory authority Queensland Rail, and around 15 private bus firms.

The government bus operator, Brisbane Transport, has a current fleet of over 1200 buses; while the combined fleets of all the SEQ private operators holding TransLink contracts probably number greater than 1400 vehicles; of which approximately 85 per cent are used to provide TransLink services, with probably around 700 of these buses running on routes within the greater Brisbane area (GCCSA). Brisbane Transport has over 3.3 million bus route services per annum (about 50 per cent growth since 2006), with the private bus operators running on the greater Brisbane portion of the Translink SEQ network probably accounting for close to another 1.3 million services per annum, out of around 5.8 million urban and school route services per annum for SEQ as a whole. Total in-service bus kilometres across SEQ's UPT bus fleets are probably in the order of 90-100 million scheduled kilometres per annum.

Queensland Rail provides Brisbane's CityTrain rail service, running 207 three-car train sets, between 147 stations, over about 740 kilometres of track (TransLink 2013) in the South East Queensland network (about half of which is roughly within the Brisbane urban area).

Adelaide

Adelaide's UPT system (Adelaide Metro) is run by the Public Transport Services Division of the South Australian Department of Planning, Transport and Infrastructure, and consists of: a bus system (provided by three private bus contractors), which includes the O-Bahn Busway (a guided busway, the first 'bus rapid transit' system in Australia and among the longer busways in the world, running on a dedicated specially-built track approximately 12 kilometres in length); six metropolitan railway lines (with over 80 railway stations); and the Glenelg-Adelaide-Hindmarsh tram route (with 28 tram stops).

Adelaide Metro typically operates up to about 180 thousand scheduled train services each year, over a commuter rail network of about 130 route-kilometres[16]. Adelaide was the last suburban rail network in Australia to operate entirely with diesel rail-cars, with some lines now in the process of being electrified (DPTI 2013). The last few years have however seen some decreases in patronage, related to major rail line closures to allow for various track rehabilitation and pre-electrification works. A number of prolonged service shutdowns, during the network rebuilding, have contributed not only to reductions in annual train passenger numbers, but also further patronage impacts on feeder bus services. Until recently, the Adelaide heavy rail fleet consisted of almost 100 diesel rail-cars, with some of these due for retirement and others for conversion during the electrification process. As part of this on-going process, 22 three-car electric rail units have been ordered by Adelaide Metro, and are currently being progressively delivered (with 7 full sets having arrived by mid-2014 and the remaining 15 due by about mid-2015).

For light rail, Adelaide Metro operates over 70 thousand scheduled tram services a year, on a route consisting of around 15 kilometres of double track. Until the 1950s, the Adelaide tram network spanned most of the city area, but by 1958 all lines except the Glenelg tram route had been removed, replaced primarily by bus services. The single then remaining tram-line has since been extended, with further extensions planned. Light rail services are currently conducted by a fleet of 21 electric trams[17].

[15] The Victorian statutory authority for public transport (PTV) also administers regional (town) bus services; with a combined fleet of around 560 buses, performing over 22 million scheduled service kilometres in provincial urban areas.
[16] For some comparisons of rail network route-kilometres, between the states' urban systems, see BITRE (2012a) Report 131.
[17] Five refurbished 'heritage' trams are also still in the fleet, and were previously operating on a restricted weekend/ holiday timetable, but are currently not in active use.

The three bus operators under contract to Adelaide Metro perform over 3 million scheduled bus services each year (over about 200 bus routes); with a combined fleet size of roughly 1080 vehicles, accounting for in-service metropolitan bus travel in the range of 40-50 million scheduled bus kilometres per annum.

Perth

The Public Transport Authority of Western Australia (PTA) manages the operation of all UPT services (bus, train and ferry) in the Perth greater metropolitan area. Under the Transperth brand, bus and ferry services are provided under contract arrangements with various private operators; and train services are provided by the PTA's Transperth Train Operations (TTO) division.

TTO runs an electrified suburban train system, with 70 stations on five main lines. The system covers more than 173 route-kilometres, with a fleet of 234 rail-cars performing approximately 350 thousand scheduled train services each year. Since the addition to the network of the Mandurah Line (running about 71 kilometres to Mandurah, through the south-western suburbs of Perth, replacing an existing busway) in late 2007, total rail patronage has almost doubled; moreover, it has increased by more than six-fold since the system was electrified and expanded in the early 1990s.

As at June 2013, the combined bus fleets, of the commercial service providers to Transperth, consisted of 1305 vehicles (with 758 diesel and 547 CNG buses), performing 61 million bus service kilometres per annum throughout the Perth metropolitan area (PTA 2013). The Transperth bus system operated 295 standard timetabled bus routes (and 323 school routes) in 2013, accounting annually for more than 5 million urban and school route service trips. Transperth also operates a ferry service across the Swan River (with 2 ferries providing more than 25 thousand services per annum).

With the physical expansion and upgrading of the rail network, and on-going bus service expansions, the total capacity of the Transperth UPT system has increased substantially in recent times. At about 12.4 billion passenger place kilometres[18] for 2013, total capacity (across all bus, train and ferry services) has increased by more than 50 per cent since the opening of the Mandurah Railway Line. In 2013, the total capacity of the Perth rail network rose to about 7.7 billion passenger place kilometres, reflecting a roughly 7 per cent increase in train service kilometres over the previous year (to almost 16 million kilometres per annum); while for the bus fleet, total capacity increased about 8 per cent (to 4.7 billion passenger place kilometres), following an even larger increase (of 16.5 per cent) during 2012 (PTA 2013).

Smaller capital cities

The Tasmanian capital, Hobart, once had considerable passenger rail infrastructure, with a tram network, operating over eight lines, as well as a commuter train line (running north from Hobart station). Though the tram system was once extensive (reaching most of Hobart's suburbs) and well patronised (carrying over 25 million passengers per annum during the mid-1940s), the tramways were closed by 1960, in favour of bus services. By the 1970s, the urban heavy rail passenger services ceased as well.

UPT in Hobart is now primarily provided by Metro Tasmania (a state owned company that operates bus passenger services in Hobart, Launceston and Burnie). Metro Tasmania currently has a fleet of 218 vehicles, with 154 of these buses used in and around Hobart. Though Metro passenger levels in Hobart had increased by around 8 per cent between 2008 and 2012, the number of annual passenger boardings fell by around 3 per cent during 2013, partially due to several instances of industrial action (Metro 2013). Metro performs over 400 thousand route services per year in Hobart (on 231 bus routes); and in 2013 accounted for close to 7 million in-service bus kilometres throughout the Hobart metropolitan area.

The Northern Territory Department of Transport's Urban Public Bus Service (under the 'DarwinBus' brand) operated 39 routes throughout greater Darwin in 2013. Over shared routes/timetables, the two bus contractors – Darwin Bus Service (with a current fleet of around 36 buses) and Buslink (which uses around 35 buses, out of their overall NT fleet, providing scheduled UPT services for the Darwin area) – accounted for more than 4.4 million in-service bus kilometres[19] for Darwin in 2013 (DoT 2013).

[18] The total (passenger carrying) capacity of the UPT system (bus, train and ferry) is calculated by multiplying the average capacity of the fleet by the number of service kilometres provided, giving what is referred to as 'passenger place kilometres'.
[19] A total of 352 school bus services are also provided each school day (using a fleet of about 116 buses) across greater Darwin, Alice Springs and regional NT (DoT 2013).

The Canberra UPT bus service, ACTION[20] is a branch of the Roads and Public Transport Division of the Territory and Municipal Services Directorate, within the ACT Government. As at June 2013, the ACTION in-service fleet was 411 buses (TAMS 2013), with total ACTION vehicle kilometres-travelled (VKT) of 28.4 million kilometres reported for 2013.

The way ahead?

Since Australia is highly urbanised, the efficiency of urban transport can strongly affect national productivity. The Tourism and Transport Forum (TTF 2012) proposes that a "well-run public transport system is at the heart of ensuring Australia's major cities are productive, sustainable and inclusive." Enhancing the efficiency and capabilities of public transport in our cities will typically deliver a range of environmental and socio-economic benefits – especially if effective integration with non-motorised travel is supported (with the established health advantages of more 'active' transport) – while helping to improve the cost recovery of Australian transit systems. However, given the dominance of private vehicle travel within the current urban passenger task, any measures that target UPT operation in isolation to that of road vehicles will generally only make fairly limited contributions to overall environmental or urban amenity goals.

Infrastructure Australia (2013) stresses the need to find an optimal balance between the amount of private car travel and public transport use, and maintains that:

"The present lack of a widely accepted, national framework for planning, financing and managing urban transport infrastructure is an impediment to effective transport and city productivity. A strategy to improve this framework would target improved city planning, better use of transport services, and better investment in road and rail infrastructure… Key issues include: integrating transport systems; integrating long-term infrastructure planning and land-use planning; the impact of urban transport systems on productivity; the importance of urban access and equity; coherent and consistent funding and financing; consistent measurement and reporting of results… A system-wide focus would acknowledge intrinsic links between various transport types and the interaction of transport and land use."

Hence policies or pricing mechanisms that directly affect road travel patterns in our cities, while also serving to improve urban public transport operations, will become increasingly important in the years ahead.

Urban passenger task summary

The changes in size and vehicle/mode composition of the aggregate passenger transport task within the Australian capital cities, over the last decade, are summarised in Tables 4 and 5.

The total UPT task within the capitals (passenger-kilometres performed by metropolitan rail, bus and route bus services) grew from about 13.94 billion pkm in 2004 to about 18.01 billion pkm by 2013 (Table 4), with per annum growth most significant up to 2009, and more muted since then. Corresponding levels of *per capita* UPT use (calculated using resident populations within the Greater Capital City Statistical Areas) were approximately 1.07 thousand annual pkm per person for 2004, increasing to around 1.21 thousand pkm per person by 2009, before falling back slightly to about 1.17 (thousand pkm per person) by 2013.

The private motor vehicle task level, at about 169 billion pkm for 2013, is almost nine times that of mass transit (see Table 5), and has seen gradual increases over the last decade (though at a slower average annual rate than for UPT). However, per capita road vehicle travel has been declining during this time, ever since reaching historical peak levels during 2004 (of about 12.28 thousand annual pkm per person); falling to about 11.02 thousand pkm per person by 2013.

Generation of total motorised passenger transport in Australian metropolitan areas is estimated at about 12.3 thousand annual pkm per person for 2013 (see Table 6); with a corresponding value for all metropolitan passenger movement (i.e. if also including a rough allowance for non-motorised travel) of about 12.8 thousand pkm per capita (Figure 4).

[20] The 'ACT Internal Omnibus Network'

Table 4: Total UPT use by mode for Australian capital cities, 2004–2013

Years ending 30 June	Heavy rail	Light rail	UPT Bus	Ferry	Heavy rail	Light rail	UPT Bus	Ferry	Metropolitan population
	(millions of passengers)				*(billions of passenger-kilometres)*				*(thousands)*
2004	492.8	149.7	553.0	19.4	8.960	0.629	4.210	0.143	12 978.6
2005	496.3	153.6	565.6	20.7	9.063	0.641	4.324	0.146	13 149.2
2006	520.2	158.8	580.2	21.2	9.559	0.658	4.456	0.145	13 344.4
2007	549.0	163.6	596.7	21.7	10.069	0.672	4.600	0.148	13 624.8
2008	592.2	167.0	617.9	21.6	10.921	0.687	4.762	0.146	13 934.0
2009	630.0	186.7	647.5	22.6	11.441	0.753	4.974	0.154	14 261.2
2010	631.4	184.4	654.1	22.7	11.342	0.744	5.039	0.155	14 507.9
2011	646.7	191.6	667.4	20.9	11.468	0.773	5.165	0.151	14 736.4
2012	650.8	200.4	696.0	22.2	11.572	0.807	5.393	0.156	15 029.4
2013	659.1	191.2	691.5	22.9	11.713	0.770	5.364	0.159	15 342.8
Annual growth, 2004-2009	5.03%	4.51%	3.21%	3.08%	5.01%	3.64%	3.39%	1.48%	1.90%
Annual growth, 2009-2013	1.14%	0.60%	1.66%	0.37%	0.59%	0.58%	1.90%	0.95%	1.84%

Note: Values denote total UPT passenger trips and pkm (including concessions and transfers) on heavy rail (trains), light rail (such as trams and the Sydney monorail), public route buses (i.e. does not include charter/hire operations) and ferries (including private operators, but not purely recreational services), summed across the 8 State and Territory capital cities. Estimated resident metropolitan population (as at each year ending 30 June) is totalled across ABS Greater Capital City Statistical Areas (GCCSAs) for the 8 capitals.

Sources: ABS (2014), Cosgrove (2011), BITRE (2014) and BITRE estimates (based on various transit authority annual reports).

Table 5: Total passenger task (billion pkm) by mode for Australian capital cities, 2004–2013

Years ending 30 June	Private motor vehicles				Mass transit	Total motorised	Non-motorised	Total	Mass transit share
	Cars	Commercial vehicles	Motor cycles	Total Private					
2004	145.90	12.65	0.78	159.32	15.11	189.54	6.46	180.89	8.4%
2005	146.57	12.71	0.84	160.12	15.36	175.47	6.59	182.06	8.4%
2006	144.41	12.95	0.91	158.27	16.03	174.30	6.69	180.99	8.9%
2007	145.76	13.45	1.01	160.21	16.70	176.92	6.87	183.79	9.1%
2008	146.68	14.18	1.10	161.96	17.75	179.71	7.10	186.81	9.5%
2009	146.14	14.62	1.19	161.95	18.65	180.59	7.31	187.90	9.9%
2010	147.20	15.41	1.27	163.89	18.71	182.59	7.48	190.07	9.8%
2011	149.18	15.85	1.32	166.35	19.07	185.42	7.70	193.12	9.9%
2012	150.38	16.32	1.37	168.06	19.55	187.61	7.86	195.47	10.0%
2013	150.87	16.75	1.42	169.04	19.62	188.67	7.94	196.60	10.0%
Annual growth, 2004-2009	0.03%	2.94%	8.90%	0.33%	4.30%	0.70%	2.49%	0.76%	3.51%
Annual growth, 2009-2013	0.80%	3.47%	4.53%	1.08%	1.29%	1.10%	2.08%	1.14%	0.15%

Notes: Task by 'Commercial vehicles' refers to trips (within the 8 capitals), undertaken by light commercial vehicles and trucks, that were not related to the carriage of freight. Values for 'mass transit' include all travel on heavy rail, light rail, ferries and buses (here comprising use of all motor vehicles with 10 or more seats - i.e. charter/hire and other private use of buses/minibuses, as well as UPT route buses; where the route bus task accounted for close to 80% of estimated total bus pkm for 2013). 'Non-motorised' values are very rough (indicative trend) estimates of metropolitan pkm due to walking and cycling. 'Mass transit share' refers to the proportion of total metropolitan pkm (motorised and non-motorised) performed by mass transit (if calculated relative to just the motorised task, proportions are of course slightly higher – e.g. 2013 value for share of motorised pkm is about 10.4%).

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

Modal composition by city

Table 6 summarises the latest BITRE estimates of urban passenger task (for the year ending 30 June, 2013), for the 8 State and Territory capital cities[21].

Table 6: Total motorised passenger task, Australian capital cities, 2013

Mode	Sydney	Melbourne	Brisbane	Adelaide	Perth	Hobart	Darwin	Canberra	Metropolitan total
				(billions of passenger-kilometres)					
Cars	45.73	45.27	21.38	11.80	19.16	2.09	0.92	4.52	150.87
Commercial vehicles	4.52	4.31	3.59	1.05	2.32	0.31	0.24	0.42	16.75
Motorcycles	0.32	0.39	0.30	0.11	0.20	0.02	0.02	0.05	1.42
Total - Private vehicles	50.57	49.97	25.28	12.96	21.68	2.41	1.18	4.98	169.04
Heavy rail	5.51	3.92	1.05	0.16	1.06	..	..	..	11.71
Light rail	0.02	0.73	..	0.02	..	..	..	..	0.77
Bus	2.53	1.42	1.27	0.64	0.74	0.088	0.078	0.22	6.98
Ferry	0.14	..	0.02	..	0.001	0.0002	..	..	0.16
Total - Mass transit	8.21	6.07	2.34	0.82	1.80	0.09	0.08	0.22	19.62
Total – All Motorised	58.78	56.04	27.62	13.78	23.48	2.50	1.26	5.20	188.67
% Mass transit	14.0%	10.8%	8.5%	6.0%	7.7%	3.5%	6.2%	4.2%	10.4%
Population (thousands)	4757	4348	2238	1292	1972	218	136	381	15343
Mass transit pkm per capita	1725	1397	1045	637	913	403	575	573	1279
Total motorised pkm per capita	12356	12890	12338	10671	11906	11482	9252	13642	12297

Notes: Task by 'Commercial vehicles' refers to trips (within the capitals), undertaken by light commercial vehicles and trucks, that were not related to the carriage of freight. Values for 'mass transit' include all travel on heavy rail, light rail, ferries and buses (here comprising use of all motor vehicles with 10 or more seats - i.e. charter/hire and other private use of buses/minibuses, as well as UPT route buses). Nationally, the route bus task has been estimated to account for almost 80% of derived *total* bus pkm for 2013 (where the allowances for charter/hire/private bus use are primarily based on ABS *Survey of Motor Vehicle Use* data, and are very approximate).

'% Mass transit' here refers to the proportion of *motorised* pkm performed by mass transit in metropolitan areas (i.e. if calculated relative to total – both motorised and non-motorised – task, proportions are of course slightly lower; e.g. national 2013 value for share of *total* metropolitan pkm is approximately 10.0%).

Estimated resident metropolitan population (as at year ending 30 June 2013) refers to city boundaries defined by ABS Greater Capital City Statistical Areas (GCCSAs) for each of the 8 capitals; where per capita values (especially for mass transit) are not strictly comparable between jurisdictions due to the quite different character of the various cities' *catchment areas* for transport services (e.g. the regional areas generating travel on the Sydney train system are substantially more populous than is the case for Melbourne's, with similar boundary issues affecting Brisbane versus SEQ 'per capita' pkm results, see BITRE 2014).

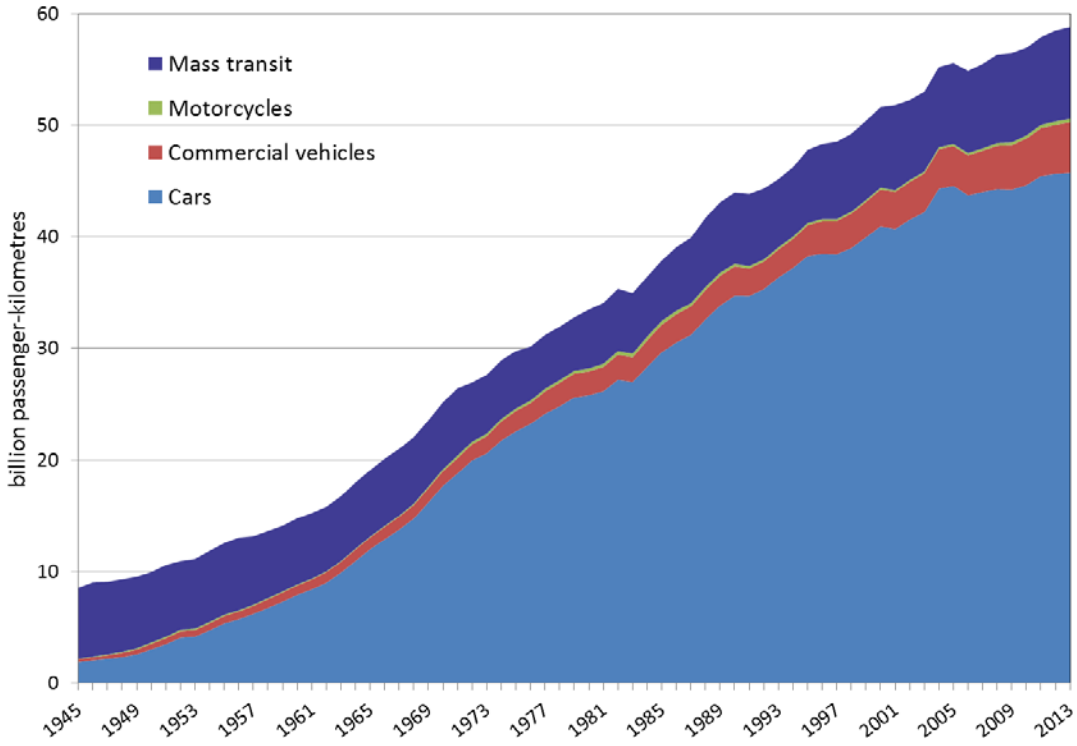
.. Negligible or currently not applicable

Sources: Cosgrove (2011), ABS (2014, 2013 and earlier), BITRE (2014) and BITRE estimates.

The post-war growth trends in urban travel, for each capital city, are displayed in the following figures (with the cities given in order of decreasing metropolitan population size) – which plot total annual motorised pkm from 1945 to 2013 (years ending 30 June), contrasting the size of the mass transit task with that performed by private road vehicles, and then show the modal composition of that mass transit task.

[21] For more numerical detail and time-series data see the accompanying Information Sheet 60 (BITRE 2014) and the BITRE website.

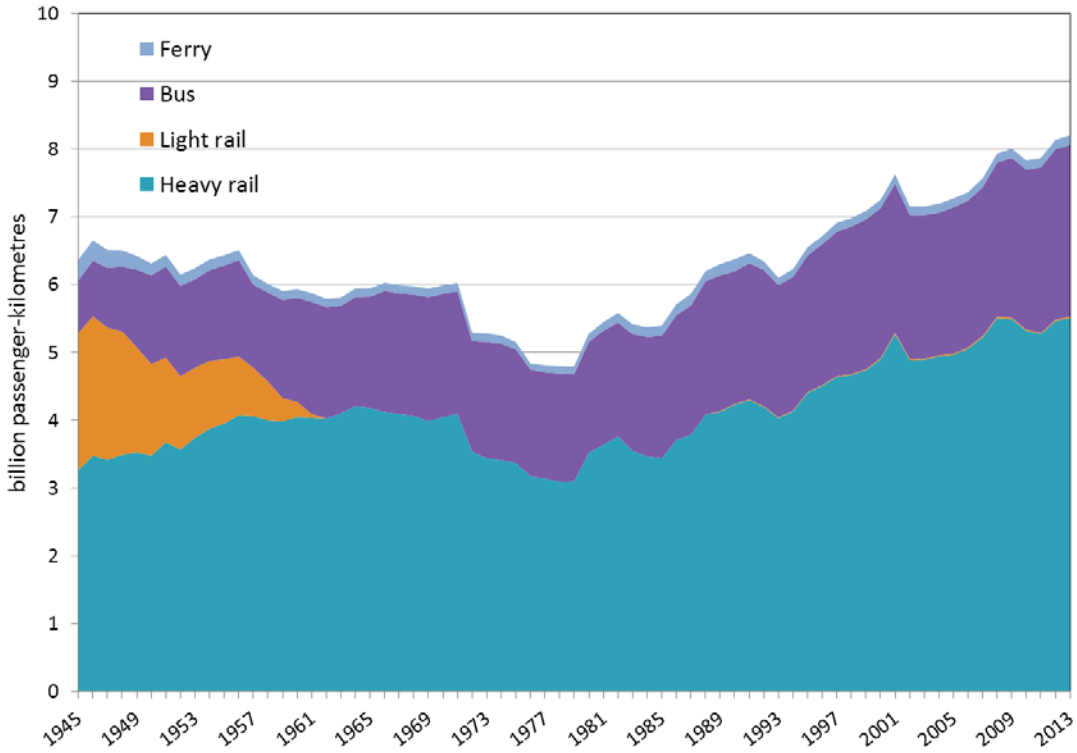
Figure 6: Motorised passenger task for Sydney, 1945–2013



Notes: Values for 'mass transit' include all bus travel, i.e. school services and by charter/hire (or other private use of buses/minibuses), as well as reported UPT route buses. Values for 'commercial road vehicles' relate to non-freight use of such vehicles.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

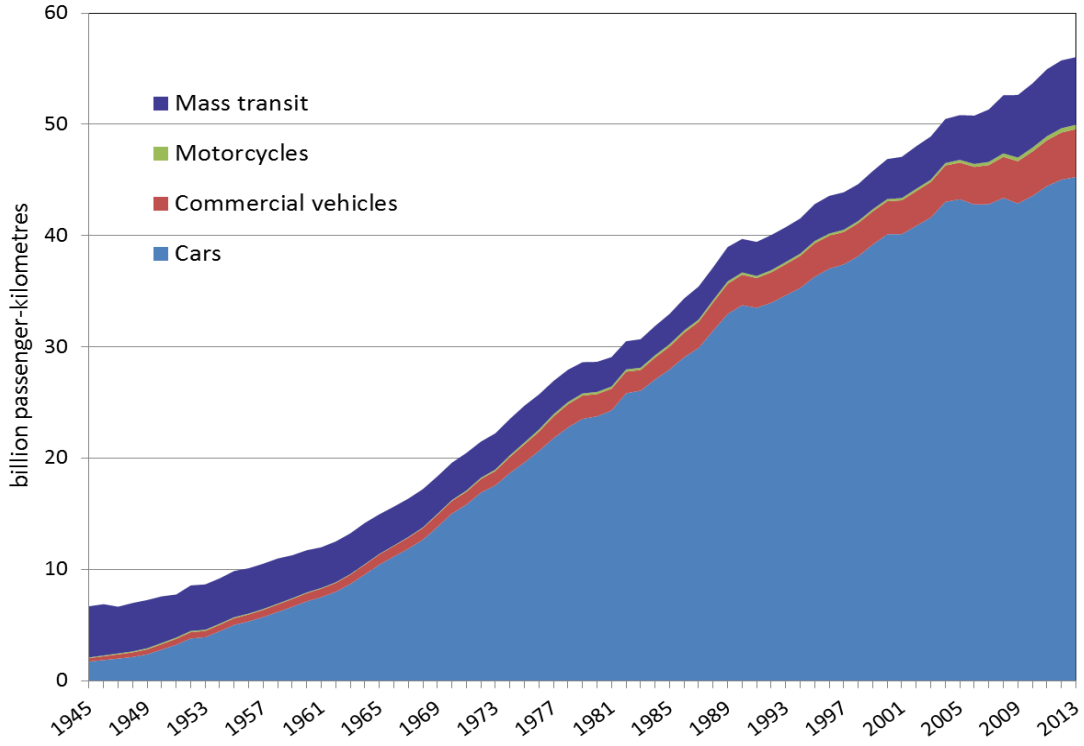
Figure 7: Mass transit task for Sydney, 1945–2013



Notes: Values for 'bus' include rough allowances for concessional school travel on the UPT network and for charter/hire (or other private use of buses/minibuses), as well as UPT route buses.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

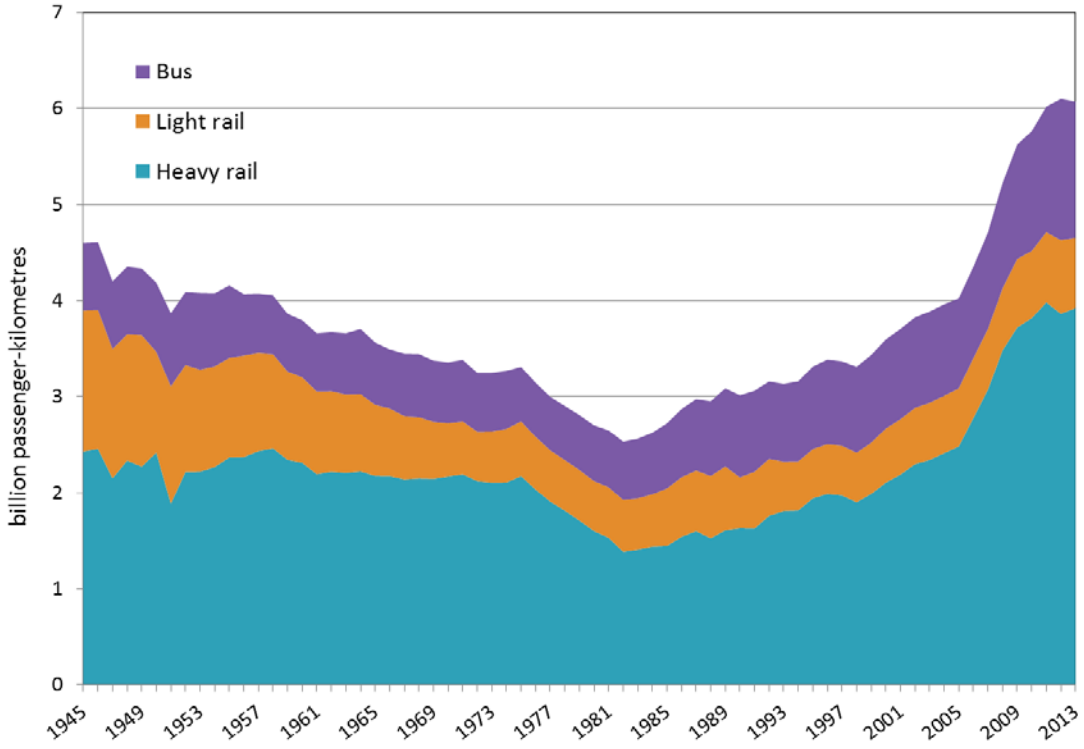
Figure 8: Motorised passenger task for Melbourne, 1945–2013



Notes: Values for 'mass transit' include all bus travel, i.e. charter/hire and other private use of buses/minibuses, as well as UPT route buses (which includes *SkyBus* services). Values for 'commercial road vehicles' relate to non-freight use of such vehicles.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

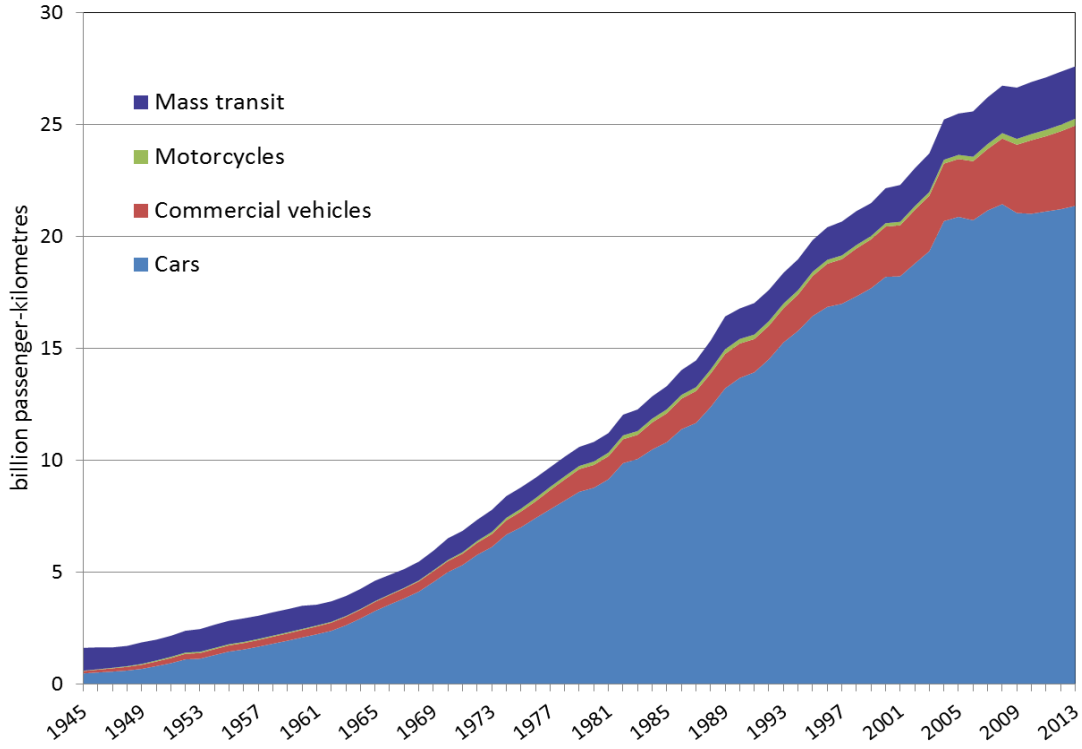
Figure 9: Mass transit task for Melbourne, 1945–2013



Notes: Values for 'bus' include a rough allowance for charter/hire and other private use of buses/minibuses, as well as UPT route buses (which includes *SkyBus* services).

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

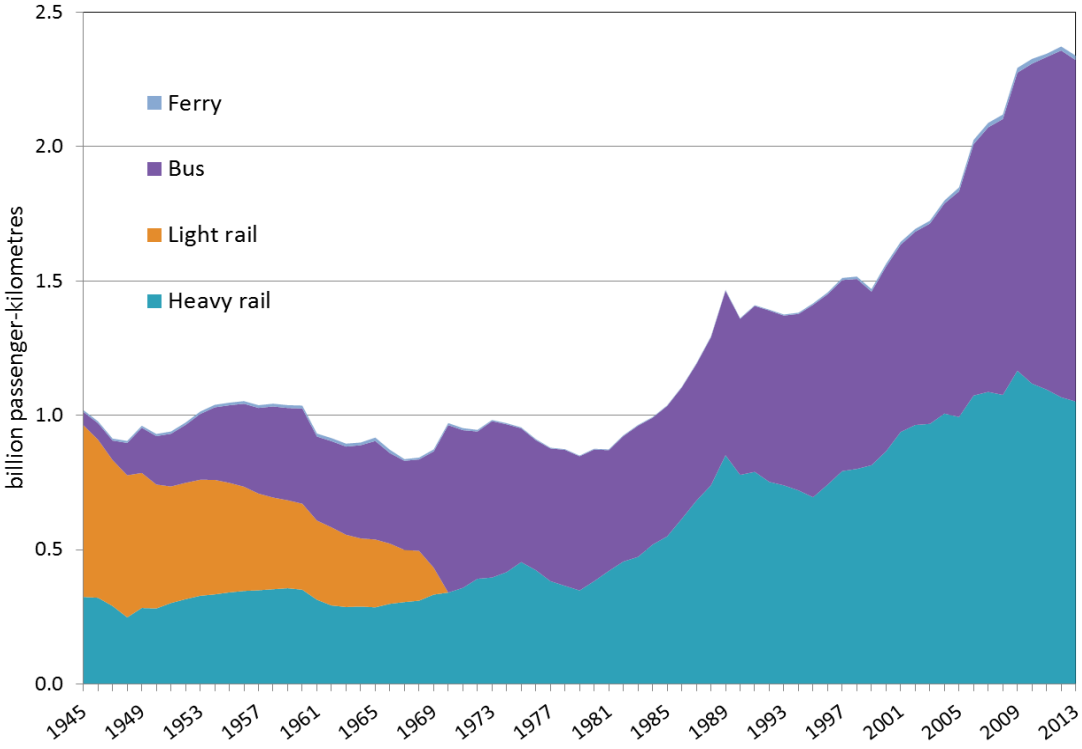
Figure 10: Motorised passenger task for Brisbane, 1945–2013



Notes: Values for 'mass transit' include all bus travel, i.e. charter/hire (or other private use of buses/minibuses), as well as UPT route buses (including all non-government operators). Values for 'commercial road vehicles' relate to non-freight use of such vehicles.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

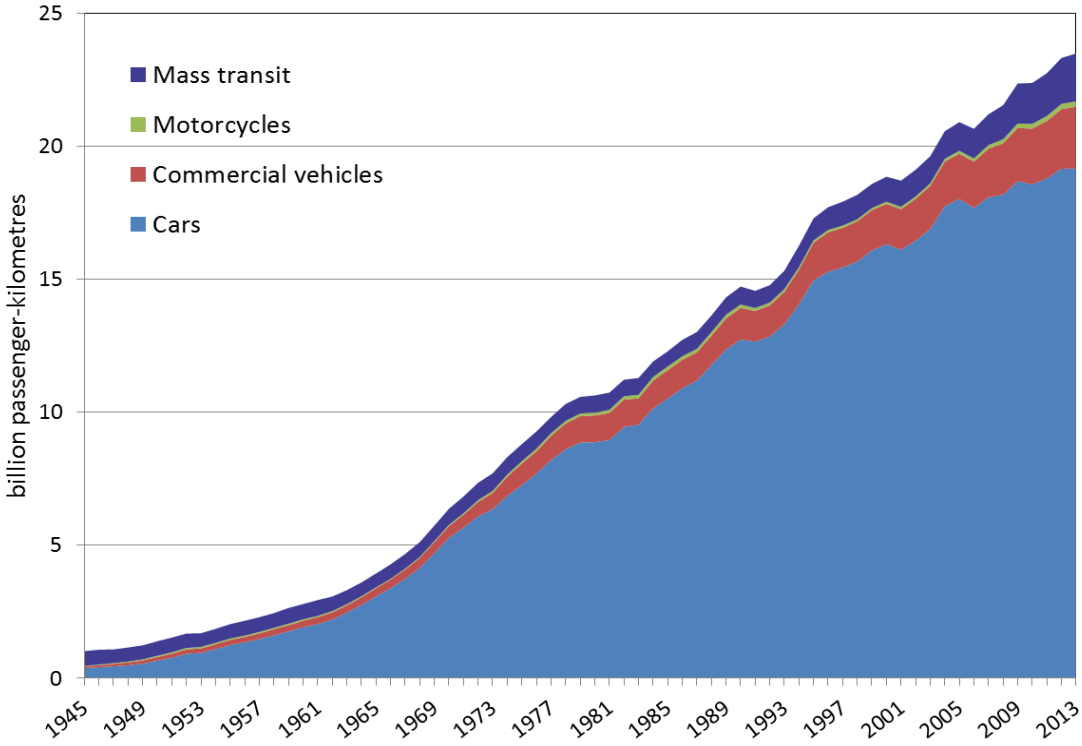
Figure 11: Mass transit task for Brisbane, 1945–2013



Notes: Estimates for 'bus' comprise all UPT route services (including SEQ regional providers operating within the Brisbane GCCSA), and rough allowance for charter/hire services (or other private use of buses/minibuses).

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

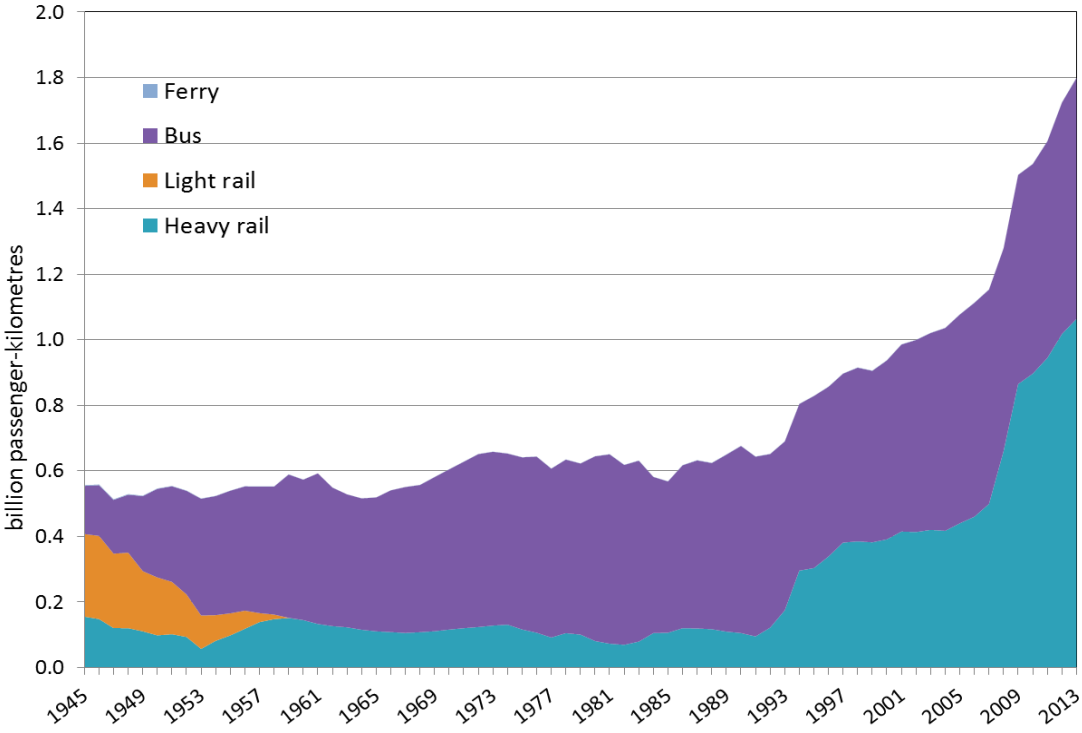
Figure 12: Motorised passenger task for Perth, 1945–2013



Notes: Values for 'mass transit' include all bus travel, i.e. contain rough allowances for charter/hire (and other private use of buses/minibuses), as well as UPT route buses. Values for 'commercial road vehicles' relate to non-freight use of such vehicles.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

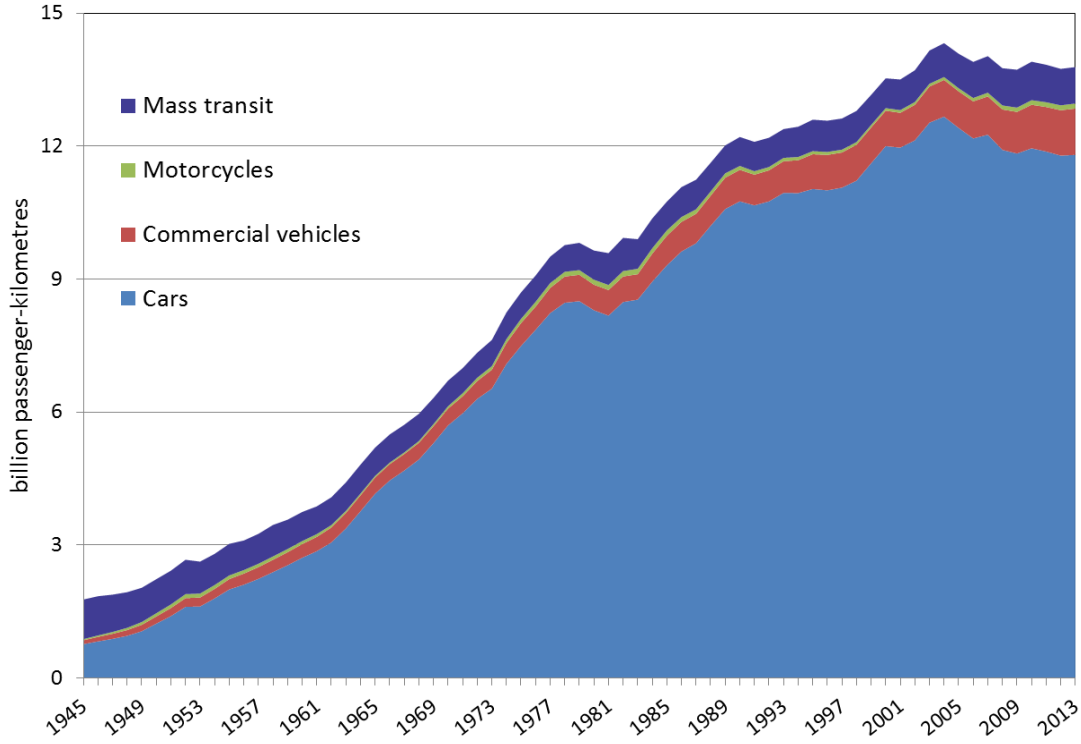
Figure 13: Mass transit task for Perth, 1945–2013



Notes: Values for 'bus' include a rough allowance for charter/hire (and other private use of buses/minibuses), as well as UPT route buses.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

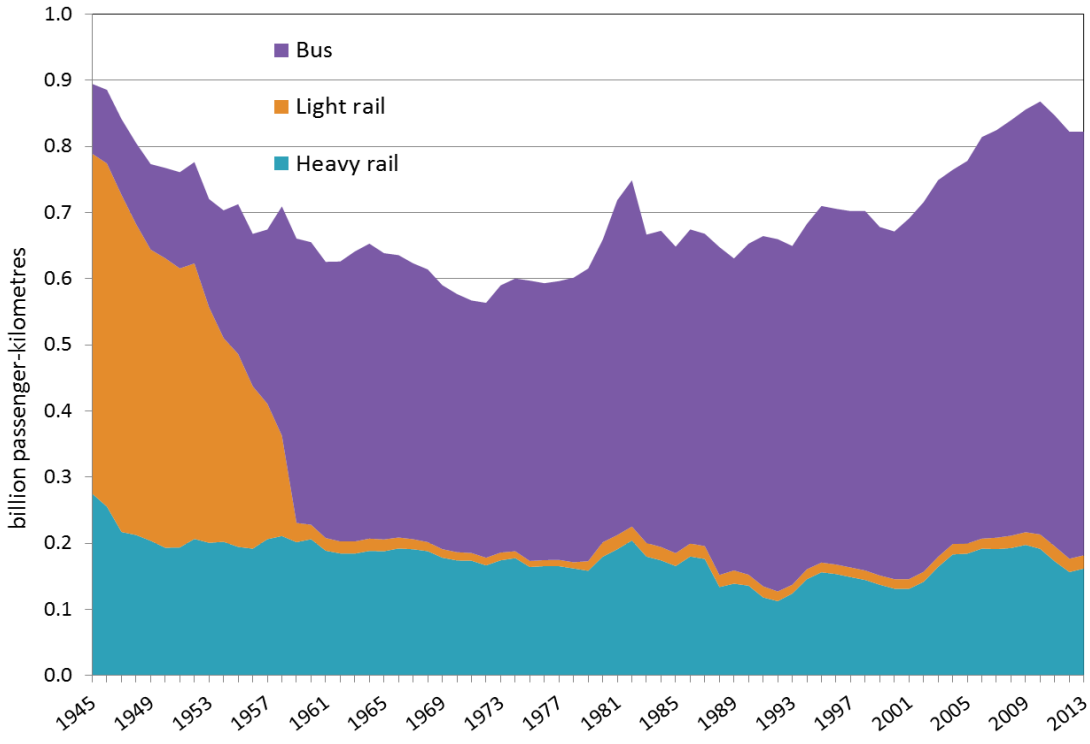
Figure 14: Motorised passenger task for Adelaide, 1945–2013



Notes: Values for 'mass transit' include allowance for charter/hire (or other private) bus use, as well as UPT route buses – where initial boardings have been scaled up to allow for transfers. Values for 'commercial road vehicles' relate to non-freight use of such vehicles.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

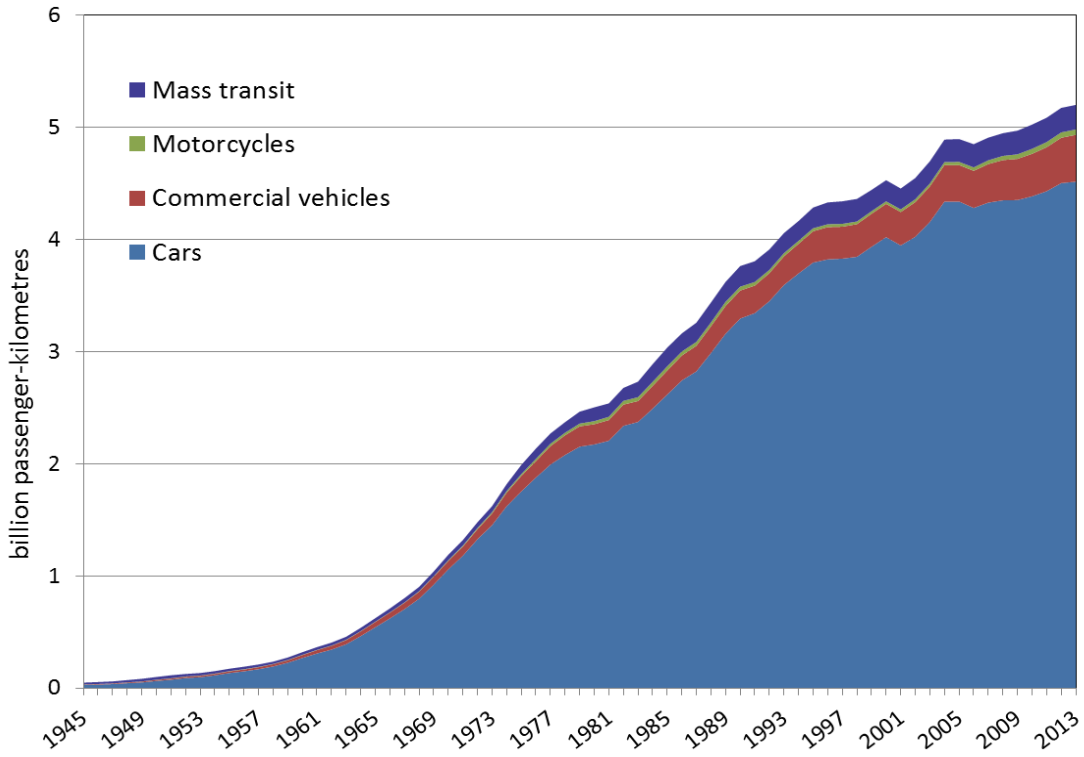
Figure 15: Mass transit task for Adelaide, 1945–2013



Notes: Values for 'bus' include rough allowance for charter/hire (or other private bus use), as well as UPT route buses – where initial UPT boardings have been scaled up to allow for transfers.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

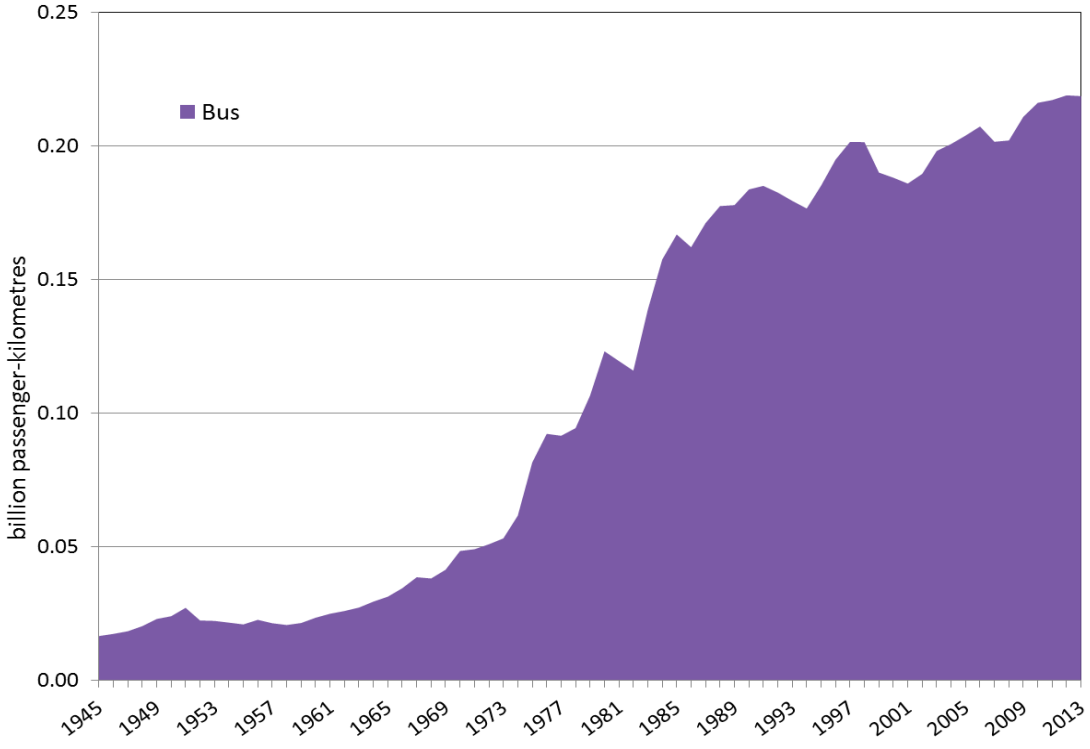
Figure 16: Motorised passenger task for Canberra, 1945–2013



Notes: Values for 'mass transit' include allowance for charter/hire (or other private) bus use, as well as UPT route buses – where initial boardings have been scaled up to allow for transfers. Values for 'commercial road vehicles' relate to non-freight use of such vehicles.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

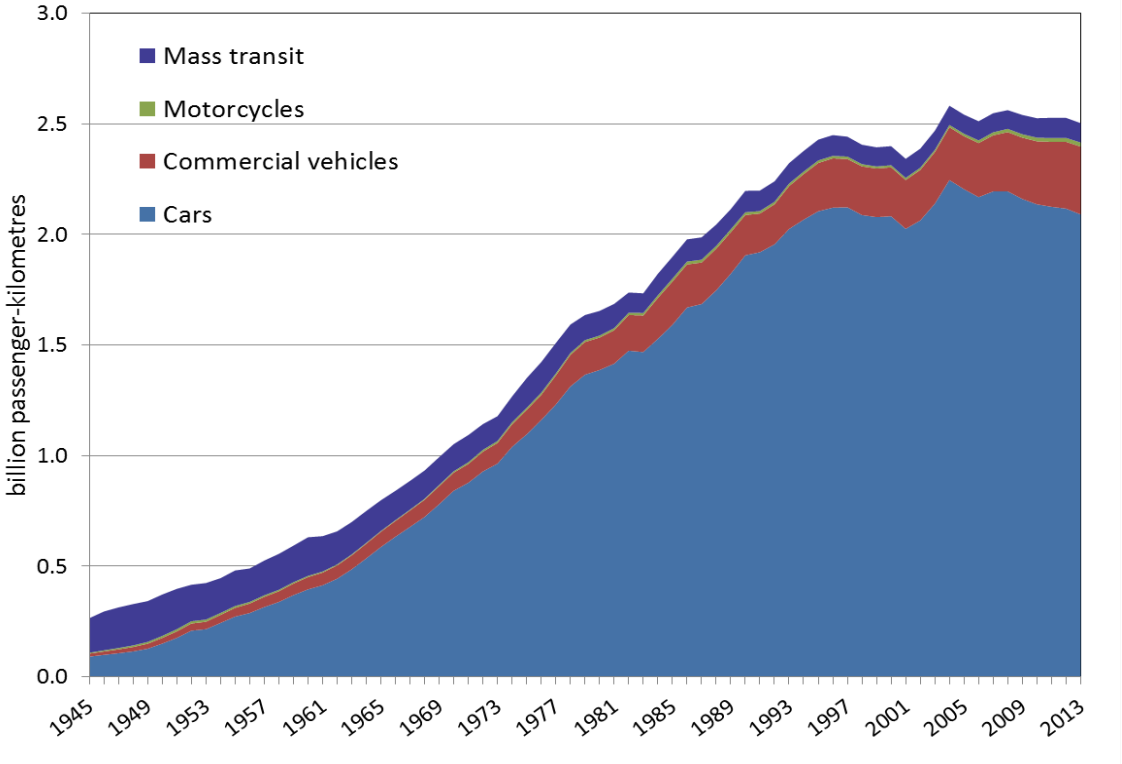
Figure 17: Mass transit task for Canberra, 1945–2013



Notes: Values for 'bus' include rough allowance for charter/hire (or other private bus use), as well as UPT route buses – where initial boardings have been scaled up to allow for transfers.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

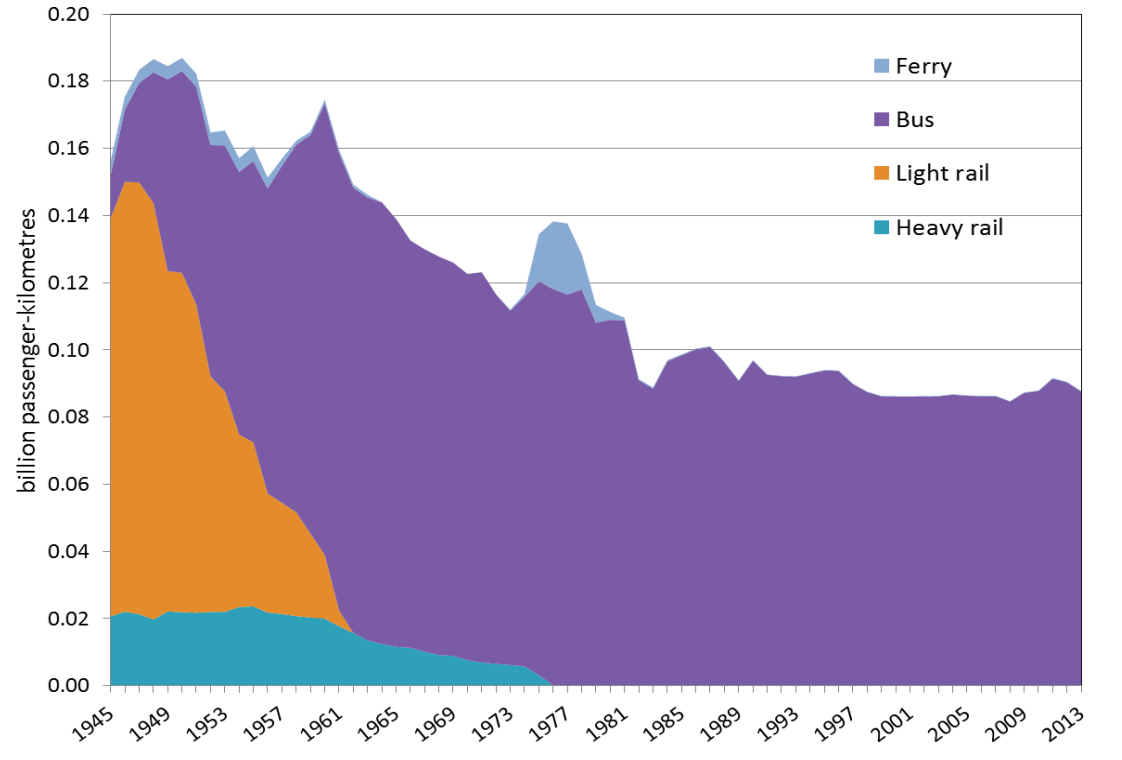
Figure 18: Motorised passenger task for Hobart, 1945–2013



Notes: Values for 'mass transit' include allowances for regional changes to travel on the UPT network and for charter/hire (or other private use) of buses/minibuses, as well as UPT route buses. Values for 'commercial road vehicles' relate to non-freight use of such vehicles.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

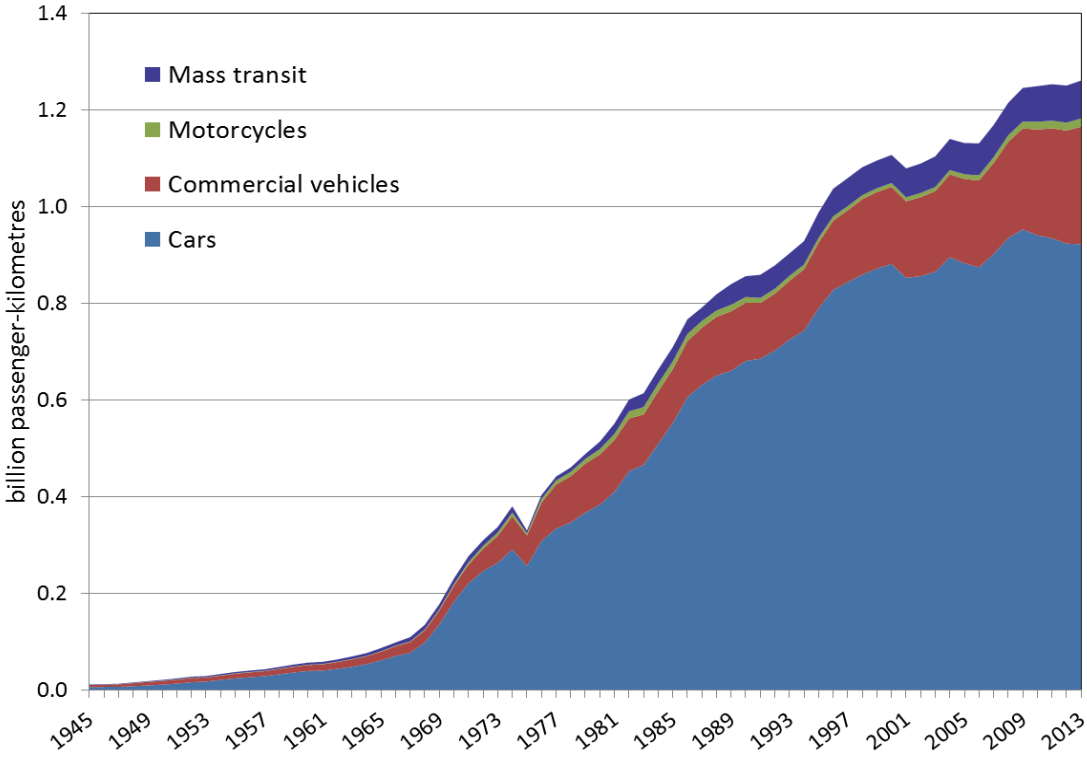
Figure 19: Mass transit task for Hobart, 1945–2013



Notes: Values for 'bus' include rough allowances for regional changes to travel on the UPT network and for charter/hire (or other private use of buses/minibuses, as well as UPT route buses).

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

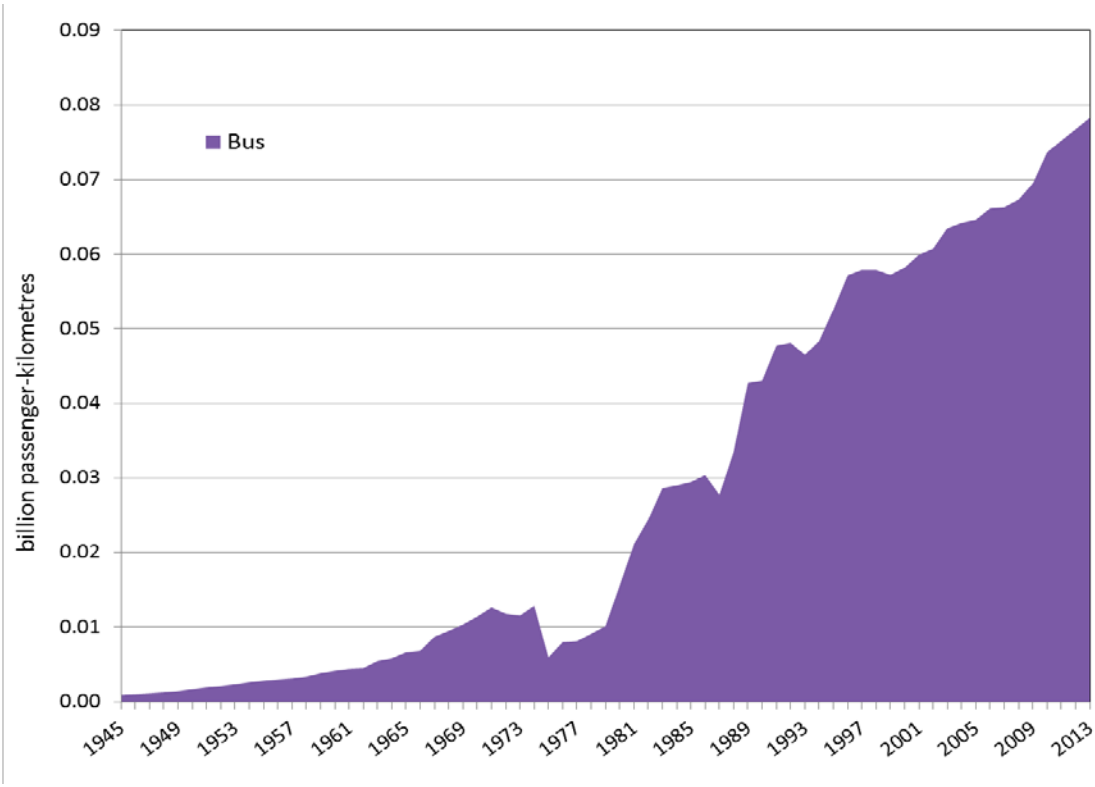
Figure 20: Motorised passenger task for Darwin, 1945–2013



Notes: Values for 'mass transit' include allowance for charter/hire (or other private) bus use, as well as UPT route buses, and rough adjustments for school services. Values for 'commercial road vehicles' relate to non-freight use of such vehicles.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

Figure 21: Mass transit task for Darwin, 1945–2013



Notes: Historical values for 'bus' include rough adjustments for school services; and all estimates include rough allowances for charter/hire (or other private use of buses/minibuses), as well as UPT route buses.

Sources: Cosgrove (2011), ABS (2013 and earlier), BITRE (2014) and BITRE estimates.

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