



Is rail cleaner and greener than bus?



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ABSTRACT

The popular consensus is that urban passenger rail is more environmentally friendly than urban passenger bus. This position is largely associated with the key energy source for each mode, respectively electricity and diesel, where electric vehicle use will typically result in local air quality improvements away from the electricity generation source. Surveys of community perceptions reflect this sentiment; however the relationship between the source of energy and its resultant emissions is not something that citizens fully understand. There is a general lack of awareness of the resource base of much of electricity generation in some countries. Where generation sources are suitably renewable or low-carbon, electricity use will offer greenhouse gas abatement potential. However, in countries which still rely heavily on coal-fired power stations, such as Australia, abatement is not as assured and estimating emission outcomes can require careful assessment. Supporters of alternatives to diesel use can focus on the future supply of fossil-fuels, an argument which has merit; however such arguments are often confounded with environmental qualities related to local air pollution and enhanced greenhouse gas emissions. This paper takes a close look at the greenhouse emissions that are associated with urban rail and bus in Australia. Estimated intensities, when presented in the context of effective service delivery (primarily in terms of emissions per passenger kilometre), raise questions about the distortions that are present in the widespread promotion in Australia (at least) of rail as a more environmentally friendly and hence a sustainable mode of urban passenger transport than bus.

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1. Introduction: The policy setting

The case for investment in urban public transport is indisputable – to not only offer a real alternative to the car, but to support the broader objectives of integrated transport and land use planning that can deliver efficient and effective accessibility that also aligns with notions of wellbeing, social inclusion and environmental sustainability (see [Stopher and Stanley, 2014](#)). Within the set of public transport options, governments have in the main focussed on supporting a mix of road and rail-based modes; and depending on the historical evolution of a specific urban area, the extent to which one mode has dominated the other is clearly visible. In Australia, for example, the capital cities are typically dominated by radial heavy rail which is a reflection of their historical developments.

It is generally understood that cities which evolved in the automobile era are very much the product of roads that service urban sprawl, where bus services have been the offered public mode because of the availability of roads. Nineteenth and

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Twentieth century cities in the USA and Australia are some of the best examples. Even though rail has been an alternative in many of these cities, its popularity has been limited by the appeal of the accessibility advantage of the car, despite the growing levels of congestion and lack of parking. Given the cost of building railways, buses have played a major role in many of Australia's cities in both radial and circumferential services where there is a paucity of rail service.

Fig. 1 summarises the long-term trend in modal share for aggregate passenger activity across all Australian urban areas, demonstrating the current dominance of car travel, in terms of passenger kilometres performed. Average mode share for public transport (especially for travel into Central Business Districts) is generally higher in the capital cities, where Tables 1 and 2 show the modal composition of the metropolitan passenger task, aggregated across the eight Australian State and Territory capital cities. Public transport has, over the last few decades, captured less than 11 percent of metropolitan passenger kilometre (pkm) market share, varying between a low of about 8.7 and a high of about 10.5 percent of the motorised total during the period from 1990 to 2014, as shown in Table 2, although there has been some upwards movement in the overall share within recent years. In 2014, Sydney had the highest average market share for public transport (at about 14% of total motorised passenger kilometres), followed by Melbourne (11%), Brisbane and Perth (at around 8%), then Adelaide and Darwin (at around 6%), and with Hobart and Canberra having the lowest levels (at around 4%).

Fig. 2 illustrates the considerable variation in the scale and composition of the different cities' public transit systems, where the larger capital cities have substantial rail networks that perform a significant portion of their aggregate public transport tasks, while the smaller capitals tend to be primarily serviced by buses.

We are now witnessing a greater commitment to improving public transport; however the emphasis on modal priority varies significantly between cities. For example, Sydney is focussed on heavy and light rail (although a light treatment of Bus Rapid Transit is being planned for two corridors without access to heavy rail, Northern beaches (Weisbrod et al., 2015) and the Victoria Road corridor); Brisbane is committed to investment in its very successful busway network with a recent interest in heavy rail, and Canberra is progressing with light rail. Drivers of modal preferences include emotional ideology (see Hensher, 1999, 2007), citizen and political preferences, and especially the ability to show visible commitment to new investment in public transport infrastructure. On balance, the revival of rail in many western societies (and a number of Asian countries), particularly light rail and metro, is very noticeable.

In contrast, we see growing support for bus-based systems, especially bus rapid transit in developing economies, particularly in Latin America (see Muñoz and Paget-Seekins, 2016). There are exceptions to this trend; for example the busway system in Brisbane (e.g., Golotta and Hensher, 2008). The Brisbane initiative was supported in its early days by a charismatic

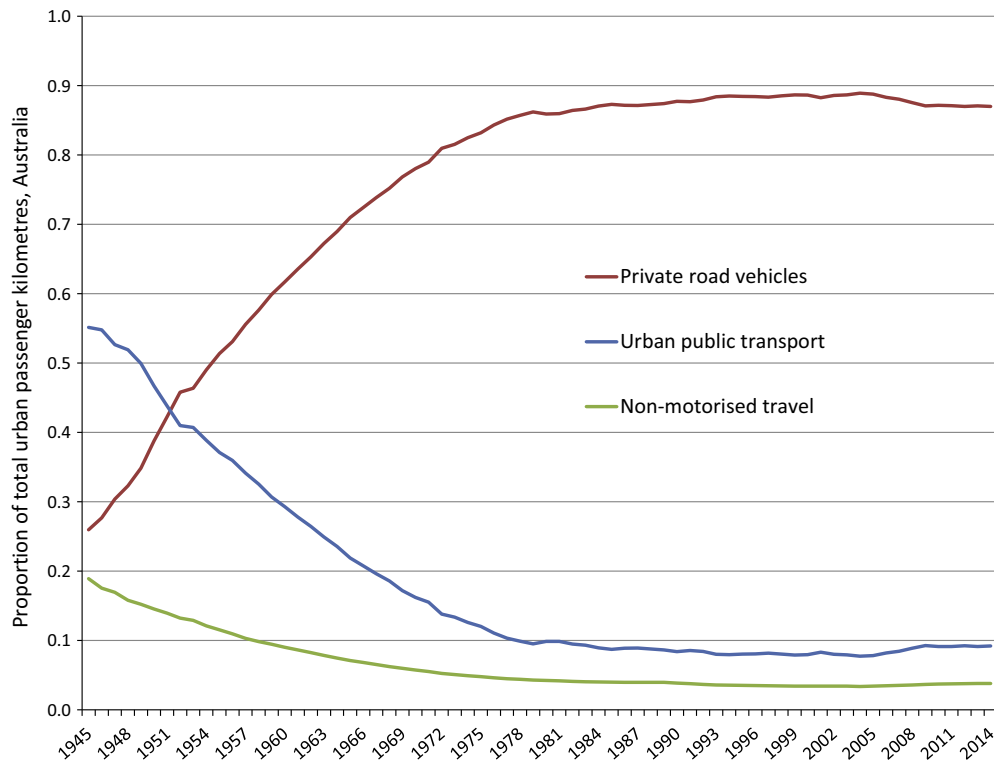


Fig. 1. Urban passenger mode share for Australia, 1945–2014. Note: Refers to share of total annual travel (in passenger kilometres, for years ending 30 June) within Australia's urban areas (with a population of 40 thousand or more), across all available transport modes (including rough estimates of non-motorised travel). Sources: Cosgrove (2011) and BITRE (2014) and BITRE estimates.

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