



*A roadmap to double ENERGY PRODUCTIVITY  
in Passenger Transport  
by 2030*

**AUTHORSHIP OF THIS ROADMAP**

This roadmap is published by the Australian Alliance for Energy Productivity (A2EP), prepared through extensive consultation with industry: the 2xEP program is led by a Steering Committee of business leaders, and a passenger transport working group reporting to it comprises representatives of industry associations, individual firms, research organisations and energy services/equipment suppliers. A2EP is supporting the Steering Committee to promote this to government, support the implementation of measures, and monitor and report on progress towards this objective. The roadmap will continue to be developed into a platform which a wide range of industry organisations and businesses will be invited to join. A2EP would like to thank the members of the 2xEP passenger transport working group for their generous contributions.

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The views expressed in this text are those of A2EP and not necessarily those of our supporters and partners. All responsibility for the text rests with us.

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## Executive summary

Passenger transport supports and underpins Australia's economic prosperity by connecting people, businesses and cities. By providing access to markets, employment, recreation and services, it facilitates economic exchanges. Passenger transport is an essential service.

This roadmap focuses on the domestic passenger transport sub-sector. Excluding aviation, total energy used in passenger transport was approximately 832.3 PJ (DIS 2015b), or around 67% of all energy used in the whole transport sector. In terms of significance, the activity covered in this roadmap represents 10% of total primary energy across all sectors (15% of final energy), and around 10% of the national total of greenhouse gas emissions.

Transport in general, and passenger transport even more so, faces some significant challenges within the timeframe covered by this roadmap. More than any other sector, it is at risk of disruption from a range of factors, including:

- Risks to the security of liquid fuels supply, with 90% of fuel requirements imported, and as little as 3-4 weeks of demand held in in-country stockholdings (Blackburn 2014).
- Disruption from rapid technology development and adoption—particularly in the case of electric vehicles and autonomous vehicles.
- Behavioural disruption from vehicle sharing, ride sharing, and ultimately a shift away from car ownership.
- Threats to the patronage and viability of public transport systems as the factors above lead to a possible 'mobility cloud' model of ubiquitous transport as a service.

At the same time, the sector faces a range of ongoing structural challenges:

- Increasing urbanisation, which results in greater concentration of negative effects in the areas of greatest population and job creation.
- Providing access and service quality for a growing and ageing population.
- Energy cost volatility due to an almost total reliance on one fuel source (oil).
- A high reliance on private road transport<sup>1</sup> which accounts for 90% of urban travel (Cosgrove 2011).
- Pollution from cars, trucks and other modes of fossil-fuelled transport is estimated to cost Australia around \$3.3 billion each year (Lindsay, Macmillan & Woodward 2011).
- The cost of road accidents nationally, at \$27 billion each year (Australian Transport Council 2011), in addition to the devastating associated social cost.

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<sup>1</sup> Use of road freight transport is not in the scope of this report, although it is acknowledged as an additional influencing factor.

Just as significant from a productivity perspective is the 'avoidable' cost of congestion<sup>2</sup> for Australian capital, which is estimated at approximately \$16.5 billion in 2015, and is predicted to deteriorate to \$30–37 billion by 2030 in AUS\$2015 (BITRE 2015)

For households, transport fuel cost represented 60% of spend on energy in 2011–12, or \$60 of the weekly household energy budget of \$99 per dwelling (ABS 2013a, 2013c). Fuel price movement therefore has a greater impact on the average household budget than electricity and gas prices, but receives nowhere near the same policy attention.

Despite these challenges, Australia regularly ranks as one of the worst performers in surveys assessing energy efficiency of passenger vehicles and transports systems. It was also one of the few countries in which passenger transport efficiency had actually decreased since 1990 (International Energy Agency 2011a, Young et al. 2014).

An energy productive domestic passenger transport system would underpin economic prosperity by providing high-quality mobility services, at lower costs, and with greater access, while utilising resources more efficiently and reducing negative environmental impacts (e.g. air pollution, greenhouse emissions and land use). Achieving this goal will require a broad range of measures spanning technology, regulation, planning and consumer behaviour. But the ultimate pathway is not yet clear: it may involve better connection of traditional public and private transport systems; or it may emerge from a new model of integrated public/private/shared transport that is just emerging. What is clear is that delivering on this goal will require a change in the prevailing urban design and transport planning paradigms.

## 2xEP TARGET

Against this background, the 2xEP initiative asserts that passenger transport can make a major contribution to the general aim of doubling Australia's energy productivity by 2030. This roadmap provides guidance to government and industry on the direction required to double energy productivity in this sector by 2030 (from base 2010)—a challenging but achievable target.

## SUMMARY OF MEASURES FOR PASSENGER TRANSPORT

The eleven recommended measures in this roadmap were developed through research and evaluation. They are supported by the passenger transport working group but will require further development and engagement with the community, industry and government. We stress that they represent an *integrated* strategy – not a set of choices to be prioritised. Some of the measures link to other sectoral roadmaps that are highlighted in red in the summary below. Additional detail on cost/benefits, barriers, linkages, examples and implementation considerations, are provided in the tables that follow.

The twelve measures comprise:

1. Better information for consumers / decision makers
2. Establish independent organisation to support and advocate for low emission vehicles
3. Incentives to purchase LEVs (*Financing Roadmap*)
4. Enable flexibility and choice to support shift away from low occupancy private cars
5. Accelerate adoption of renewable energy in transport

<sup>2</sup> i.e. where the benefits to road users of some travel in congested conditions are less than the costs imposed on other road users and the wider community.

6. Support wider use of carpooling and car sharing
7. Coordination of autonomous vehicles (*Innovation Roadmap*)
8. Fuel efficiency standards for light vehicles
9. Incentives for high occupancy vehicles
10. National target for LEV uptake
11. Cost-reflective road pricing.
12. Examine the role of industry associations in providing information

Several measures from the Built Environment roadmap will also have critical links into the passenger (and freight) transport roadmaps. These measures canvass better planning and the integration of infrastructure (including energy infrastructure), 'smart' infrastructure and 'smart' cities.

The measures proposed in this roadmap combine short, medium and long-term measures. Owing to the nature of the sector, involving predominantly private consumers operating dispersed equipment, many of the measures involve government action to reduce or eliminate market barriers. Others require a combination of government and industry action.

The timing and categorisation of the measures is summarised in Figure 1 below. Additional detail for each of the numbered measures is provided in the tables in Section 8.

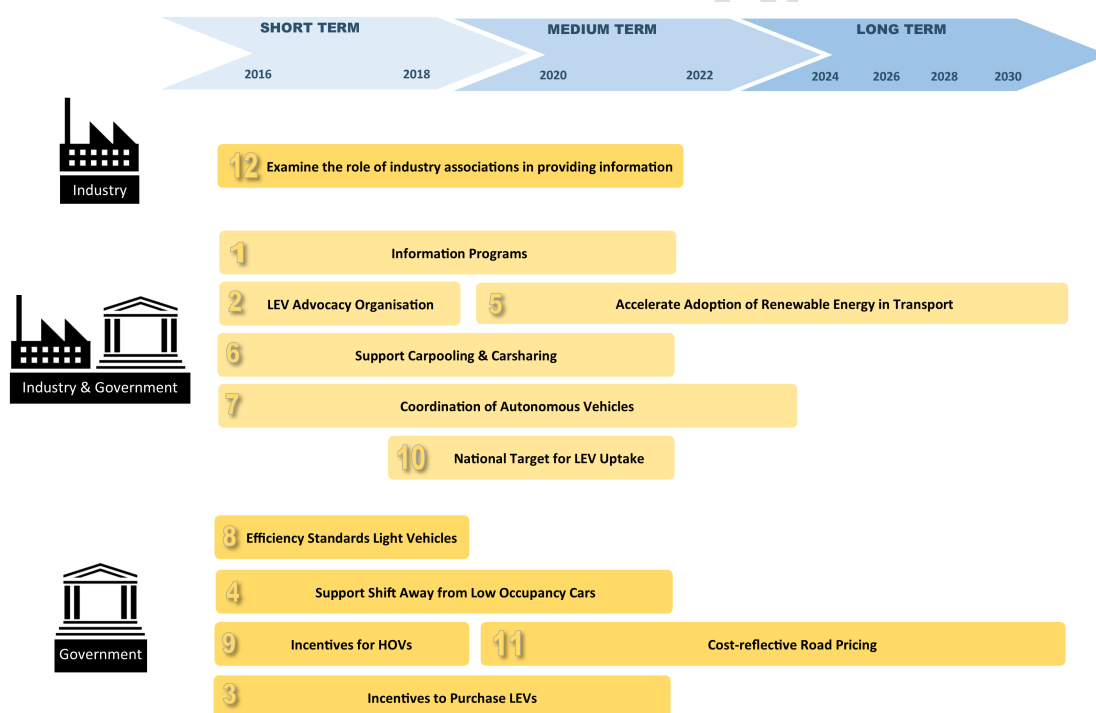


Figure 1

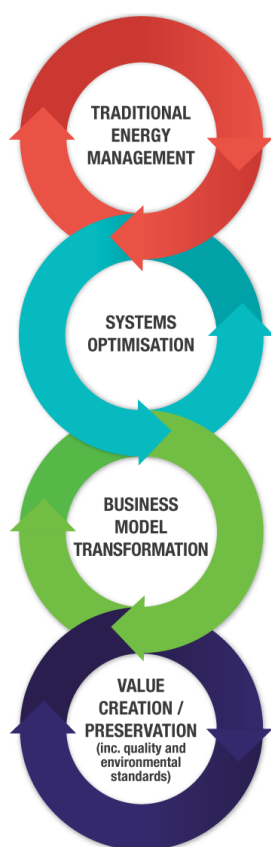
### Timeline and responsibility for implementation of measures

# 1 The purpose and limitations of this roadmap

This roadmap is intended as both a compass and a map. As a compass, it highlights the main directions for changing passenger transport in ways that will improve energy productivity in Australia, while still maintaining the services required to meet current and emerging mobility needs. As a map, it shows some paths that could be taken—not the only paths, but those that could maximise the sector’s contribution to doubling energy productivity.

These perspectives, combined with continued industry engagement around the roadmap, will be used to develop a sectoral target to support the overall 2xEP target of doubling energy productivity in Australia by 2030. A2EP proposes to consult with a diverse range of stakeholders about what this target should be, and how improvement in the energy productivity of the passenger transport sector could be tracked. It will also highlight collaborative action that the industry could take, and recommend actions required by governments to reduce or remove barriers.

Energy productivity is typically expressed as the real economic output per unit of energy (usually primary energy). Consequently, the potential to achieve a voluntary energy productivity target could be influenced by adopting complementary strategies that either increase economic output or reduce the relative energy consumption per dollar output. Energy productivity is not energy efficiency by a different name. Energy efficiency—which generally focuses on using less energy to deliver the same service—is, however, an important part of the four key strategies to enhance energy productivity, as illustrated below.



**Strategy area 1:** ‘Traditional’ energy management—improving fuel efficiency through better energy management, innovative technologies, best practice data management and benchmarking to facilitate better decision making.

**Strategy area 2:** Systems optimisation—focusing on energy-related aspects of the passenger transport system, including integrated urban planning and design to optimise asset utilisation and reduce congestion. These changes may be implemented to improve broader productivity, but greater value can be realised with a deliberate focus on energy productivity.

**Strategy area 3:** Business model transformation—focusing on the energy-related aspects of fundamental longer term change in the provision of public and private passenger transport solutions. This area relates to the design, development and operation of passenger transport assets (including private vehicles) and infrastructure.

**Strategy area 4:** Value creation or preservation—a focus on quantitative, as well as qualitative aspects of passenger transport from the perspective of individual operators, passengers and society in general. This includes agglomeration benefits of public transport interchanges, increasing opportunities for economic exchange and increased health benefits from active transport and reduced pollution.

## 2 Passenger transport and energy

Our transport systems are major enablers of Australia's economic prosperity and way of life. As the population becomes increasingly urbanised, the need to move people and goods through our cities strongly affects productivity via a number of linking mechanisms. Specifically, passenger transport connects people with opportunities for work, commerce, health, recreation and connections with each other. The main energy and productivity implications of passenger transport are introduced and discussed below.

### 2.1 Significance of the passenger transport sector

Transport is a significant sector in the Australian economy. Passenger and freight transport combined employ around 5% of Australia's workforce (ABS 2012), and account for approximately 6% of 2012–13 industry gross value added (DIS 2014a, ABS 2016).

While these employment and economic contributions seem relatively small, the transport sector overall generates around 17% of all national greenhouse emissions (CCA 2014). Of the total transport emissions, passenger transport (including aviation) is responsible for approximately two-thirds of this total (the rest being freight transport), or around 59% if aviation is not included.

In the context of this roadmap, the most important aspect is passenger transport's contribution to energy use.

### 2.2 Energy used in transport

The most significant aspect of the transport sector is its energy use. More energy is now used in transport than in any other sector of the economy. In primary energy terms, oil-based fuels used in passenger and freight transport account for 27.3% of all primary energy in 2013–14, higher even than primary energy used in electricity production (Table 3.3, DIS 2015a). It is also the fastest growing sector in terms of energy use (now that the mining boom has eased), so is projected to increase to 32% of all primary energy in 2045–50 (BREE 2014a, 2014b).

In final energy<sup>3</sup> terms (that is, at the point of use) transport is even more significant. Around 39% of all end-use energy consumed in Australia in 2012–13 was used in transport (DIS 2015b).

Of course, these figures include both freight and passenger transport. Passenger transport<sup>4</sup> increased an average 1.5% p.a. over the decade to 2012–13. Energy used by the sectors covered by this roadmap (which excludes aviation) represents just over 61% of all transport emissions. The relative contributions are shown in Table 2.1.

Until recently, growth in transport-related energy use was projected to be moderated by both improved end-use efficiency in the sector, and high fuel prices. However, neither of these has eventuated. The average fuel efficiency of private motor vehicle use has barely shifted in over a decade<sup>5</sup>, and retail diesel prices in early 2016 were at the same level as they were in 2004.

<sup>3</sup> Excluding crude energy supply sectors.

<sup>4</sup> 'Passenger transport' in this definition includes: motor vehicles (cars, motorcycles and buses); rail (heavy rail, light rail), shipping (ferries and coastal) but not air (domestic aviation). 'Freight' includes: motor vehicles (LCVs, articulate and rigid, rail (heavy rail, light rail), shipping and air.

<sup>5</sup> New vehicle fuel efficiency has certainly improved over time, but the average of the entire fleet only improved by 6% between 2006 and 2014, from 11.4 L/100km to 10.7L/100km (ABS 2015).



**Table 2.1 Energy consumption in domestic passenger transport (excluding aviation)**

Scope of final energy consumption	2012–13 ( PJ)
Total transport sector (including private passenger)	1,355
Total domestic passenger transport	959
Total domestic passenger transport, excluding air	832

Source: DIS (2015b)

Energy consumption of all transport, including the private passenger transport sector, is projected to grow at a rate of 1.3% per annum until 2050, with road transport (the largest contribution to transport energy consumption) projected to grow at 0.65% per annum.

Figure 2.1 shows the relative significance of all passenger transport segments, including aviation. It clearly shows that passenger cars are the major energy consuming segment, with aviation slightly less than light commercial vehicles (LCVs).

It is worth noting that LCVs shown here are only the LCV allocation for passenger transport, whereas a similar but slightly larger allocation is made for LCVs in freight transport. The main reason for allocating an LCV share to passenger transport is the increasing number of dual-cab utility vehicles being purchased by private buyers, who currently represent half of all utility sales. Given the relatively inefficient nature of this type of vehicle, this is a significant challenge because the vehicles are very popular: three of the best-selling vehicles in 2015 were utilities (VFACTS 2016).

### 2.3 Fuel cost and price trends

Households spent \$26.7 billion on transport fuel alone in 2011–12 (ABS 2013a, BREE 2014a, Stadler 2015). On aggregate, transport fuel cost represented 60% of household spend on energy in 2011–12, or \$60 of the weekly household energy budget of \$99 per dwelling (ABS 2013a, 2013c). Fuel prices therefore have a greater impact on the average household budget than electricity and gas prices. As Figure 2.2 shows, in 2012 transport cost was the second highest household expenditure item, only slightly lower than housing cost, except in Tasmania where transport was the highest cost (ASIC 2014).

The price of liquid fuels used in passenger transport is driven by global oil market dynamics and the Australian dollar exchange rate, which results in volatile prices. This volatility means that energy efficiency can swing from being a major driver of vehicle choice (favouring fuel efficient vehicles), to one that has little more importance than other purchasing factors.

Imported crude oil and petroleum products now account for 91% of domestic demand for liquid fuels, up from 60% in 2000. Blackburn (2014) notes that import dependency could reach 100% by 2030 under current policy settings<sup>6</sup>. One interesting implication of this reduced self-sufficiency relates to trade: the value of fuel imports exceeds \$25 billion (DIIS 2016); when combined with car imports, these nearly offset completely the value of iron ore exports, negating the economic benefit we might otherwise derive from exported iron ore.

<sup>6</sup> Fuel security considerations associated with this reliance on imported fuel and Australian stock holdings are further discussed in Stadler et al. (2014).

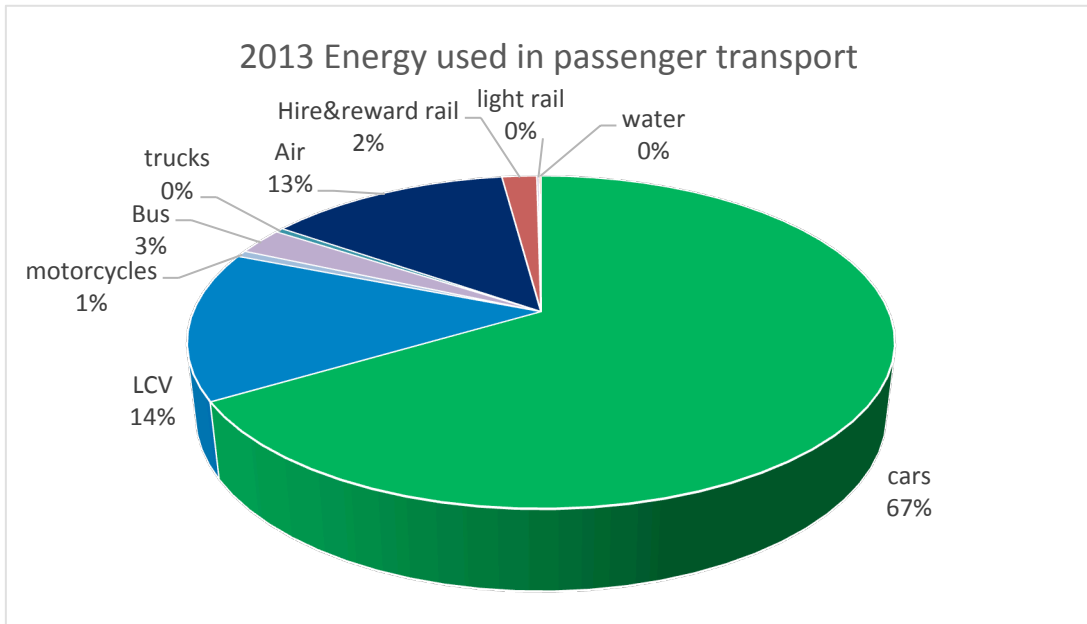


Figure 2.1  
Energy used by passenger transport segments (PJ)

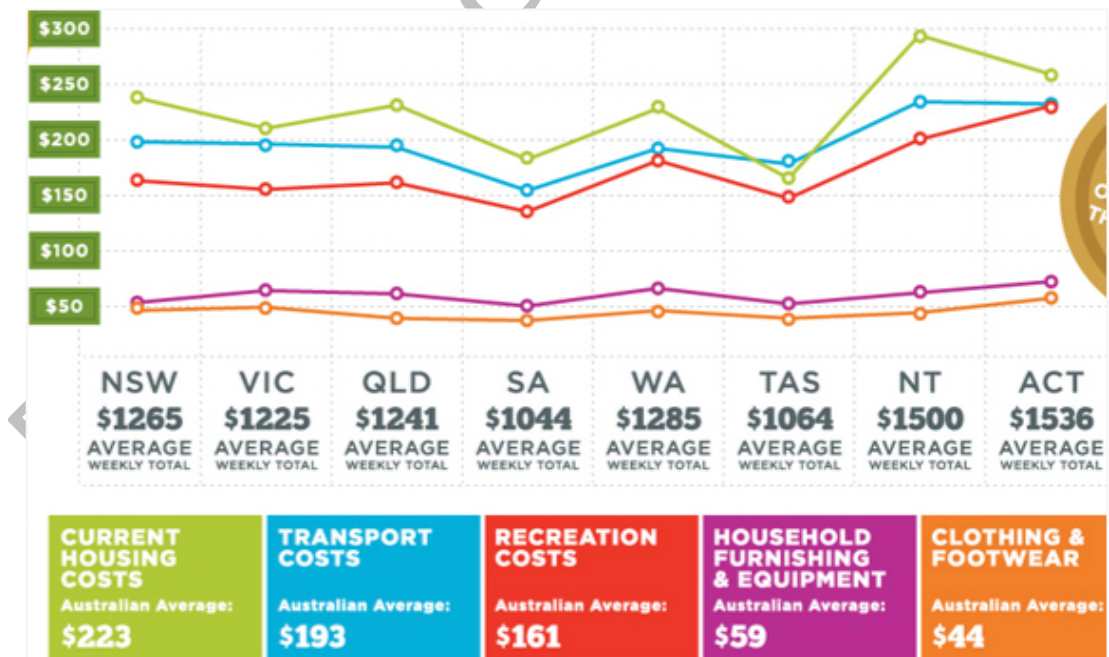


Figure 2.2  
Weekly spend by households in Australia by state and spend category (2012)

### 3 Balancing transport choice and costs

Contrary to the popular image of Australians dispersed across great distances over a wide brown land, we are a highly urbanised society—with almost 90% of the population living in urban areas, more so than the United States and many western European countries such as Germany, France, Sweden and the United Kingdom (Worldbank 2016). An estimated 80% of the value of economic activity in Australia can be attributed to 0.2% of its landmass.

This level of urbanisation makes our cities significant generators of employment, economic growth, productivity and opportunities—for individuals and businesses. However, the economies of scale and network benefits, also referred to as ‘agglomeration’ benefits, are not infinite. Maximising agglomeration benefits is highly dependent on local transport systems. These systems also define the per capita cost of hard infrastructure (i.e. road and rail), as well as services such as education, health and policing (Zeibots 2003). If not optimally managed, the negative economic cost of over-crowding and congestion will mount. In fact, congestion costs can increase disproportionately once a transport network or node approaches capacity (BITRE 2014a), which has been evident in Australia for some time.

A 2016 study estimated the ‘avoidable’ cost of congestion<sup>7</sup> for Australian capital cities in 2015 at approximately \$16.5 billion which, in the absence of measures to alleviate congestion, could grow to \$30–\$37 billion by 2030 (BITRE 2015). The major impacts of these costs relate to productivity: business (48%) and private time lost (36%) due to delays and trip availability, as well as extra vehicle operating cost (9%) and extra air pollution cost (6%) (BITRE 2015). Reducing congestion could also extend the life of existing infrastructure by increasing its capacity to support transport services at standards<sup>8</sup> acceptable to users.

#### 3.1 Structural imbalances in the Australian passenger transport sector

It is interesting to note that the post-war period saw the proportion of trips taken by private motor vehicles grow steadily to far outweigh those taken by public transport, walking and cycling, which have all fallen correspondingly (Figure 3.1). Since the 1980s, public transport’s share of the metropolitan passenger transport task has stabilised at around 10%, while private vehicles levelled at around 85% (Cosgrove 2011).

Around one in six people (17%) in the capital cities are now using mass transit for daily commuting (DIRD 2014a). A slowdown in the rate of growth in private vehicle passenger-kilometres between 2004 and 2012 is also apparent in the five major cities (Sydney, Brisbane, Melbourne, Adelaide and Perth), as illustrated in Figure 3.2 (BITRE 2013b, 2014b).

However, Figure 3.1 also shows a mixture of historic (pre-2015) and forecast (post-2015) data indicating that, while car travel has moderated slightly in recent years and is expected to continue to do so in future (offset by slight growth in rail), the overall share is not expected to change significantly from recent experience, even out to 2030.

<sup>7</sup> ‘Avoidable’ costs being where the benefits to road users of some travel in congested conditions are less than the costs imposed on other road users and the wider community.

<sup>8</sup> This could include public safety standards that may restrict the number of people allowed within transport facilities.

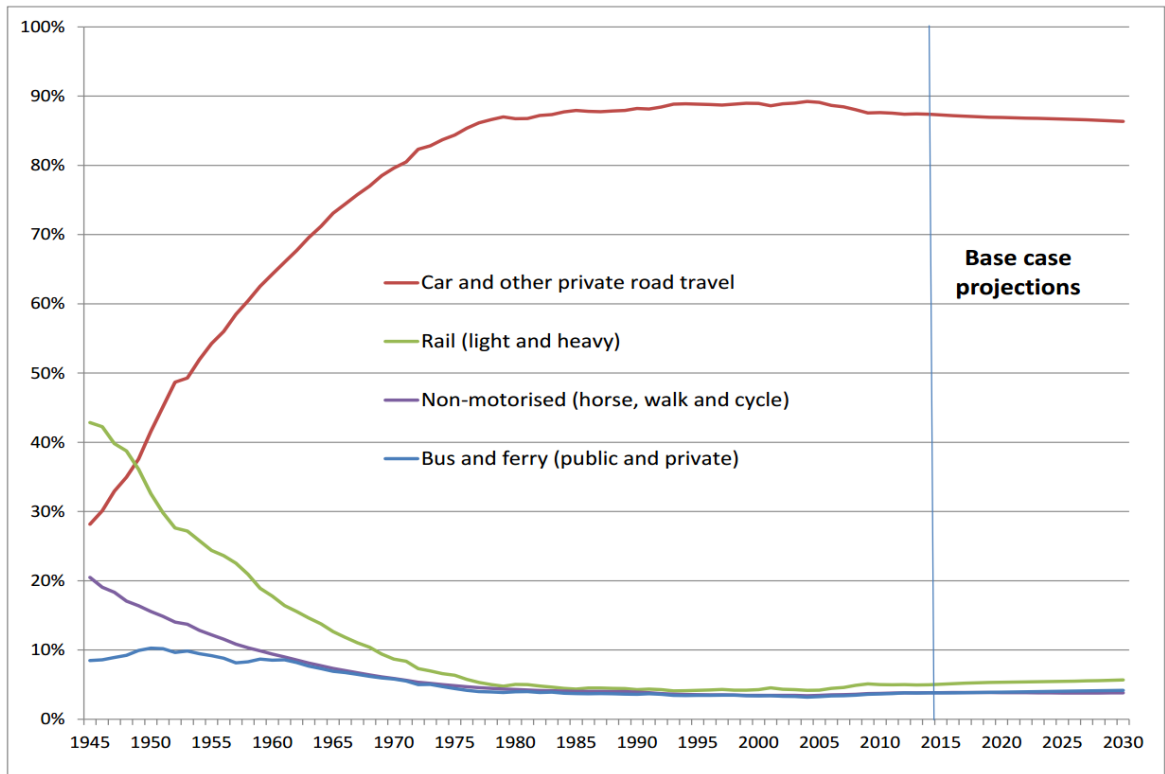


Figure 3.1

Aggregate mode share for the main types of metropolitan travel in Australia (BITRE 2015)

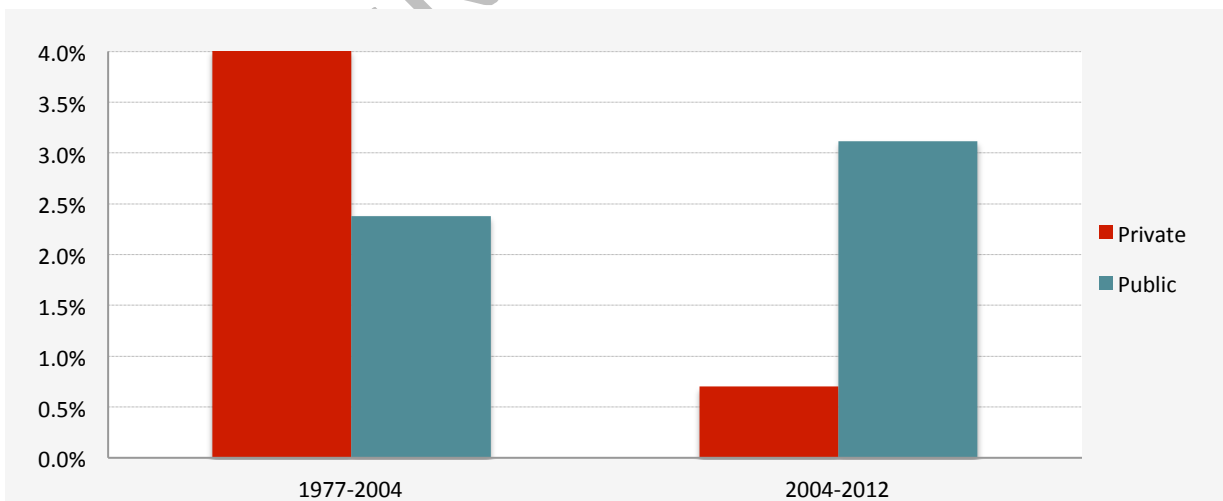


Figure 3.2

Average annual growth in passenger-kilometres in five major Australian cities

New vehicle sales are growing strongly in Australia. In 2014 there were 17.6 million motor vehicles registered in Australia: a 2.6% increase on the year before, and an increase of 12.5% since 2009. (ABS 2014d).

Over a 10-year period, this growth in private vehicles resulted in significant investment in road infrastructure for passenger and freight transport. Over the decade to 2010, transport infrastructure spending by all levels of government on public roads and bridges was 4.3 times that spent on public railway construction (Australian Conservation Foundation 2011).

But instead of addressing road congestion, the investment in road infrastructure may have itself caused the prevailing structural bias against more efficient mass transit rail transport<sup>9</sup>. People make transport choices based, in part, on a perceived 'travel time budget constant' (Zeibots 2003), choosing between modes based on the perceived speed of getting to their destination. In this way, expanding road capacity that mitigates congestion effectively subsidises the ongoing competitiveness of private vehicle use.

Cars on average use approximately 2.5 times more energy per passenger-kilometre than public transport (Glazebrook 2014). Our continued high reliance on private motor cars, and supporting investment in associated road infrastructure, contributed to Australia's low ranking on international benchmarks for transport efficiency (see breakout box).

An additional cost of high levels of road transport is the economic cost of road accidents in Australia: \$27 billion in 2010 (ATC 2011), in addition to the devastating associated social cost.

For these reasons, many of the measures proposed in the Action Plan of this roadmap are intended to help users understand the full costs and benefits of their choices, as well as simplify the decision and process of choosing more efficient options over the long term.



### **Australia's transport energy efficiency scores poorly on the world stage, based on the ACEEE Scorecard**

Australia continues to score poorly in global terms when it comes to transport energy efficiency. A regular assessment by the American Council for an Energy-Efficient Economy (ACEEE) ranked Australia last of 16 major OECD countries in 2014 (Young et al. 2014); and second last of 23 countries in 2016.

The apparent improvement from 2014 to 2016 needs to be seen in context. The score of 7 did not change between assessments, but one of the additional 7 countries in the 2016 assessment scored more poorly than Australia. In other words, all countries from the 2014 assessment, as well as some added in 2016, continued to do better than Australia

The ACEEE scorecard is a qualitative assessment against weighted criteria including policies, efficiency metrics, and economic indicators.<sup>10</sup> Australia scored zero points in the categories of light vehicle fuel economy, fuel economy standards for light-duty vehicles and heavy trucks. Australia also had low scores for use of public transport and investment in rail versus roads.

<sup>9</sup> A single lane of railway can carry up to 50,000 persons per hour; a busway 7,000 persons per hour; and a highway lane just 2,500 persons per hour (Kenworthy 2003).

<sup>10</sup> The transport metrics used in the scorecard are vehicle miles travelled per capita, fuel economy of light-duty vehicles, fuel economy standards for light-duty vehicles, fuel efficiency standards for heavy-duty tractor trucks, energy intensity of freight, freight transport per unit economic activity transport, use of public transit.

### 3.2 Vehicles are just one part of better designed transport system

Optimising individual vehicles is only part of the solution as economic productivity is intrinsically tied to travel time. The passenger transport system itself must be designed to maximise the agglomeration benefits associated with large cities. This requires an integrated approach to urban design with due regard for the interdependence of zoning, concentration of economic activity, densification of residential areas and the capacity of transport networks. Parking also remains a key consideration for the passenger transport system, as most Australian cities are heavily dependent on private vehicle travel and adequate commuter parking facilities.

However, the long life of transport infrastructure assets means that urban designers and planners do not have a blank canvas to work from. They are typically constrained by the legacy of past planning approaches, which determine the available transport corridors. Congestion and demand management<sup>11</sup> strategies are therefore equally important to ensure the maximum benefit from existing transport infrastructure is realised (i.e. move the maximum amount of people during all times of the day within acceptable service standards and cost thresholds per passenger-kilometre).

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<sup>11</sup> Demand management in this context refers to both a reduction in the need to travel and strategies designed to actively shift passengers to transport modes with a lower cost per passenger-kilometre.

## 4 Challenges and opportunities ahead

Over the next decade-and-a-half covered by this roadmap, the transport sector faces significant uncertainty and disruption from major shifts in energy, technology, regulation and social changes leading to new competitive risks and business transformation. The long life and high capital cost of motor vehicles means that car transport is probably the most vulnerable to these social and technological changes, as discussed below.

### 4.1 Energy security and diversity

- Australia's dependence on private motor vehicles for passenger transport means it is highly reliant on a single source of energy—oil. While Figure 3.1 showed this is certainly the case in metropolitan areas, it is even more acute outside these areas.
- This energy is increasingly being imported rather than domestically produced, with 90% of liquid fuel imported.
- As unlikely as it may be, any disruption to the fuel supply chain could have severe implications for economic and social stability, with as little as 3–4 weeks of transport fuel demand held in Australia's in-country stockholdings (Blackburn 2014).
- The longer our reliance on oil continues, the likely the quicker (and more disruptive) the transformation will be, as the transport sector follows other sectors in transitioning to renewable energy.

### 4.2 Technology

Three major technology areas that may transform passenger transport are electric vehicles, autonomous vehicles, and information and communication technologies (ICT).

- Less than 50% of Australia's high definition video conferencing market potential, and less than 40% of the potential for decentralised working in Australia, have been realised to date (ClimateRisk 2014). As people expand their experience with various kinds of media, and the NBN expands data capacity and connectivity, the need to operate from a dedicated, centralised workplace becomes less critical (at least for knowledge workers). At the same time, higher-quality video conferencing (and services such as webinars and Skype) will reduce the need for some business travel. For those that do need to travel to work, their vehicles will be of a new kind.
- Technological innovation now enables commuters to track traffic data remotely and make independent plans to avoid congestion, with vehicle-to-vehicle communications likely the next frontier. Such systems could be capable of collision avoidance, automatic road rule enforcement, or enhancing the control of traffic through intersections (Ball & Dulay 2010).
- In Australia, electric vehicles have so far struggled to gain a foothold in the market, representing only around 0.1% of all new vehicle sales. Reasons for this include the higher costs (and lower driving range) of current batteries, lack of widely available recharging infrastructure, and limited availability of models. However, battery costs are falling rapidly, and by 2020 a full battery EV could be around the same price as a conventional car equivalent. At that point, the shift to EVs is expected to be rapid. Some time after that, hydrogen fuel cell EVs will also become widely available. In countries where the higher costs of EVs are subsidised, the shift has already started: EV sales in Norway already represent close to 20% of the new vehicle market, and are increasing 80% annually. Globally, electric vehicle technology is the only one of nineteen technologies being

monitored by the IEA that is on track to meet its target for contributing to 2050 climate goals.

- The first stages of autonomous driving technology and systems are already available on some current cars. These include lane departure warning systems, intelligent cruise control and autonomous emergency braking, progressing up to Tesla’s so-called “Autopilot” (which is in reality just driver assistance technology). By 2018, Tesla expects to have fully-automated driver systems incorporated into their vehicles, which will not require the driver to perform safety-critical functions. Even if one considers that overly ambitious, other mainstream manufacturers are claiming they will have the same by 2020 (and on lower-priced models). In other words, the technology is surprisingly close to current reality—with or without supporting infrastructure. Western Australia is planning a trial of an autonomously driven bus later this year in Perth, with Figure 4.1 showing the bus under consideration.
- If anything, passenger cars are simply playing catch-up with other industry sectors where automated machinery is already common place. Aircraft have had autopilot for many years, which can perform even the hardest manoeuvres (take off and land). In Western Australia, a fleet of driverless mine-haul trucks already moves iron ore in the Pilbara (DIRD 2014a), connecting with trains that also operate without a driver. In warehouses around the world, manual stock picking by humans has been replaced by autonomous robots that can operate in the dark.



*Figure 4.1*

**Autonomous bus proposed for trial in Perth later in 2016 ([www.motoring.com.au](http://www.motoring.com.au))**



### 4.3 Regulation

- Once the safety benefits of autonomous vehicles, and the emissions benefits of electric vehicles, are fully realised, regulatory pressure may force their accelerated adoption.
- Some countries (Netherlands, Norway) have already signalled their intent to ban sales of conventional fuel powered cars—as early as 2025. It may be easy for individual cities to quickly follow suit—cities like Beijing already limit access by vehicles on particular days, and Paris is considering a full ban on vehicles older than 20 years (now) or 10 years (by 2020).
- If, or when, autonomously driven vehicles are demonstrated to reduce accident rates, the case for regulators to mandate the adoption of the technology in new vehicles may be compelling. After all, if the technology is available at little cost, an argument could be made that there are moral, economic or social obligations to require it, given the significant reduction in accident costs and trauma it could generate. A precedent for this occurred in 2010, when Australian Design Rules were amended for similar safety reasons, mandating the fitment of electronic stability control systems (ESC) on vehicles imported to Australia, even on models that until that time did not offer it even as an option. The United States National Highway Traffic Safety Administration has already expressed a desire to impose mandatory vehicle-to-vehicle communications when the technology improves (United States National Highway Traffic Safety Administration, 2014).
- In addition to the vehicles themselves, infrastructure is likely to require new design standards to ensure compatibility with emerging electric and autonomous vehicles. This could be as simple as recharging stations in residential unit developments, or identifying features or characteristics on roadside signage or infrastructure.

### 4.4 Social change and business transformation

- People are exploring new ways to meet their needs and desires through non-traditional market mechanisms. The internet and social media have bred new models to directly match needs with services, transforming areas as diverse as asset ownership (via the sharing economy), energy supply (as a service), employment (task-level contracting), and productivity (co-working spaces and business collaborations).
- These new models are converging in the transport sector where ride sharing and ride hire booking companies (Uber, Lyft) have disrupted traditional services like taxis and public transport. Ultimately, many expect 'private' transport to evolve into mobility as a service. Some cities are already experimenting with a single annual mobility subscription fee that covers ride sharing, public transport, bicycle hire and taxi services.
- As autonomous vehicles become common place, the rationale for car ownership will be undermined even further. A small number of large fleet operators keeping vehicles highly utilised in autonomous taxi services could meet the majority of private and public urban transport requirements. While the timing of this is highly uncertain, the many benefits of people not being required to drive themselves (road safety, productivity, recreation time, cost reductions) suggest that the business case will be strong.

- Combined, these developments may erode patronage and viability of public transport systems as the 'mobility cloud' becomes reality, at least in urban areas. Such a concept would see an extensive fleet of ubiquitous, driverless, connected vehicles picking up passengers on-demand—either as a shared ride service or private hire. Waiting times would be short, costs would fall, and congestion would be reduced. And instead of cars spending the majority of their life parked, they would be better utilised, with the overall size of the fleet falling.
- In the longer term, changes in the design and integration of cities will also reduce the need for people to travel. Integrated urban design results in co-location of employment opportunities, residences and services with public transport and walkable urban form. Initiatives such as the NSW Green Grid is a good example of a spatial development strategy that has as a central tenet of encouraging shifts to less energy intensive modes of transport, particularly active transport (walking and cycling) and public transport (Government Architect's Office n.d.). Coupled with concepts such as smart hubs, it could also reduce the scale of the transport task by reducing the need for travel or the distances travelled, particularly distances travelled in private vehicles. A national Smart Cities Plan has seen opportunities emerge linked to the government innovation agenda.
- Convergence of energy, information, buildings and transportation is creating opportunities to incorporate transportation as part of a ubiquitous energy network.

Meeting these challenges and exploiting the opportunities requires a proactive and long-term perspective. Measures are needed across the spectrum of policy, investment decision-making, technology, infrastructure and urban planning. But action is urgent, because the useful life of transport assets (i.e. infrastructure, vehicles, ferries and trains) is more than 20 years<sup>12</sup> (ABS 2014d). Today's transport and urban planning decisions could therefore lock in energy-intensive modes of transport for decades to come (DCCEE 2010).

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<sup>12</sup> BITRE calculation from ABS, Motor vehicle census, cat. no. 9309.0.

## 5 The case for 2xEP in passenger transport

Improving the energy productivity of passenger transport systems (including active and public transport options) is essential for improving economic growth and productivity, public health, fuel security and social equity (Hulten 2007). The benefits of a significant improvement in energy productivity in the passenger transport sector will include:

- cost savings for vehicle operators—both private and public—through better fuel efficiency;
- cost reductions for transport users, originating from the lower operating costs;
- cost-effective reduction of greenhouse gas emissions;
- reduced requirement for imported transport fuels, and the associated economic and trade impacts;
- a reduction in overall vehicle-kilometres travelled, by reducing the need to travel;
- optimisation of passenger transport systems (i.e. capacity utilisation) and agglomeration impacts of increased opportunities for economic exchange;
- multiple dividends in terms of improved fuel security, balance of payments, reduced congestion costs, reduced health costs, and improved accessibility, amenity and equity.

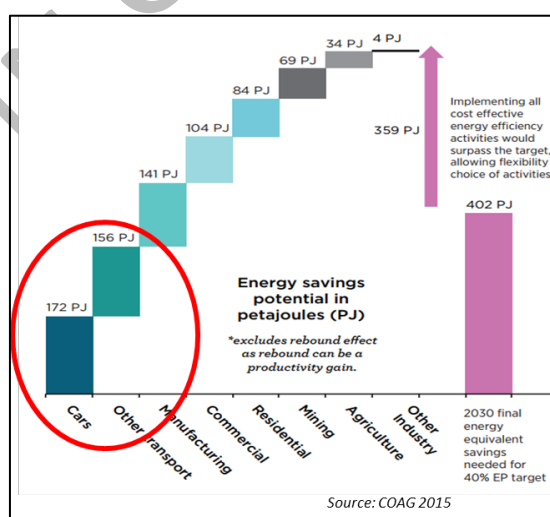
Energy efficiency may not be the primary driver for all of these benefits. Indeed, in some cases the energy savings may be the lowest value of any of the benefits. However, the idea of energy productivity is useful precisely for this purpose, bringing together a range on disparate, non-energy benefits under a common metric.

## 6 Barriers to energy productivity

Many studies suggest that transport has some of the most cost-effective opportunities for improving energy efficiency of any sector in the economy (ClimateWorks 2010; CCA 2014; DIS 2015c; COAG 2015). The sectoral contribution chart from the National Energy Productivity Plan (Figure 6.1) shows the expectation of cost-effective energy savings from each sector, with cars and other transport the two biggest opportunities. However, while the transport sector has some of the best opportunities, many of these are not being realised because of market failures and other barriers.

It is crucial that barriers to the adoption of energy productive technologies and practices are overcome to maximise the agglomeration benefits of Australian cities. The main reasons the opportunities are not being realised can be summarised as follows.

- Prevailing transport investment paradigms:** Transport infrastructure is among the most complex areas of investment decision making. It requires a very long-term strategic investment decision-making framework due to the lifespan of transport infrastructure, and also the deterministic impact transport systems have on urban form, spatial development and, ultimately, economic activity in Australian cities. Yet despite development principles that include systems, social, economic, environmental and governance criteria (IA 2013), traditional transport infrastructure policy has not explicitly considered energy productivity. One result is that past planning and infrastructure investment policies directed funding to road infrastructure—essentially the ‘point of greatest pain’. However, this simply reinforces the dominance of road transport against all other modes. So the decision-making paradigm that has shaped Australia’s current infrastructure<sup>13</sup> appears to be in sharp contrast with the required strategic approach to investment in an integrated transport system that reflects energy productivity principles.



Source: COAG (2015)

Figure 6.1

### Cars as the biggest energy saving opportunity under the NEPP

<sup>13</sup> With notable recent shifts in some States as previously discussed

- **Prevailing energy policy paradigms:** Transport is now the biggest user of energy and growing, and it has important linkages to major issues including congestion, greenhouse emissions, air pollution, and other productivity factors outlined earlier. Yet despite its significance, transport is rarely included in policies and programs that claim to be “energy” focussed. Instead, most of these focus on electricity, or electricity and gas. This is particularly so at state government level. There are in fact very few policies that directly focus on reductions in transport energy use, transport emissions, or reducing transport costs.
- **Planning regulations and responsible agencies:** The current split in responsibilities for transport systems between federal, state and local governments adds complexity to integrated planning and decision-making on large infrastructure projects and urban development more generally. This results in siloed decision-making processes that do not allow for government agencies with different responsibilities and at different levels to come together to discuss planning as a whole (Simpson, 2014). This view is also supported by the Rail Tram and Bus Union’s (RTBU) Public Transport Blueprint for Sydney which notes the issue of responsibilities for transport planning being spread across too many government departments and authorities with insufficient coordination, and imbalances of power between public transport and roads portfolios (Atherton, Riedy, & White, 2006). Furthermore, Regulation Impact Statements and cost benefit analysis tend to maintain the status quo and can further entrench fundamental flaws in city structures (Simpson, 2014). The transport task is therefore not adequately considered as a whole in conjunction with strategic urban and regional planning.
- **Corporates and government incentivise the use of private vehicles:** Between 2008-09 and 2011-12, over \$4.5 billion more was spent on roads than was raised in almost all road taxes and charges (IA 2014). At the same time, leased company vehicles are a standard feature of many corporate salary packages, with Fringe Benefits Tax (FBT) rules effectively subsidising private use of new vehicles, while simultaneously incentivising commercial company vehicles over more efficient passenger cars. The cost of FBT associated with company cars in 2007–08 was estimated at more than \$1 billion. The Australian Conservation Foundation (ACF) argued that the FBT regime is a subsidy to road transport users due to application of the statutory method to value car benefits (ACF 2011).
- **Lack of information to support decision making:** The Energy Efficiency Opportunity (EEO) report Fuel for Thought on transport efficiency opportunities, identified a lack of adequate data in the transport sector, particularly data on the real-world benefits of new technologies. While this is less significant in light vehicles than in heavy vehicles, it does apply to bus and rail investment. (DRET 2012). Equally, one of the reasons for the slow uptake in EVs is the view that ‘green’ consumers do not deem it to be a lower emissions transport option while coal continues to dominate grid-supplied electricity (Duff, 2015). While this may be true for some classes of vehicles in Victoria, which has the most emissions-intensive electricity in Australia (Lal, 2015), it is not the case for most average vehicles in other states (CCA 2014). EV emissions intensity is also likely to reduce further as the share of renewables in the grid continues to increase, or of charged from rooftop solar panels. Different considerations in the business case calculation for EVs and hybrid vehicles (e.g. lower maintenance costs, different depreciation) might also make it overly complex for private buyers, who do not base their purchasing decision on a whole-of-life cost calculation.

- **Reluctance to regulate industry:** New vehicles are required to be labelled to indicate fuel economy. However, there are no regulated minimum standards for vehicle fuel efficiency such as the minimum energy performance standards (MEPS) that many other products are subject to; and with which over three quarters of vehicles in the rest of the world must comply. Numerous vehicles emissions standards and supporting measures have been proposed and considered in Australia over a number of years. However, past governments of all persuasion have refused to impose fuel efficiency or CO<sub>2</sub> standards, fearing the decline of local vehicle manufacturing in Australia as a result.
- **Split incentives:** Nearly 50% of all new car purchases are for fleets. The purchasing choices of fleet buyers therefore affect the second-hand car market. However, corporate fleets are diverse, ranging from executive corporate car schemes to specially equipped utility style vehicles. Thus, fleet buyers have different requirements, motivations and constraints to private buyers. ClimateWorks estimates the payback period on more fuel efficient vehicles to be three years, which is well within the five-year average period of car ownership for private car owners (ClimateWorks, 2014b). However, this may not be the case for fleet buyers for whom stock turnover is more frequent.
- **Unpriced externalities:** This barrier includes costs or benefits that affect a party who did not choose to incur the cost or benefit. Three relevant examples include the free emission of exhaust pollution into the air, the lack of any price for climate change—causing greenhouse gas emissions, and the avoidable costs of lost productivity arising from traffic congestion. Failing to charge for these externalities reduces the incentive to choose products or practices that could reduce these costs to society. Of particular relevance is the lack of a price on carbon, which would increase the cost of less efficient vehicles and support other measures to drive change in consumer choices.
- **Negative public perceptions:** Negative public perceptions about collateral impacts of improved passenger transport systems (both private and public), particularly those that rely on significant changes to the urban environment, can hamper and prevent improvements in energy productivity. These supposed impacts might include higher traffic flows, higher development density, changes in use and amenity and reduced property values. These are reasonable concerns and efforts must be made to understand and mitigate them or/and facilitate support for change in the community interest. Any case for change must engage with decision-makers including local governments and with relevant stakeholders.

## 7 Measures to overcome the barriers

### 7.1 Opportunities to improve energy productivity in passenger transport

In the passenger transport sector there have been some positive steps in recent years in relation to energy productivity, particularly significant investment in public transport systems such as heavy and light rail in Sydney and light rail on the Gold Coast. However, an energy productive passenger transport sector is at the intersection of urban design, infrastructure investment, technological advances and socio-economic development trends. Isolated investments are therefore unlikely to deliver an energy productive transport system. The productivity of such a complex system will require co-ordinated action.

The International Energy Agency recommends policy packages for improving energy efficiency and reducing emissions in each sector. Its transport sector package<sup>14</sup> includes six main elements:

- **Minimum fuel efficiency standards:** Three-quarters of all new cars sold globally are regulated by some form of CO<sub>2</sub> emissions standard (ClimateWorks 2014b). China and India, which have mandatory standards, have more efficient passenger vehicle fleets than Australia (Jabour 2014). By not having some kind of efficiency standards, the efficiency of new vehicles in Australia continues to languish compared to other countries. Increasing fuel efficiency of light vehicles could reduce fuel costs by up to \$7.9 billion annually by 2024 at an average pump price of \$2.10/L (ClimateWorks 2014b).
- **Mandatory fuel efficiency labelling:** While light vehicles require a label with fuel efficiency performance and CO<sub>2</sub>, some kind of rating or label needs to be extended to heavy vehicles (such as buses used in passenger transport). In addition, major components such as tyres account for 20–30% of a vehicle’s fuel use (European Commission 2015). But in Australia, there is no standard basis of comparison, even though installation of low-rolling resistance tyres is recognised as an eligible activity by the Commonwealth’s Emissions Reduction Fund (ERF) (Department of the Environment 2015a).
- **Mandatory reporting of energy consumption of vehicle fleets:** The former Energy Efficiency Opportunities program met this objective, but has been discontinued. The emissions-focused NGER scheme remains, but does not provide a suitable metric for benchmarking individual vehicles, routes, or depots. A more extensive, and publicly available, benchmarking database would help fleet owners compare their performance with both the industry average and best practice fleet operators.
- **Targeted information:** Vehicle operation and management at both fleet and private level can be improved. Changing driver practices or adopting ‘fuel efficient’ driving techniques<sup>15</sup> could reduce fuel consumption of private vehicles by 4.6% (Graves, Jeffreys & Roth 2012). For rail operators, driver assistance software can help to optimise driving techniques based on detailed data about location and conditions, resulting in potential fuel savings of 5 to 20% (DRET 2012). Often this information is not accessible or not understood—better provision of information can change behaviour and improve operating practices.

<sup>14</sup> <https://www.iea.org/media/training/eetw2016/day1ppt/3Policies.pdf>

<sup>15</sup> Typically includes smoother driving, slower driving, less idling, and the prediction of traffic flow to obtain better fuel economy.

- **Incentives such as tax allowances:** Australian governments at all levels appear loath to offer direct incentives to stimulate uptake of technology or reduce emissions. This may be due to a reluctance of governments from both sides to interfere in existing (though imperfect) markets; and a recognition that past interventions have sometimes produced unintended consequences. Nevertheless, overseas experience shows that time-limited, well-designed schemes could support the commercialisation of lower carbon fuels, low emission vehicles, and public transit investment.
- **Cost-reflective road pricing:** this could include congestion fees to capture congestion costs, or mass-distance time charging to better connect road use and its associated costs. These have been under discussion and consideration in Australia for a long time. Reform is likely, but has been slow.

## 7.2 Principles for a passenger transport roadmap

The recommended measures that appear here are based on three main principles.

- A trip-based energy hierarchy (Figure 7.1) showing pathways for reducing energy intensity in transport choices.
- Information and measures that support and enable lower energy choices in the hierarchy (via better information and products).
- Regardless of the choice, options to reduce energy intensity at all points within the hierarchy.

The hierarchy is a general framework, and not intended to fully represent all costs and benefits. However, the two trend bars at right broadly indicate both the general weighting of both costs and energy intensity in the transport options hierarchy.

It was the intention of the measures outlined in the Roadmap to:

- act at trip decision points (such as availability of mode options; full information on costs/benefits of different options, etc); and
- permit easy downshifting along the left-to-right trip journey for switching to lower cost pathways.

Ultimately, even with all information available and choice between pathways, a passenger may still choose high embedded energy paths for a range of other reasons. In that case, it was still considered important to have options for the final vehicle/route/vehicle which represented a best case option under the circumstances.

Research and evaluation for the roadmap produced a shortlist of eleven measures for further development. Importantly, some of the measures have important links to other sectoral roadmaps and other 2xEP working groups. Additional detail on barriers, linkages, implementation considerations, costs/benefits and examples, are provided in Tables 8.1 to 8.11.



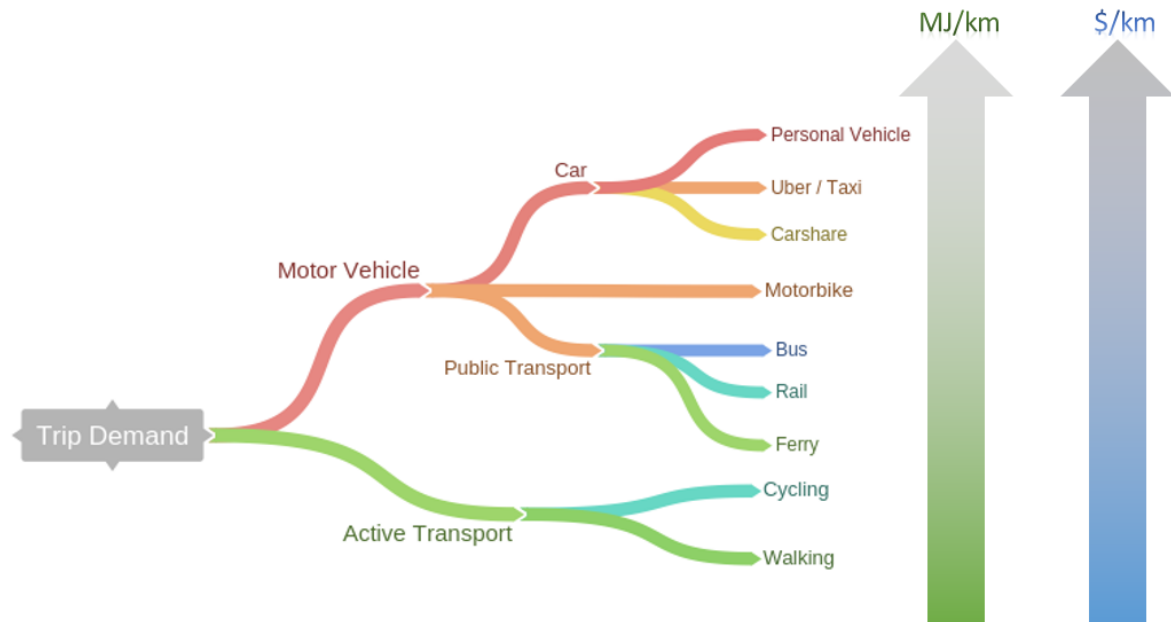


Figure 7.1

**Passenger transport energy hierarchy supporting the measures in the roadmap**

The twelve measures prioritised for implementation to double energy productivity include:

1. Better information for consumers and decision makers
2. Establish independent organisation to support and advocate for low emission vehicles
3. Incentives to purchase LEVs (*Financing Roadmap*)
4. Enable flexibility and choice to support shift away from low occupancy private cars
5. Accelerate adoption of renewable energy in transport
6. Support wider use of carpooling and car sharing
7. Coordination of autonomous vehicles (*Innovation*)
8. Fuel efficiency standards for light vehicles
9. Incentives for high occupancy vehicles
10. National target for LEV uptake
11. Cost-reflective road pricing
12. Examine the role of industry in providing information

An indicative timeframe for the implementation of these measures is shown in Section 8.

## 7.3 Benefits and costs of energy productivity improvement

### High level benefit/costs analysis

A2EP has conducted a high level qualitative assessment of the costs and benefits for each of the proposed initiatives to help determine whether a project should be pursued. The analysis also includes reference to other assessments previously conducted where relevant and applicable. A more robust approach is required for assessing the initiatives prior to implementation.

### Summary of potential benefits

Boosting productivity and competitiveness	Likely to result in improved output and a reduction in energy intensity as well as reduced costs and improved competitiveness
Improving company value and brand	High performance companies are more profitable, attract investment and customers, attract and retain staff
Reduced government outlays	Once implemented a reduced number of government staff required to administer the initiative. Additional savings are also achieved through a reduction in infrastructure and on-costs.
Reduced company resources	Reduced company resources required to access support and assistance as a result of streamlined and consistent processes
Red tape reduction (by industry)	Consistent and streamlined processes resulting in reduced regulatory burden
Improved investment certainty	Potential for increased investment as a result of increased certainty about the policy and regulatory environment and in the performance of plant and equipment
Contributing towards Australia's emissions reduction	Assisting Australia meet its emissions reduction goals through improved energy productivity
Reducing the cost of energy	Potential to reduce the amount of company expenditure on energy
Protecting energy security	Reducing reliance on imported liquid fuels as well as coal-based generation and networked electricity infrastructure

### Summary of potential costs

Additional government outlays	Additional staff may be required to develop, administer or deliver the initiative taking into account additional salaries, infrastructure (i.e. office space and equipment) and on-costs.
Increased company resources	Increased company resources required to access support and assistance
Increased energy prices	Potential to increase energy prices. For example a nationally consistent white certificate scheme might increase retail energy prices in jurisdictions that currently don't have schemes.
Increased red tape	The potential for increased government involvement leading to delays in development and implementation
Government funding/support	Financial costs associated with providing either direct or indirect funding, incentives and support

## 8 Implementation

The measures proposed in this roadmap combine short, medium and long-term measures. Owing to the nature of the sector—which involves predominantly private consumers operating single, geographically dispersed pieces of equipment—many of the measures involve government action to reduce or eliminate market barriers. Others require a combination of government and industry action.

The timing and categorisation of the measures is summarised in Figure 8.1. Additional detail for each of the numbered measures is provided in the tables that follow.

It is important to note that not all actions—indeed not many—are capital intensive. This may be crucial to implementation, as higher cost initiatives are typically longer term and subject to greater uncertainty. Some of the lower cost actions include:

- pricing strategies that enable full cost recovery to support ongoing investment in public (and where applicable active) transport options;
- removal of tax incentives and employee benefits that in isolation may be desirable, but when viewed within the context of an energy productive passenger transports system can contribute to unintended outcomes;

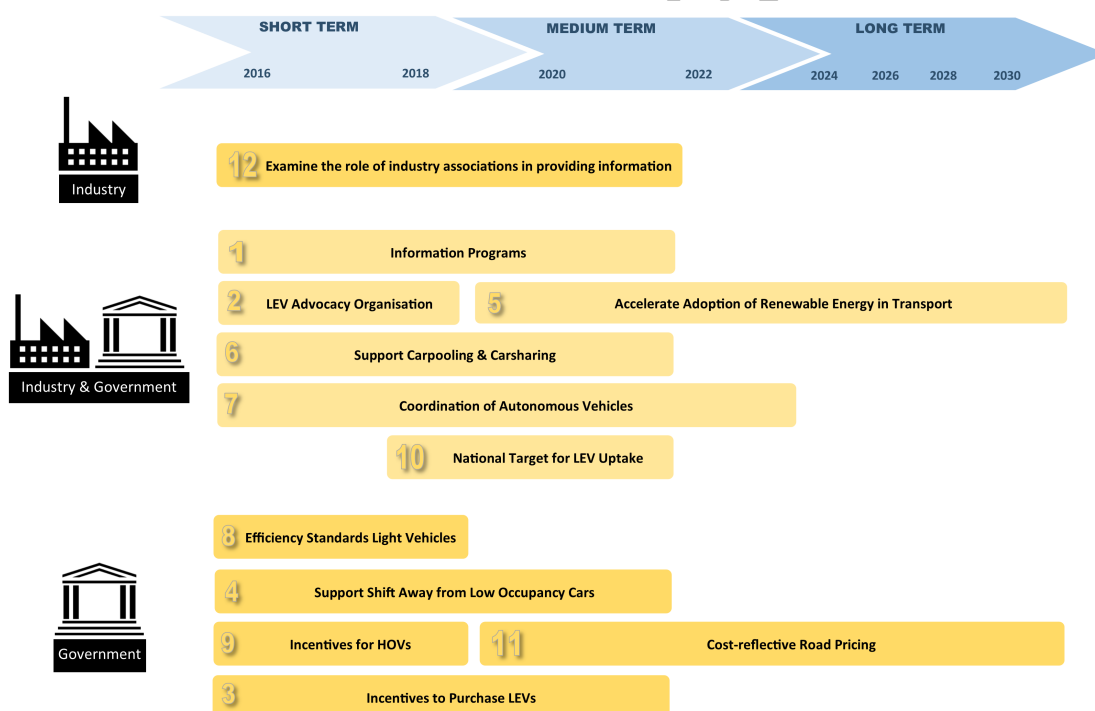


Figure 8.1

### Timeline and responsibility for implementation of measures

- incentivising more energy-efficient private and fleet vehicle purchases through mechanisms supplementary to the ERF, which is far less effective for mobilising transport projects than in other sectors;
- supporting reforms in preferential stamp duty and registration charges (fee-bates);
- investing in congestion management and travel planning technologies that supports real-time decision making by travellers;
- introducing benchmarking tools for fleet efficiency, and raise awareness about technology and behavioural opportunities;
- better integration of transport into broader energy policy, and better integration of energy into transport policy.

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**Table 8.1 Better information for transport consumers and decision makers**

Category: Joint industry and government initiative

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**Overview**

Technological innovation (especially ICT) enables provision of data so consumers can prioritise transport decisions based on real-time mode availability, travel time, cost and environmental impact of different options (routes, modes) using journey planners and mapping tools. Underpinning the success of tailored information is the completeness, structure, accessibility and accuracy of open-access data.

By monitoring travel behaviour and increasing understanding of what informs choices, planners can also predict how transport users will respond to changes in transport systems. This may even allow more applied behavioural economic techniques to be adopted.

**2xEP recommends:**

- Develop open access platform supporting real time data exchange to better reflect whole-of-trip travel time and cost (congestion, PT delays, car park occupancy, tolls, fares, fees).
- Collect data (e.g. visitation, parking occupancy) about historical, real-time and future travel demand for major destinations and public spaces (e.g. hospitals, schools, universities, airports, shopping centres, sports stadiums).
- Support increased parking occupancy-detection capability.
- Support third-party developers and users to improve the delivery and use of mobility services through information services.
- Support platforms to share learnings on successful adjustment of travel behaviour (e.g. councils that increase public transport patronage and higher car occupancy).
- Support applied transport research and analytics (e.g. Transport and Logistics Living Lab)

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**Current barriers**

- Information gaps: a major barrier to making informed decisions, particularly if predicted travel time or cost is unreliable on some modes of transport (e.g. taxi compared with train to/from airport). Unavailability of information related to whole-of-trip cost/time/emissions can also distort decision making.
- Unpriced externalities: major destinations (e.g. airports) may encourage driving because they make revenue from parking/taxis but do not pay for resulting congestion; other venues (e.g. shopping centres) may impose costs on local residents due to overflow of parked cars.
- Most destinations also benefit from uncertainty of travel times as visitors that arrive earlier are more likely to shop (e.g. prior to appointments, lectures, flights or entertainment).

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**How the approach will address the barrier(s)**

- Increased accuracy, completeness and certainty of information (particularly predictability) allows individuals to adjust travel choices based on their needs as changes occur in real-time.

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**Factors to consider**

- Linkages with existing government programs around data sharing and retention.
- Privacy or confidentiality of travel behaviour information.

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**Cost/benefit**

- Ability to track traffic data remotely and shift plans to avoid congestion can cut travel times by 8.5%, and reduce fuel consumption by 2.45% (CIVITAS Initiative 2010). The adoption of smart phone parking software and a peer-to-peer parking market could reduce times to find parking and lower costs without the need to invest in new parking infrastructure capacity (NRMA 2015b).
- Information can significantly influence non-commuter car use in peak times in Sydney based on the large proportion of 'discretionary' trips (~20% related to shopping, social and recreation and a further 17 % related to school transport (Sydney Household Travel Survey 2012–13).

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**Relationship with NEPP**

- NEPP measure 3 - 'Make choice easier'
- NEPP measure 15 - 'Drive innovation in transport and infrastructure systems'
- NEPP measure 16 - 'More liveable, accessible and productive cities'
- NEPP measure 24 - 'Improve the exchange of market data'

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**Links to other programs**

[Transport for NSW - Transport Data Exchange \(TDX\) program](#)  
[National Policy Framework for Intelligent Transport Systems](#)

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**Examples**

[LA Mobility Plan 2035](#)  
[City of Chicago – data portal](#)

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**Table 8.2 Minimum fuel efficiency standards for light vehicles (cars and LCVs)**

Category: Government initiative

**Overview**

In 2014, the [Climate Change Authority](#) examined five policy scenarios to improve light vehicle efficiency, and concluded that mandatory standards are the best approach (the other four being continuation of current settings, voluntary standards, information campaigns, and financial incentives).

**The Ministerial Forum on vehicle emissions has scoped options for improving light vehicle efficiency (due June 2016). To capitalise on the opportunity, 2EXP recommends:**

- Selection of an ambitious target (e.g. 50% improvement, leading to 95 g CO<sub>2</sub>-e/km in 2025 and 75 g CO<sub>2</sub>-e/km in 2030)
- Alignment with World Light-duty vehicle Test Procedure (WLTP) being developed by the EU by 2020.
- A mechanism to compare test results with real world performance to track correlation over time (e.g. allowing motorists to input actual fuel consumption on a Vehicle Fuel Economy Labelling (VFEL) website or database similar to MyMPG on the US website [www.fueleconomy.gov](http://www.fueleconomy.gov)). Download and reporting of real world economy could also be aligned with vehicle service events.
- Provide star ratings comprising fuel economy/emissions/operating cost savings on VFEL.
- To improve affordability and accelerate fleet improvements faster than current replacement rate, private importation of second-hand light vehicles could be permitted if their efficiency is better than some minimum LEV threshold (e.g. 30 g CO<sub>2</sub>/km less than the target).

**Current barriers**

- Higher capital cost of more fuel efficient vehicles/technologies.
- Vehicle manufacturer opposition.
- (Potentially) fuel quality standard for petrol.

**How the approach will address the barrier(s)**

- Increase range of vehicles.
- Vehicle manufacturers offering more efficient models/variants to meet the fleet standard.

**Factors to consider**

- Three-quarters of the light vehicles on Australia’s roads in 2030 are yet to be sold.
- Loss of consumer choice (for less efficient vehicles)

**Cost/benefit**

- Higher price premium (CCA modelling estimates standards could add \$1,000 to \$1,500 per vehicle by 2025); but this would be outweighed by fuel savings of up to \$7,000 (depending on the standard adopted) over the life of the vehicle.

- Reference table:

Table 8. Cost-effectiveness analyses of light- and heavy-duty fuel economy and CO<sub>2</sub> standards

Rule	Per-Vehicle Cost	Payback Period
US LDV 2017-2025 <sup>a</sup>	\$1,800	3.5 years
US LDV 2012-2016 <sup>a</sup>	\$950	3 years
US HDV Phase 1 2014 – 2017 <sup>a</sup>	\$378-\$6,215	1-2 years
California Advanced Clean Cars Program 2017 – 2025 <sup>a</sup>	\$1,340-\$1,840	3 years
Canada LDV 2017-2025 <sup>a</sup>	\$2,095	2 to 5 years
Canada LDV 2011-2016 <sup>a</sup>	\$1,195	1.5 years
European 95g CO <sub>2</sub> /km Standard 2020 <sup>a</sup>	€1,300	4-5 years
India LDV 2020 <sup>a</sup>	\$400 to \$600	2-3 years

- ClimateWorks (2014b): fuel efficiency standards could achieve 258PJ reduction in energy use by 2024 (i.e. a drop in fuel demand of 30–50% by 2024, compared to 2012 levels) and annual fuel savings across the economy of up to \$7.9 billion annually by 2024 in AUD2012.

**Relationship with NEPP**

- NEPP measure 14

**Links to other programs**

- LEV rebates/targets

**Examples**

- See VFEL study

**Table 8.3 Measures to increase mode shift**

Category: Government initiative

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**Overview**

Public transport uses less energy per passenger-km than light vehicles, with immediate energy productivity improvements of over 50% available. But the appeal of public transport is constrained by its inability to respond to individual traveller needs. New and dynamic models could be investigated that disrupt the status quo in terms of fixed routes, stations and stop locations, following regular schedules with limited price flexibility. To increase mode shift away from private cars, public transport must become more customer centric but do so at least cost.

**2xEP recommends:**

- Improve first mile/last mile connectivity by integrating bike sharing schemes with public transport smartcards (at same daily cost).
- Trial door-to-door public transport options with smaller buses or ride share organisations (e.g. shared taxi service).
- Adopt free public transport between 10 am and 2 pm and 8 pm to 6 am.
- Provision of discounted travel passes to corporates for employee use.
- Removal of Fringe Benefits Tax (FBT) if an employer meets the cost of an employee's public transport costs
- Integrated ticketing systems (e.g. Sydney Opal card) which improve modal interchanges.
- Provision of seamless connections between dedicated cycle ways and public transport, through measures such as bike racks on the front of buses.

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**Current barriers**

- Perceived safety risks of active transport (for some).
- Perceived over-regulation (mandatory helmet laws noted as a major deterrent to cycling)
- Level of service for public transport (access, speed, flexibility)

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**How the approach will address the barrier(s)**

- Improved service
- Incentives

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**Factors to consider**

- Public transport is far more space efficient (2,500 people/hour on a freeway lane vs 50,000 on heavy rail)
- Also contributes to a reduction in air pollution
- Up to 20% of all trips in Australia are less than 5 km (ABS 2009, cited in Australian Bicycling Council 2010): therefore appears to be significant scope for increased cycling and walking.

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**Cost/benefit**

- Victoria's Myki off-peak trial (train fares into CBD free before 7 am): 2,600 people took advantage; assuming these people would otherwise travel in the post-7am peak, and those trains in the peak are full, additional peak capacity would need to expand by five new trains to accommodate them, costing \$100 million. Even factoring in the cost of fare subsidy (\$15 million) results in an \$85 million 'saving' compared with adding new trains.

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**Relationship with NEPP**

- NEPP measures 18, 12, 4, 6, 16

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**Links to other programs**

- Infrastructure and road pricing (Recommendation 11)

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**Examples**

- Myki – Victoria
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**Table 8.4 Support establishing an independent organisation for planning and research**  
 Category: Joint industry and government initiative

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**Overview**

Australia does not have a nationally coordinated research/advocacy body for low carbon transport (many OECD peers do) that brings together government, industry and research partners. This body could provide independent expertise and build the capacity of supporting sectors to improve energy productivity.

**2xEP recommends:**

- Define low emissions vehicles for purposes of incentive allocation.
- Provide a framework to rate new vehicles through the Vehicle Fuel Economy Labelling system.
- Develop a voluntary labelling system sponsored by tyre manufacturers to independently rate their products for fuel efficiency (and determine eligibility for ERF/CEFC incentives).
- Incentivize the collection of real-time vehicle data through an integrated national database.
- Coordinate knowledge sharing to nationally and internationally reduce average fleet fuel efficiency via fleet (e.g. FleetWise), industry (RACQ eco drive) and household programs (e.g. ClimateSmart Home service).

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**Current barriers**

**Information gaps:**

- Lack of adequate data on real-world benefits of investment in more efficient vehicles/technology.
- Lack of information (relative efficiency) for heavy vehicles used in passenger transport (buses).

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**How the approach will address the barrier(s)**

- Independence and credibility of information
- LEV advocacy

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**Factors to consider**

- Existing role that State transport departments play in defining low emissions vehicles (e.g. ACT defines them as new vehicles emitting less than 130 g CO<sub>2</sub>/km).
- Ability to leverage information developed by similar US/EU bodies (Calstart, UK LCVP)
- Interaction with CSIRO, Climate Change Authority, Productivity Commission and ClimateWorks.

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**Cost/benefit**

- Vehicle operation and management at both fleet and private level can be improved. Changing driver practices or adopting 'fuel efficient' driving techniques<sup>16</sup> could reduce fuel consumption of private vehicles by around 5% (Graves, Jeffreys & Roth 2012).

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**Relationship with NEPP**

- NEPP measure 4 - 'Support best practice services for vulnerable consumers'
- NEPP measure 7 - 'Recognise business leadership and support voluntary action in business'
- NEPP measure 8 - 'Research business benchmarks and success factors'
- NEPP measure 13 - 'Support innovation and commercialisation'
- NEPP measure 17 - 'Promote leading practice'
- NEPP measure 18 - 'Collaborate internationally'
- NEPP measure 25 - 'Build service provider capacity'

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**Links to other programs**

- Australian Centre for Energy Productivity (proposed in manufacturing 2EXP roadmap)
- State and Territory road agencies could participate through Austroads or NTC

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**Examples**

- Climate Smart Home Service
  - CALSTART and SmartWay (US)
  - UK Low Carbon Vehicle Partnership (LowCVP)
- 

<sup>16</sup> Typically includes smoother driving, slower driving, less idling, and anticipating traffic flow to obtain better fuel economy.



**Table 8.5 Incentives for fleets and private motorists to purchase low-emissions vehicles**  
Category: Government initiative

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**Overview**

In 2014, the Climate Change Authority identified that incentives may be a useful complement to standards and could be considered further by state and territory road authorities. Research has shown significant impact from incentives on sales and the range of available LEVs (which itself supports greater levels of adoption). For example, CSIRO attributes the availability of subsidies as a major driver of the 50% increase in global sales of electric vehicles in 2014.

**2xEP recommends (for fleets):**

- Grants for corporate and government fleets to purchase LEVs (light vehicles, buses and medium trucks) that is complementary to \$50m Clean Energy Finance program.
- Improved CEFC eligibility program criteria for heavy vehicles (esp. buses).

**2xEP recommends (for private motorists):**

- Remove stamp duty and adopt a sliding scale for registration fees for new vehicles based on fuel efficiency (e.g. revenue-neutral feebates with registration discounts from 10 g CO<sub>2</sub>/km below new vehicle standard offset by registration fee increase for vehicles from 10 g CO<sub>2</sub>/km above).
  - Rebates for LEVs under Luxury Car tax threshold, and removal of Luxury Car tax for LEVs above threshold (e.g. Nissan Leaf receives rebate and Tesla Model S does not pay Luxury car tax) – if rebate is significant (>\$5,000) this could be recovered via registration fees over a 10-year period.
- 

**Current barriers**

- High capital cost: energy efficient vehicles typically have higher upfront costs due to the additional technology and systems developed to save energy (e.g. engine start stop, electric drivetrain, turbos, intelligent transmissions, low-rolling resistance tyres). Yet many fleets or motorists can only allocate a certain budget for replacement.
- 

**How the approach will address the barrier(s)**

- Reduce upfront cost
  - Build LEV market demand and model diversity through greater volume
  - Linkage with national LEV targets (and buyers coalition) – see recommendation 11
- 

**Factors to consider**

- Equitable allocation of funds (no rebates for vehicles if above Luxury Car Tax threshold)
  - Linkage with national LEV targets and (buyers coalition)
- 

**Cost/benefit**

- Ability to purchase ACCUs based on operation of LEVs at a lower cost.
  - Private buyers purchase more efficient vehicles (average of 178 g/km), followed by business buyers (190 g/km) and government buyers (204 g/km).
- 

**Relationship with NEPP**

- NEPP measure 6: 'Help business self-manage energy costs'
  - NEPP measure 12: 'Improve energy productivity in government operations'.
  - NEPP measure 2 – 'Market mechanisms to capture societal benefits (Emissions Reduction Fund)'
  - NEPP measure 13 – 'Support innovation and commercialisation'
- 

**Links to other programs**

- ERF, CEFC
  - LEV target
- 

**Examples**

- It is already common practice to reduce registration based on engine cylinders in most states
  - The ACT Government has a 'Vehicle Emission Reduction Scheme' which removes the stamp duty for new vehicles which emit less than 130 gCO<sub>2</sub>/km, and reduces the stamp duty on vehicles under 176 gCO<sub>2</sub>/km. (ACT 2014)
  - Solar Rebate scheme
  - Rebates available for EVs in US, Norway, UK
  - Registration Feebates in France (bonus-malus)
-

**Table 8.6 Accelerate adoption of renewable energy for passenger transport**

Category: Joint industry and government initiative

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**Overview**

Certainty of access to charging/refuelling is a pre-requisite to purchasing an EV or alternative fuel vehicle. Whilst most EV buyers will have access to home charging there is a need for an infrastructure roadmap to support wider adoption (longer distance driving) and build public confidence.

**2xEP recommends:**

- Co-investment in infrastructure by Australian, Local and State Governments, private car park and petrol filling station operators for a nationwide roll-out of open-access, standardised renewable energy access (grants eligibility if open access)
- Support a visible and accessible charging/refuelling network for all drivers through harmonisation of technology standards, location databases, booking and payment systems.
- Collection of data on prospective/actual EV owners to determine where future recharging needs may be needed and home recharging is most likely to occur. This could include open access platform to collect vehicle state of charge in real-time on major roads.
- Support powering EVs via onsite renewables to reduce energy losses in distribution (e.g. solar car park scheme).
- Electricity tariff reform to enable time-of-use charging.
- Require new housing developments and commercial buildings to be EV “socket ready” (linked to Built Env Roadmap)
- Intrastate targets for charge points (i.e. 90% of the time motorists will be no more than 30 km from an accessible charge point by 2030)

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**Current barriers**

- Higher capital cost (payback too long from fuel savings alone)
- Information gaps on fuel options and supporting refuel infrastructure
- Limited choice of models
- Perceived risks – buying a vehicle without access to recharging/refuelling (range anxiety)

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**How the approach will address the barrier(s)**

- Accessibility
- Information
- Reduce upfront cost

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**Factors to consider**

- Equity in location of EV charge points
- EV manufacture contributions and business models that may cover vehicle charging with vehicle purchase (e.g. Tesla)
- Quantification of future EV peak power

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**Cost/benefit**

- Reduce imported liquid fuels and support biomass/biogas collection
- Decarbonise electricity with flow on benefit for EVs
- Reduced air pollution in urban areas

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**Relationship with NEPP**

- NEPP 18 Collaborate internationally
- NEPP 19 Emerging technologies in the electricity system

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**Links to other programs**

- LEV target: ensure delivery of renewable energy is aligned with location and number of vehicles.

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**Examples**

- Adelaide City Council currently does through its Sustainable City Incentives Scheme, which provides up to \$500 to support installation of charging systems
  - UK: Plugged-in-Places scheme (OLEV)
  - Ergon: <https://www.ergon.com.au/network/manage-your-energy/electric-vehicles/electric-vehicle-range>
  - ‘Ergon Energy Retail to create an EV highway, with plans for a solar powered fast charging station in Townsville. Tesla recently to launch 16 high powered supercharger stations between Melbourne and Brisbane by 2016. Tritium planning a string of connection points from northern NSW to Brisbane and Toowoomba’
  - <http://www.lowcvp.org.uk/projects/fuels-working-group/infrastructure-roadmap.htm>
-

**Table 8.7 Removal of regulations preventing carpooling and car sharing**

Category: Joint industry and government initiative

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**Overview**

Single occupant cars are prevalent in urban areas (esp. in peak traffic times) but are very inefficient. In many cases, energy intensity of trips could be doubled or tripled (passenger-km basis) if additional drivers picked up additional passengers. People have shown a willingness to adopt new behaviours and trip models (e.g. Uber) which could enable increased car sharing.

**2xEP recommends:**

- Support carpooling (two or more people in one car to a common destination) for one-off trips or a regular basis using a technology platform/app to exploit network effects. This could be licensed to a third party operator, and safety concerns addressed with trip-based license/vehicle photo records.
- Reduce government regulation that may limit UberPool and Lyft Line as they can complement public transport in areas or at times where it is unavailable. It may even be possible to eliminate some public transport services that are underutilised and offer discount ride hailing services for cost and energy productivity benefits.
- Information about regularity of ad hoc travel requirements (demand and supply) to match drivers with potential passengers. Social ridesharing (hitch-a-ride).
- Create designated pick-up zones for carpool, hitching and car sharing.
- Employer/government organised schemes.
- Cab share: support splitting fares in taxis.
- Review regulations that impact innovative technologies and the sharing economy to allow communities access to entrepreneurial approaches to deliver great customer experience with customised transportation (e.g. Uber still illegal in Queensland, but not NSW).

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**Current barriers**

- Perceived safety/security/comfort in shared vehicles.
- Network effect.
- Regulatory: It is illegal to hitch-hike in no-pedestrian zones like freeways

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**How the approach will address the barrier(s)**

- Security: Use of technology/apps to capture vehicle and driver identification details.
- Real-time user ratings of providers.
- Building acceptability and critical mass (the key to successful carpool matching).

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**Factors to consider**

- Ride sharing means less cars on the road, reduced congestion, and less waiting around.
- Ride share also enables more cars to use transit lanes (reducing congestion in other lanes).
- Another helpful factor is a common interest. People who work or study at the same place – like a university or large corporate or government office – have something in common.
- Equity, Competition.
- Reaching hard-to-get-to places affordably

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**Cost/benefit**

- Although the contribution of carpooling is likely to be small, the benefit-cost ratio for these sorts of low-cost interventions can be very high.
- Taking a passenger along for the ride and splitting the costs can help reduce the cost of the trip for both parties (tolls, petrol, parking).

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**Relationship with NEPP**

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**Links to other programs**

- Link to incentives for high occupancy vehicles (Recommendation 9).

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**Examples**

- Sydney airport provides pickup points for ride sharing.
- Oz carpool, an Australia-wide car pool database, connects people in the same area by travel time.
- Incentive in US provided by High Occupancy and Tolloed (HOT) lanes on freeways.
- <http://hitcharide.me/>
- <http://www.gizmodo.com.au/2016/05/uber-is-testing-a-5-flat-fee-for-shared-rides-in-the-us/>
- Naphthine government cancelled \$5.4M funding for carpooling (why?)
- World Vision: reduced number of staff driving alone from 65% to 58% through a TravelSmart program conducted in partnership with local and state governments.

**Table 8.8 Action plan for national coordination of autonomous vehicle roll-out**

Category: Joint industry and government initiative

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**Overview**

Autonomous, self-driving or driverless vehicles are a disruptive technology with significant potential to improve energy productivity of passenger transport. Depending on the level of automation, vehicles will be able to optimise acceleration, speed, braking, and route selection to reduce energy use.

Connectivity between autonomous vehicles can reduce aerodynamic drag via closely-spaced vehicle platoons (increasing density of traffic) and improve traffic flow by removing risk of inattention. Over time the acceptance of dramatically improved safety will also allow lighter weight and smaller vehicles (e.g. two wheeled) to be adopted with a focus on energy to move people not on parts of a vehicle.

**2xEP recommends:**

- Existing regulatory investigations by the National Transport Commission assess barriers and other national bodies to lowering vehicle energy use (including the ability to platoon vehicles).
- Support vehicle-to-vehicle communications to enhance the control of traffic through intersections and coordinate platooning (possibly in dedicated lanes to maximize benefits).
- Expedite resolution of liability issues (insurance, road traffic law) related to autonomous vehicles.
- National approach to research and trials (to reduce duplication between states).

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**Current barriers**

- Regulatory: liability and road traffic law (e.g. safe following distance).
- Availability: Several companies predict sales from 2018 but capabilities are not specified.
- Insurance, liability and road traffic laws.

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**How the approach will address the barrier(s)**

- Allow platooning
- Accelerate introduction of autonomous vehicles

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**Factors to consider**

**Benefits include:**

- Reduced traffic congestion, accident risks and insurance premiums.
- Increased road capacity (platooning or change time of travel).
- Supports shared vehicles. Changing vehicle ownership model (transport as a service) combined with autonomous vehicles could vastly accelerate energy productivity improvement (eco driving modes, higher utilisation).
- When fully autonomous, previous downtime (driving) becomes productive/leisure time.
- Independent mobility for affluent non-drivers.

**Potential negatives include:**

- This could result in rebound effect: induce more travel as that time is no longer wasted.
- Another unintended consequence could be to reduce use of public transport if transport-as-service is significantly cheaper and more convenient (also leading to greater urban sprawl).
- More efficient parking so less parking required – or more discretionary trips and AVs waiting (requiring MORE parking).
- AVs are also more likely to drive empty (finding cheaper parking outside a city or returning home for use by another driver).
- May result in larger vehicles to accommodate desks, eating and sleeping facilities.

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**Cost/benefit**

- High upfront cost will need to be offset with high rates of utilisation.

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**Relationship with NEPP**

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**Links to other programs**

- NTC discussion paper
- Link to car sharing/carpooling (source of income to offset high capital cost)

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**Examples**

- <http://www.vtpi.org/avip.pdf>
-

**Table 8.9 High-occupancy vehicle incentives to increase average car occupancy**

Category: Government initiative

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**Overview**

The most immediate pathway to improving Australia passenger transport energy productivity by 50% is by increasing passenger car occupancy by 50% by 2030. This strategy corresponds to better utilisation of existing assets, and (importantly) works with all vehicles rather than relying on adoption of new cars

**2xEP recommends:**

- Sponsor a national ride share scheme
- Provide HOV discounts for parking and tolls (not specific lanes).

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**Current barriers**

- Information on carpooling opportunities
- Safety

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**How the approach will address the barrier(s)**

- Identify drivers and passengers through drivers licence scion via mobile devices

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**Factors to consider**

- Impact on taxi industry
- Unintended consequences – i.e. picking up passengers before entering a HOV parking spot

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**Cost/benefit**

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**Relationship with NEPP**

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**Links to other programs**

- Link to Recommendation 7

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**Examples**

- Many US examples with HOV only lanes
  - Transit lanes operate in some states, but have been removed from others (e.g. Queensland).
-

**Table 8.10 National target for LEV uptake (including but not limited to EVs**

Category: Joint industry and government initiative

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**Overview**

Some countries such as the US, China and EU plan to realise the benefits of EVs by using targets (supported by incentives) to drive accelerated adoption.

**2xEP recommends:**

- Establish national target for LEV uptake (not just EVs): for example 300,000 by 2030. This could include annual targets supported by a fleet purchasing policy for Government and Corporates to 'lead by example' (e.g. 1,000 each per year).
- Support a Government and corporate bulk buyer's coalition for EVs held annually with request for proposals submitted to major EV manufacturers. Government fleet could underpin volumes.
- Information/demonstration to strengthen current understanding and increase demand (e.g. 'Oz Goes Electric Tour', Victorian government-backed initiative to raise public awareness about EVs).
- Enable EV interaction with electricity supply and demand by integrating with building energy use
- Road user charge exemption until EVs represent more than 5% of registered vehicles.

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**Current barriers**

- Higher capital cost of LEVs
- Limited model availability. International evidence suggests a strong correlation between cumulative EV sales and the number of vehicle choices being offered. Only a limited number of models are available in Australia (with some manufacturers choosing not to bring certain models to Australia). Until this issue is addressed, EV take-up is likely to remain low.
- The Australian Energy Market Operator (AEMO 2015, p. 60) recently forecast a relatively pessimistic uptake of electric vehicles penetration given the lack of policy incentives to purchase them, consumer anxiety and lack of public infrastructure. This suggests that a combination of supporting measures would be most appropriate.

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**How the approach will address the barrier(s)**

- More vehicles, lower cost and greater certainty that LEVs are a viable and growing market segment (i.e. will maintain residual value).

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**Factors to consider**

- Less than 1,000 EVs sold in Australia each year (0.1% of market)
- ClimateWorks summarised numerous studies analysing future EV deployments, noting that projections ranged from 5% to 50% depending on the type of policy support available.
- Controlling the impact of the EV load on electricity grid capacity, with specific reference to peak demand, is essential to ensure the system-wide economic impact is positive. Even though there is generally excess capacity in the national electricity market, this capacity varies in space and time with constraints prevailing in specific zones and at peak times.
- There are a range of measures (direct and indirect) to boost EV uptake in Australia, for example:
  - direct subsidies (in 2012, CSIRO estimated that 1.5 million EVs could be adopted in the Victorian fleet on a subsidy of \$7500 per vehicle)<sup>17</sup>;
  - tax concessions for new vehicles (e.g. exemption to the Luxury Car Tax or Fringe Benefits Tax).

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**Cost/benefit**

- Hybrid vehicles are up to 65% more fuel efficient than traditional vehicles<sup>8</sup> and are now becoming well-established in Australia and in other markets.
- Electric vehicles offer even greater efficiency, using about 4 times less energy than a new internal combustion engine car today.
- EVs reduce urban air pollution and can be carbon-free if powered by renewable energy.

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**Relationship with NEPP**

- NEPP measures 12, 17

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**Links to other programs**

- Recommendation 4: independent organisation to support LEV uptake/research/advocacy
- Recommendation 6: renewable energy for transport

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**Examples**

- NZ target 64,000 EVs by 2021
  - Norway, Germany, US, China targets
  - AGL is committed to purchasing EVs for its business fleet (10% electric by mid-2018).
  - Dutch plan to ban petrol and diesel engines by 2025.
  - Germany promised a €1bn subsidy boost for electric cars. Rebates available for EVs in US, Norway, UK
-

**Table 8.11 Cost-reflective road pricing**

Category: Joint industry and government initiative

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**Overview**

Road pricing currently only accounts for the cost of road building and maintenance. Externalities such as traffic congestion, air pollution and climate change are not currently attributed to their contributing sources. A cost-reflective road pricing mechanism or road user charge could better reflect the societal and community costs of transport, drive behaviour change and mode shift, and improve urban amenity and liveability of cities

**2xEP recommends:**

- Cost-reflective road pricing is introduced to transparently signal full (or more accurate) costs of road use – helping to reduce (or discourage) discretionary travel in peak periods; and to shift travel to less costly alternative modes of transport
- Whole-of-network charging schemes should be introduced with a time-of-day component and distance component. This could eventually replace road excise and therefore avoid declining revenue from LEVs as they become a large part of the fleet

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**Current barriers**

- Regulatory: Introducing additional road taxes would require a comprehensive overhaul of other taxation measures.

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**How the approach will address the barrier(s)**

- Raise revenue where demand is high and redirect to increase supply on infrastructure.

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**Factors to consider**

- Use of technology
- Public and political support
- Equity
- Use of revenue for public transport
- Rebound: More road space for cars can simply encourage more traffic.
- Road pricing should capture cost to all motorists and infrastructure provision and maintenance

---

**Cost/benefit**

- Analysis by Infrastructure Australia shows the cost of road congestion in the six largest capital cities will grow by almost 300 percent from \$13.7 billion in 2011 to \$53.3 billion in 2031
- Implemented properly, road pricing could contribute to higher efficiency of Australia's road network, and lift productivity and improve economic outcomes as a direct consequence

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**Relationship with NEPP**

- n/a

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**Links to other programs**

- Link with public transport targets
- Infrastructure Australia recommendations 5.4 and 5.5 - governments should commit to the full implementation of heavy vehicle road charging in the next five years and light vehicle road charging structure in the next ten years

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**Examples**

- <https://www.claytonutz.com/knowledge/2016/may/a-bold-new-model-to-pay-for-our-road-network-and-improve-its-performance>
  - 'In Australia, Transurban is currently undertaking a Road User Study. The study is being conducted across the whole Melbourne road network, involving 1,200 volunteer participants and will trial different user-pays models. When completed it will provide valuable information for developing a road user charging model for Australian cities. Trialled and implemented in a number of cities overseas, including Singapore, Washington, London and Stockholm'
  - KPMG 2016 study - <https://assets.kpmg.com/content/dam/kpmg/pdf/2016/05/road-pricing-schemes-australia.pdf>
-

**Table 8.12 Examine the role of industry associations in providing information**

Category: Industry initiative

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**Overview**

2xEP recommends industry investigate the role of industry associations in providing information to businesses working in and with the passenger transport sector to improve energy productivity. For example:

- Raise decision-makers' awareness of the benefits of improved energy productivity and its co-benefits, such as more productive deployment of labour and materials and lower maintenance costs. These benefits can contribute to improving overall productivity, competitiveness and profitability. Where energy productivity initiatives are assessed to be cost-effective, decision makers are encouraged to sanction implementation of these initiatives.
- Provide information regarding appropriate energy productivity-related performance indicators for staff and associates, cognisant of existing contractual obligations and agreements. Note, an integrated view of energy productivity is required to incentivise decision making in each part of the process that contributes to the enhancement of energy productivity of the process or plant as a whole.

2xEP recommends industry investigate the role of industry associations in engagement with decision-makers, transport consumers and the general public about opportunities and potentials, benefits and costs (for the community and individuals) of energy productive passenger transport

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**Current barriers to doubling energy productivity**

- Availability of relevant information
- Benefits of energy projects pursued in isolation are perceived as lacking materiality
- Management practices and internal barriers
- Negative public perceptions about collateral impacts of improved passenger transport (both private and public) systems including higher traffic flows, higher development density, reduced amenity and property values

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**How the approach will address the current barriers**

- Increase collaboration and understanding within the industry of the direct and indirect benefits of improved energy productivity, and the associated positive impacts on competitiveness, productivity and value.
- Provide practical assistance in implementing changes to bring about energy productivity improvements.

---

**Factors to consider**

- Risk of lower productivity compared to competitors if energy productivity issues are not addressed: link energy productivity to overall productivity and competitiveness.
- Success of international industry groups in bringing together members to better understand sector-wide performance and improve energy performance.
- Diversity of companies within industry and challenges in providing information relevant to all.
- Resourcing challenges within industry group staff given the range of responsibilities and initiatives coordinated across the sector.
- The business case for energy productivity is not always clear using typical financial tools. For example, NPV analysis discounts future energy cost reductions relative to up-front investment in energy productivity projects. It may be helpful to include alternative methods of valuation when assessing energy projects e.g. real options analysis. Taking a long-term 'value at risk' perspective of energy cost may be useful.

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**Cost/benefit**

Potential **costs** of this measure

- Increased industry association resources – staff in industry associations may require energy productivity training and additional human resources may be required to provide information the sector. The cost to industry associations of implementing this initiative may be significant.

Potential **benefits** of this measure

- General benefits of improving energy productivity, as listed in section 7.3.
- Leveraging established networks to share knowledge will likely accelerate the development of a cohesive approach to energy productivity for the sector.

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**Relationship with NEPP (COAG 2015)**

**(7) Recognise business leadership and support for voluntary action in business** Business-led voluntary action can boost economic productivity, national competitiveness and employment opportunities. Government will work cooperatively with the business community on options to support energy productivity improvements.

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**Example**

*Moving Australia 2030: A transport plan for a productive and active Australia.* A report from the Moving People 2030 Taskforce (Australian Local Government Association, Australasian Railway Association, Bus Industry Confederation, Cycling Promotion Fund, Heart Foundation, Planning Institute of Australia, Tourism and Transport Forum, UITP Asia Pacific): <http://ozebus.com.au/solutions-for-moving-people/moving-australia-2030>

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## 2xEP Steering committee and working group members

### 2xEP Steering Committee

The 2xEP Steering Committee was inaugurated in July of 2015 and is tasked with guiding the program through development and completion. The Committee meets quarterly to review progress, refine strategy, and provide leadership. Most Steering Group members are involved in one or more of the sector working groups.

Kenneth Baldwin, Director, Energy Change Institute, Australian National University  
 Matthew Brown, Environmental Manager, Pacific National  
 Graham Bryant, Deputy Chair, Energy Users Association of Australia  
 Tony Cooper, Chief Executive Officer, Energetics  
 Bo Christensen, Manager Sustainability, Linfox  
 David Eyre, General Manager, Research & Development, NSW Farmers  
 Chris Greig, Fellow, Australian Academy of Technology, Sciences and Engineering  
 Tim Hicks, Senior Manager, Economic Policy, Australian Chamber of Commerce and Industry  
 Travis Hughes, Head of Energy Services, AGL Energy  
 Jonathan Jutsen, Deputy Chairman, Australian Alliance for Energy Productivity  
 Andrew Lamble, Co-Founder and Chief Operating Officer, Envizi  
 Adam Lovell, Executive Director, Water Supply Association of Australia  
 Luke Menzel, Chief Executive Officer, Energy Efficiency Council  
 Sid Marris, Director – Industry Policy, Minerals Council of Australia  
 Brian Morris, Vice President, Energy & Sustainability Services, Schneider Electric  
 Matt Mullins, Chairman, Advisory Board, Resource Governance International  
 Gordon Noble, Managing Director, Inflection Point Capital  
 Andrew Peterson, Chief Executive Officer, Sustainable Business Australia  
 Glenn Platt, Group Leader, Energy Technology, CSIRO  
 Tennant Reed, Principal National Adviser – Public Policy, AiGroup  
 Duncan Sheppard, Director Communications and Policy, Australian Logistics Council  
 Anna Skarbek, Executive Director, ClimateWorks Australia  
 Scott Taylor, Head of Living Utilities, Lend Lease  
 Kane Thornton, Chief Executive Officer, Clean Energy Council  
 Suzanne Toubourou, Executive Officer, Australian Sustainable Built Environment Council  
 Laura Van Wie McGrory, Vice President, International Policy, US Alliance to Save Energy  
 Stephen White, Energy for Buildings Manager, CSIRO  
 Stuart White, Director, Institute for Sustainable Futures  
 Bruce Wilson, Syndicate Chair, CEO Institute, Transport specialist  
 Oliver Yates, Chief Executive Officer, Clean Energy Finance Corporation

2xEP is supported by 10 working groups; for each key end use sector of the economy plus finance, innovation, metrics and communications.

### Transport - Passenger

Peter Haenke, Senior Manager, Group Sustainability & Environment, NRMA  
 Bruce Wilson, Syndicate Chair, CEO Institute  
 Scott Ferraro, Head of Implementation, ClimateWorks Australia  
 Stuart White, Director, Institute for Sustainable Futures  
 Mark Gjerek, Director, Move3ment  
 Lana Assaf, Senior Associate Infrastructure & Environment, Jacobs

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