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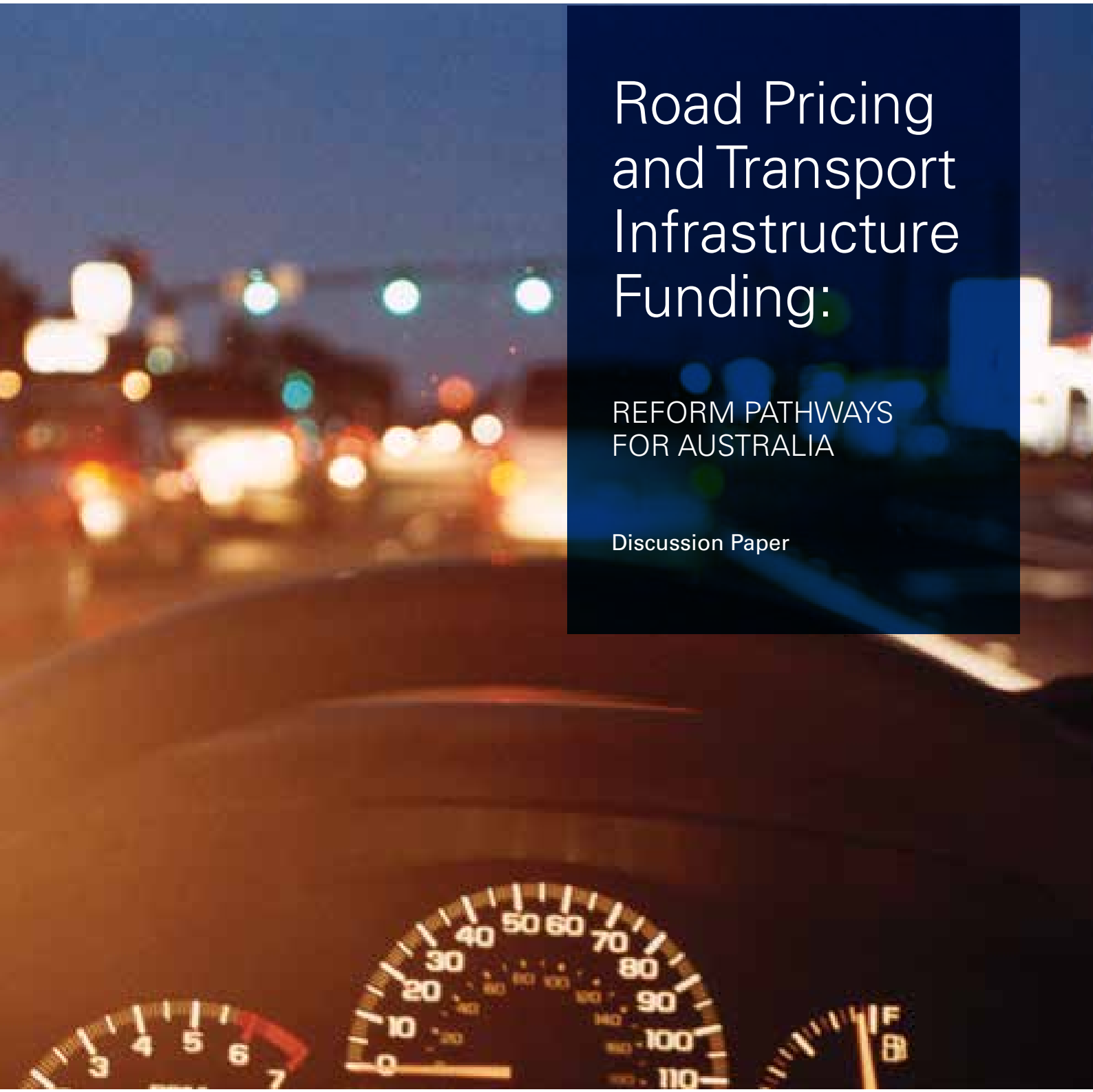

Road Pricing and Transport Infrastructure Funding:

REFORM PATHWAYS FOR AUSTRALIA

Discussion Paper

NRMA MOTORING + SERVICES

RACQ

RACV

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TRANSPORT REFORM NETWORK

The Transport Reform Network (TRN) is an initiative of stakeholders from across the transport and infrastructure sectors interested in the fundamental reform of transport in Australia.

In broad terms, the TRN's mission is to seek a better way of planning, managing, funding and financing land transport in Australia to ensure it delivers optimum and sustainable economic, social and environmental outcomes for all Australians.

CONTENTS

Executive Summary

A lack of long-term investment in transport means that as a nation, we extract less than we should from the transport infrastructure we have, and we invest less than we should in the transport infrastructure we need.

Stronger investment and new approaches to funding are required to deliver the growing list of transport projects that are needed across Australia to improve the community's mobility and safety. Reducing congestion in our cities and delivering productivity and economic growth all rely heavily on an efficient, integrated and safe transport network. Achieving these outcomes will inevitably require substantial reform to the status quo.

Funding immediate project priorities will require increased government revenues, a wider application of user pays, smarter thinking about value capture and innovative private funding, in addition to options such as reinvesting the proceeds from the sale of public assets, to create immediate capacity for urgent priority transport projects. But over the medium-term, fundamental reform will also be needed, because the current charging and investment system is inequitable to road users, and unsustainable for taxpayers.

Australia's motorists already pay a substantial burden in taxes and charges for use of the road network. For this reason, this paper does not contemplate charging motorists more, but rather, it considers how the existing revenue envelope can be collected more fairly, and invested more efficiently. A revised road user charging system should only be implemented as part of genuine reform and not be imposed on top of the current system.

Reforming transport pricing will be a complex policy and political issue. For this reason, it is important the debate is methodical, thorough and transparent. Winning support for substantial reform will require a transparent diagnosis of the problem, and a deliberate consideration of the benefits and impacts of alternative options.

This is why the paper has been developed by Infrastructure Partnerships Australia (IPA) and Deloitte, in association with Australia's leading motoring clubs, the Australian Automobile Association (AAA), the National Roads & Motorists' Association (NRMA), the Royal Automobile Club of Queensland (RACQ), and the Royal Automobile Club of Victoria (RACV). The paper does not endorse a particular model or imply that the proposals are the policy of the participating organisations, rather it seeks to instigate genuine reform.

Jointly, the group represents the users, owners, regulators and providers of the nation's transport network; and jointly, we are calling for a formal, national and transparent process that considers the options, and resolves the pathway, toward enduring solutions to Australia's transport challenge.

This paper does not consider commercial and heavy vehicles, in light of the separate but complementary reform process that is being advanced under the Council of Australian Government (COAG) Heavy Vehicle Charging and Investment (HVCI) reform process.[1]

Is the current system broken?

Under the current approach, motorists are taxed for road use through a disconnected two part tariff, comprising of fixed, state-based access charges (such as registration and licence costs)[2] and the Commonwealth's consumption-based Fuel Excise.[3]

This paper makes a case that the current road charging approach is ineffective, and requires substantial reform because:

1. the revenue model is increasingly unsustainable;
2. the pricing model lacks transparency and does not price efficient use of the network; and
3. the investment priorities are poorly aligned with the needs of network users.

We find that the current system of transport network pricing is no longer fit for purpose. The system of road pricing embeds inequities, cross subsidies and distortions and has been the result of organic growth, rather than developed as part of a well-considered strategy or plan. However, it is acknowledged that this system has achieved validity through familiarity.

Revenue model

The existing approach to revenue is unsustainable because a broad shift toward more fuel efficient vehicles and alternate fuel types, alongside a fall in the relative value of Fuel Excise revenue since the early 2000s, has hollowed out the revenue collected by the Australian Government. As shown in Figure i overleaf, Fuel Excise revenue as a proportion of GDP has fallen from 1.69 per cent in 2001-02 to 1.16 per cent in 2010-11, further complicating the funding challenge faced by Australia's governments.

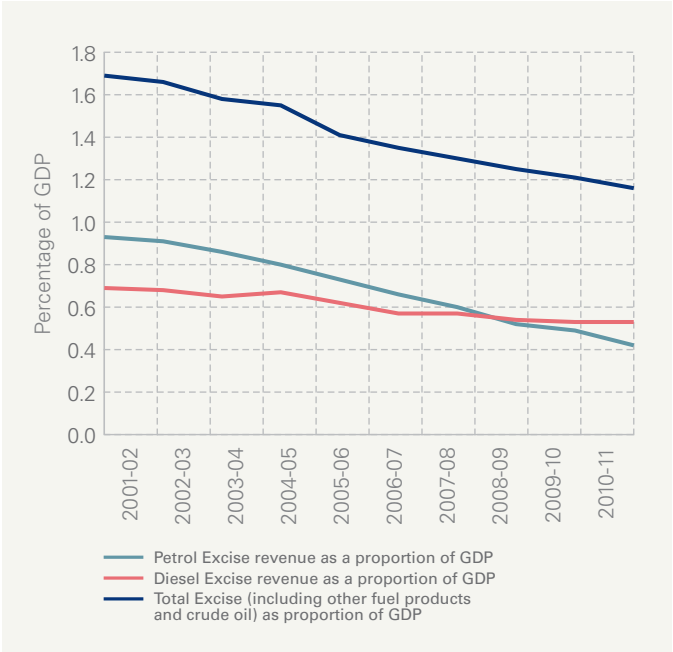
1 The COAG Road Reform Plan (CRRP) was rebranded Heavy Vehicle Charging and Investment (HVCI) process in 2012. The broader reform options of the CRRP were significantly informed by the Productivity Commission's 2006 Public Inquiry into Road and Rail Freight Infrastructure Pricing. This paper refers to the COAG HVCI as the programme currently in place – however, many of the actions discussed were undertaken under the CRRP process and are referenced to CRRP accordingly.

2 Registration charges represent those in place during the reference year used for the paper, 2011, but may have changed in subsequent years and do not include additional charges levied at the point of registration such as Compulsory Third Party insurance or vehicle safety checks.

3 Fuel Excise is currently levied at $0.38143/litre on gasoline, diesel, ethanol, biodiesel and blends of these fuels. The charge is levied on motorists at the fuel pump but not normally displayed as a component of the overall fuel price. Producers of ethanol receive grants equivalent to the excise rate under the Ethanol Production Grants (EPG) programme for ethanol produced and supplied for transport use in Australia from locally derived feedstocks; this excise reimbursement can then technically be partially or fully passed on to the end consumer. Similar 100 per cent grant rebate schemes exist for biodiesel and renewable diesel production. Automatic indexation of Fuel Excise against the Consumer Price Index ceased in 2001.

▼ FIGURE i

FUEL EXCISE REVENUE BY TYPE (AND TOTAL) AS A PROPORTION OF GDP



Source: IPA analysis, Commonwealth Budget Paper – 2001-02 to 2010-11

Pricing model

The current approach entrenches inefficiency, because it does not include a transparent mechanism to efficiently allocate capacity on the existing road network. The excessive demand for capital city motorways during the morning peak, and the under-utilisation of these corridors during other times, is an everyday example of how existing pricing arrangements fail to manage traffic demand.

For example, a reformed model might provide commercial vehicles with a discounted access charge to make journeys outside of the commuter peak, increasing the efficiency of both the freight and passenger transport tasks, without expensive and avoidable investments in new lanes that are only used for a few hours each day.

Road pricing reform is made more attractive by the opportunities that exist to permanently and materially improve the efficiency of the broader transport network, ultimately making the system fairer and more transparent for users.

Investment

A further opportunity from a broad reform of road user charging will accrue through the direct connection between usage, revenue and subsequent investment.

Under the current system, road related fees and charges are collected by two levels of government, while investment in maintenance, renewal and expansion is spread across all three tiers of government; resulting in an opaque and complex system that disconnects revenue from, and expenditure in, the transport network. For example, the current approach sees road users charged some $20.4 billion in road related taxes and charges; but sees only $16.9 billion reinvested into roads and bridges.[4] Taking just the Federal level, the investment shortfall is more stark – in the reference year used for this paper around $13.2 billion of revenue was raised through Fuel Excise, but Commonwealth investment in land transport stood at around $5.6 billion. The current system also fails to recognise that local governments bear substantial responsibility for road delivery and maintenance but have no direct mechanism to generate revenue to support investment. Improved investment alignment will deliver outcomes that better meet the needs of network users.

Principle and options

Clarity about the objectives of road pricing reform will be a central and defining feature in the selection of potential models; and critical in establishing the public case for change.

International experience of effective reforms to road pricing has relied on clear identification of the objectives of reform with a clear discussion of the costs of inaction.

This paper uses its analysis to articulate the principles that should underpin the selection of a reform model for Australia; those principles include a system that can:

1. allocate the costs and benefits of road use fairly and efficiently across users, based on their impact and level of use;
2. provide revenues that are sufficient to fund new transport projects;
3. provide revenues that are sufficient to fund the maintenance of the network;
4. secure the funding stream for the transport network, giving certainty about the long-run funding capacity and allowing for rational investment strategies; and
5. improve the performance of the transport network by actively balancing supply and demand.

This paper also considers that a key basis for reform should be a pricing system where the total contribution from road users is initially maintained at existing levels, but with a fairer system that ensures high end users contribute their fair share, with low-impact users contributing less.

4 Reference year 2009-10.

Road pricing scheme design

This paper considers the core structure of a number of operating road pricing systems around the world, including London, Switzerland, Germany and New Zealand, amongst others.

These models range from single purpose, limited congestion charging schemes (for example, the London or Singapore congestion schemes) through to rationalised charging systems that apply across the entire road network (such as the Swiss heavy vehicle fee system). The paper then considers each of these structures against their ability to meet the objectives we have identified, in the section above.

While this paper does not seek to endorse a particular model, we select an approach we term the Universal Road User Charging model (URUC), for detailed examination within the paper.

The URUC is based around a charging structure that prices the following aspects of user behaviour:

- **Mass:** The mass of a vehicle has a direct relationship to that vehicle's impact on the road network, through higher wear and tear as well as other factors (such as safety, impedance of other road users, among others). The URUC would allow for a fairer contribution from higher mass vehicles, reflecting the increased costs that they impose.
- **Distance:** The URUC is structured to efficiently connect the amount charged, with the amount consumed. This offers a range of benefits, principally in terms of equitable charging, ensuring that high end users make a contribution reflective of their use.
- **Location:** The URUC recognises that road users impose and receive different costs and benefits, dependent on where they access the road network. Currently, consumption is accounted for in the Fuel Excise, but the excise obviously cannot recognise the differential in costs when a litre of fuel is consumed on a capital motorway, compared with an unsealed regional road.
- **Time:** Time is a fundamental component of the URUC, because it allows for a charging scheme that is able to respond to and manage congestion. For example, the URUC would allow for differential prices in urban areas during the peak, providing a signal for discretionary journeys to occur at other times, and providing a meaningful way to drive up public transport patronage and maintain the functionality of capital city road networks.

Based on these parameters, our modelling found that in the broadest terms, a rural user in a small car could expect to pay 4.57c/km, which is around half the current average user charge per kilometre of circa 9.9c/km. Meanwhile, a user driving the same car in an urban area during the morning peak could pay up to 18.99c/km (consisting of a 4.57c/km distance based component and a 14.42c/km time and location based component) – taking account of their relatively higher impact on congestion and higher costs imposed on the economy.

User impacts

A key aspect of this paper is that it applies the theoretical concept of the URUC to a series of hypothetical, 'real-world' users. The modelling of how the URUC concept could apply in practice allows for a debate based around familiar journey types, allowing the broader community to consider the model discussed in this paper.

The modelling of hypothetical users begins to answer the personal concerns that road users might have about the direct impacts of reform.

The modelling suggests that the greatest cost upsides will accrue to road users in non-capital cities and the regions. Indeed, 'Peter', a Regional Victoria based hypothetical user studied in the paper, would enjoy direct cost savings of circa 70 per cent on one of his two vehicles, despite being the highest consumer of vehicle kilometres. This reflects the substantially lower impacts of a non-capital city user, principally using his vehicle in non-congested segments of the road network.

'Graham', another of our hypothetical case studies, drives an Audi to his CBD office in Sydney from the suburbs each day. On that vehicle, Graham would see his road user charges increase by circa 45 per cent, reflecting the much greater impact he imparts on other road users and the broader economy. This cost could be partially offset however, by a 36 per cent reduction in Graham's costs on his second vehicle, which is used infrequently and principally for shorter, local journeys (such as dropping children to school, shopping or weekend sport).

Our third hypothetical user, 'Leanne', enjoys a substantial gain under the URUC despite living in a capital city. Leanne, a nurse who owns a single small vehicle, lives in the outer suburbs of Brisbane, and by virtue of her role, principally works night shifts, travelling to her non-CBD workplace in the early evenings and returning before the AM peak. Overall, Leanne would see her share of road taxation fall by around 23 per cent, reflecting her lower cost of use on the road network at off-peak periods, and her choice of a smaller vehicle.

The assumptions, methodology and results of this modelling are detailed in chapter six, allowing for a transparent analysis of our conclusions and findings.

This modelling only considers the user price impacts, and does not consider, monetise and apportion the broader efficiency gains on the network, through lower congestion, increased journey time reliability and better asset condition, amongst other wider benefits.

We do not model the demand mitigation or price sensitivity of users, but it is reasonable to assume that the approach of the URUC would offer the opportunity to substantially alter current demand requirements, as users who face a negative pricing impact adjust their usage through public transport, changing their journey profile or making informed choices about vehicle type and size.

Pathways for reform

The utility and desirability of a reformed transport charging system has been the subject of discussion over recent decades, but to date this has not resulted in any meaningful consideration, beyond its potential application to heavy vehicles (through the Heavy Vehicle Charging and Investment programme).

It is increasingly apparent that the current approach is diminishing in its funding capacity, and of limited use in balancing the signals for efficient expansion, maintenance and usage of the broader transport network. This is not a niche area of government policy, or an abstract application of economic theory; rather it is a fundamental challenge that is entrenched into the price of the goods and services that we consume and produce. Failure to reform will risk increasing urban and freight congestion, and a sustained erosion of the abilities of Australia's cities and regions to compete in global markets.

We do not see the kind of model explored in this paper as immediately possible. The concept of road user charging reform has been discussed in Australia since at least 1991, but to date this discussion has been ad hoc and without an ongoing process to interrogate options and resolve a reform pathway.

This paper finds that successful reform will ultimately require strong political leadership, but also recognises that a deep, detailed and honest process to clearly identify the case and pathway for reform is fundamental to achieving a more sustainable and fairer system of road charging and investment.

This is why the principle recommendation of this paper is the development of a scrutable, transparent and public process, led by the Productivity Commission, to allow the options, challenges and opportunities posed by road user taxation reform to be explored, resolved and progressed toward a more efficient and transparent road pricing system.

RECOMMENDATIONS

This paper accepts that the scale of reform needed to deliver a fairer, simpler and sustainable model for taxing and funding road transport will require deep public debate and detailed consideration by transport policymakers.

Therefore, this paper's recommendations are divided into two sections.

The principal recommendation argues for the commissioning of a formal inquiry process through the Productivity Commission.

This process recommendation is designed to ensure that the options raised in this paper (and other models) advance through a detailed and national review. This is important, because it will provide a formal process that allows all stakeholders and jurisdictions to submit their views and interrogate the challenges presented by whole of network road pricing reform.

The paper's secondary recommendations concern themselves with more modest, complementary reforms that should be pursued in advance of (and to better enable) a later transition to a rationalised, equitable and transparent system of user charges across Australia's road network.

The paper has been structured in this way to provide policymakers with a logical, sequential and actionable framework to finally advance meaningful solutions to the national transport challenge.

PRINCIPAL RECOMMENDATION

1. **The Australian Government should direct the Productivity Commission to establish a detailed Public Inquiry into the funding, regulation and pricing of Australia's road transport market, and related impacts in the broader transport market.**

   This Inquiry must consider the capacity of the existing structure of road charging to fund future investment requirements; and the limitations of the current framework to achieve more efficient use of the transport system.

   The Public Inquiry should evaluate the potential for new pricing mechanisms to better address funding, equity and demand management on the road network. It should ultimately recommend the principles for a new, optimal structure and a clear reform pathway for Australia's governments.

SUPPORTING RECOMMENDATIONS

In advance of a broad and national consensus towards change, the following suite of enabling reforms and actions should be pursued. Each of these reforms is designed to simplify cross-border inconsistencies and/or advance public understanding of road pricing and increase the public appetite for reform.

2. **State-based registration and administration charges for light vehicles should be progressively harmonised, eventually leading to a single national pricing structure for light vehicle registration.**

   Under current arrangements, the fees and charges imposed on light vehicles, such as licensing and registration, differ substantially between states. Reform toward a nationally consistent road pricing system would be simplified by immediate steps to harmonise fixed cost access charges across the states and territories.

3. **State-based regulations for light vehicles should be progressively harmonised, delivering a single regulatory regime for light vehicles across Australia including registration, safety and licensing.**

4. **Consistent and detailed data should be collected to inform decisions on, and design of, any future road pricing mechanisms.**

   Australia's jurisdictions already collect substantial data about actual road use and user impacts. This data should be made available to the Productivity Commission and others to provide a detailed and long-term data set to inform and guide the development of reform pathways.

5. **Australia's governments, motoring clubs and broader industry stakeholders should formally partner together to increase the public's awareness and understanding of the flaws and challenges posed by the existing system of road regulation.**

   Substantial changes to the regulation and taxation of, and investment in, the road transport sector will require policy bravery and leadership from governments, motoring clubs and other stakeholders. Consideration should be given to how stakeholder groups can be integrally involved in the Productivity Commission process, to promote a dispassionate and collaborative process to resolve and implement the scale of changes countenanced in this paper.

6. **Large scale trials of road pricing should be developed and deployed to concept test different scheme design options. This process should be commenced in concert with the Productivity Commission review; allowing these trials to inform and shape the Productivity Commission's Public Inquiry process and final report.**

   It is likely that the Heavy Vehicle Charging and Investment process would provide an ideal "pathfinder" trial for the operation of a broader scheme that would ultimately include all road vehicles.

   Data from the Heavy Vehicle Charging and Investment trial (and subsequent trials with other vehicle classes or regions) would provide valuable insights into the efficacy of technologies and charging models in shaping demand and altering motorist behaviours. This data and experience would then inform design of the system for other vehicle classes, such as privately owned light vehicles.

1 Introduction

1.1 SCOPE

This paper considers the policy, regulatory and other levers that are available to fundamentally change the way Australia's transport market is regulated, priced and funded.

The paper starts by considering the current model, identifying a substantial and accelerating disconnection between the way Australia's roads are priced and how they are funded.

The paper then considers how a new, more transparent and fairer system of charging, based on the mass, time, distance and location of a vehicle's use of the road network, could offer opportunities to better manage, fund and invest in Australia's transport sector.

The paper also models user costs for a range of hypothetical 'real-world' users, allowing the public debate to move beyond an abstract theory, toward a greater understanding of the practical impacts and positive opportunities that could be offered through the type of reform developed in this paper.

Finally, the paper presents a series of actionable recommendations that should be pursued to advance reforms to Australia's transport network.

1.2 BACKGROUND

The need to 'solve' Australia's transport infrastructure shortfall is an issue of consensus between Australia's policymakers, the business sector and the community.

The growth in inefficient traffic congestion; the lack of available funding for new transport projects; the lack of clear connection between road-related incomes and expenditures; and the entrenched but invisible inequity of the current system – all point to a strong policy case for substantial change.

However, the consensus across the community about the need for better transport outcomes has not yet evolved into a sustained and mature debate about the options that exist to deliver better outcomes.

That is why this paper has been developed as a collaborative project between Infrastructure Partnerships Australia (IPA) and Deloitte, together with Australia's leading motoring associations – the Australian Automobile Association (AAA), the National Roads & Motorists' Association (NRMA), the Royal Automobile Club Queensland (RACQ), and the Royal Automobile Club Victoria (RACV).

This paper provides a single voice from the operators, providers and users of Australia's transport infrastructure, calling for a genuine and nationally-led process to allow all Australians to consider and resolve the way forward

As this paper outlines, the current charging and investment system is demonstrably failing to meet the expectations and requirements of the nation's economy, taxpayers and commuters.

While theoretical policy options to reform road pricing have been discussed with varying degrees of depth for some decades, to date there has been little analysis of the price and service impacts on the user, that is to say, the motoring public.

This paper seeks, in part, to demystify the debate about transport pricing reform by providing real-world examples of the price impact on 'hypothetical' real-world users.

It also considers the policy underpinnings of operating road pricing systems in other jurisdictions across the world; drawing on international experience to define a series of foundation principles that should form the basis of a road pricing system in Australia.

We recognise that a range of possible road pricing approaches could satisfy most or all of these principles. However, for the purpose of this paper, we develop a single option which we term the Universal Road User Charging (URUC) model.

Finally, the paper resolves a high level pathway that would allow this defining national issue to finally be advanced through a formal process of consideration, adoption and implementation.

Rather, we recognise the valuable work that is being pursued by HVCI and acknowledges that this process for heavy vehicles is likely to provide the foundation for later reforms to the charging for other vehicle classes.

Consideration of toll roads and the charges levied for their use are excluded, recognising that a future road charging scheme should be structured in a way that does not discourage either private sector investment or disadvantage existing, facility based tolling concessions.

1.3 REFORM CONTEXT

This paper acknowledges a range of prior and ongoing research and advocacy projects that consider pricing reform.

In particular, we refine and develop IPA and SAHA International's (2009) paper *Urban Transport Challenge: A discussion paper on a role for road pricing in the Australian context.*

We also recognise the contribution of the final report of the Commonwealth Government's *Infrastructure Finance Working Group,* whose first recommendation was that "governments should implement targeted measures such as user charges to enhance price signals to better balance supply and demand, and to increase the funding available for infrastructure investment."

The paper notes the recommendations advanced in the *Review of Australia's Future Tax System (*Henry Review), which highlighted the efficiency of price signals to manage congestion.

We also acknowledge the important path finding role that the HVCI process will play in time. Further details of that process are outlined immediately right.

Finally, we note the contribution and collaboration of the Transport Reform Network. The Transport Reform Network, established in 2012, provides a broad forum to articulate the need for reform to the way road usage is charged for and transport infrastructure investment is funded.

Heavy Vehicle Charging and Investment

In response to the findings of the Productivity Commission Review of Road and Rail Freight Infrastructure Pricing released in 2007, the COAG agreed to a three-phased reform programme (Road Reform Plan). The Plan included a number of research components looking at incremental charging and mass-distance-location (MDL) charging. In its response, the Australian Transport Council (ATC) agreed to a series of key reforms to the current heavy vehicle charging regime including to: introduce mass and distance charging; ensure recovery of infrastructure maintenance costs from heavy vehicles; and ensure that the cross-subsidisation across heavy vehicle classes is removed.

At the ATC meeting of May 2008, it was agreed that a work programme be developed to the research building blocks to enable COAG to further consider the potential merits of a move to mass, distance and location based charges for heavy vehicles. In 2009, COAG considered an initial report into key road reform elements, including heavy vehicle road use and costs. COAG determined that there was sufficient evidence to support a feasibility study.

The Feasibility Study involved a multi-jurisdictional approach and has considered various forms of direct charging, including fuel only, distance and distance-location options. The Feasibility Study was completed in 2011 and findings were recently presented to COAG for consideration.

Reported findings from the Feasibility Study suggest that the net economic benefits of a more direct charging are low or negative, principally as a result of the high potential costs associated with implementation. Findings suggest that a broader focus on reform of road funding, provision and use would result in benefits well in excess of those from reform of heavy vehicle pricing alone.

In 2012 the COAG Road Reform Plan was rebranded as the HVCI process.

1.4 STRUCTURE

This paper is structured as follows:

- **Section 2** discusses the structure of the current charging system, the weaknesses of that system and considers objectives of road pricing reforms.
- **Section 3** considers the case for road pricing reforms in Australia.
- **Section 4** explores the principles, objectives and options for road pricing reform in Australia before selecting a charging framework for evaluation.
- **Section 5** describes the process followed to estimate charges under a selected model.
- **Section 6** analyses the potential impact that the selected model could have on network users.
- **Section 7** considers future pathways for the road reform process in Australia.
- **Section 8** concludes the paper and outlines a number of immediate and medium term recommendations.

2 Is the current system broken?

Far from being a new concept for Australia, direct user charging played a foundation role in developing Australia's early colonial road network.

Australia's first tollway, a bridge crossing South Creek at Windsor in New South Wales, was commissioned in 1802.

This began an accelerating process of tolled roadways, with the first major corridor, the 25 kilometre Hawkesbury Road turnpike, commissioned in 1811. By the late 19th century, Sydney had a number of tolling plazas across the metropolitan and broader road network, which funded the maintenance and development of the road system.

This focus on direct charging largely fell away through the 20th century, particularly as tramways and other mass transit options began wide operation and the tax transfer system became more sophisticated.

In contemporary Australia, motorists in Sydney, Melbourne and Brisbane are accustomed to paying direct, point of use charges for access to various motorways in those cities. But beyond these relatively few direct charges on capital city tolled road corridors, the pricing of road access and consumption has become much less visible to the user.

Under current arrangements, road related revenues are derived from an array of flat state-based taxes, including registration, vehicle stamp duties and licensing fees, and the Commonwealth's Fuel Excise Tax. *The Review of Australia's Future Taxation System (Henry Review)* found that the current system is unsustainable because it offers diminishing revenues to government. Moreover, it also correctly identified the utility of fundamental transport taxation reform, in terms of the ability to better manage road network congestion.

The current approach also fails to provide clear signals to transport network users. In Australia, public transport patronage remains stubbornly low, while the economic and social costs of road congestion continue to rapidly escalate. The Federal Government estimates that urban congestion costs the national economy more than $14.2 billion in 2012, a figure that will exceed $20 billion by the turn of the decade.[5]

Clear minded reform to the way road access is taxed offers Australia's governments an opportunity to rebase the system. On the one hand, rational pricing could provide a mechanism to restore declining road related income, in turn allowing for greater investment; while on the other hand, reform to pricing would allow transport policymakers to influence and shape peak demand.

Although the use of the road network appears 'free' at the point of use, motorists are creating impacts on other motorists, the community, the environment and the economy. These external impacts, known as 'externalities', might include the wear and tear on the road surface, the impedance and delay of other (potentially higher value) journeys through congestion, vehicle occupant and pedestrian safety, or the emission of greenhouse gases.

The current approach does not reflect these additional costs to the motorists, meaning that high-end users are effectively subsidised by low-cost users.

For example, a motorist with a low external impact, say driving on a quiet country road, is effectively subsidising a motorist driving to their CBD office during peak hour.

If you assume a similar vehicle type, both motorists are paying similar fixed costs to access the road network, even though the broader external cost from the city peak hour motorist is much higher.

The same is true of two city motorists. For example, a motorist who uses their vehicle infrequently, or for shorter journeys, such as driving from home to a neighbourhood park-and-ride railway station, is also in effect subsidising the high-end motorist who drives to and from work each day.

5 Bureau of Transport and Regional Economics, 2007, Estimating urban traffic and congestion cost trends for Australian cities, Working paper 71

2.1 THE CURRENT ROAD USER CHARGING FRAMEWORK

Any broad taxation reform is routinely accompanied by justifiable concern from those affected, and understandable caution from policymakers, who are ultimately accountable to the electorate. For that reason, it is important that the debate about road pricing reform begins with a detailed understanding of the structure of costs and incentives which exist under the current approach, and why change is required.

The current system acts as a relatively unsophisticated two-part tariff – comprising a combination of fixed access charges and a consumption-based charge. The fixed charge components include state-based fees, like registration, licensing and stamp duties on vehicle purchases; while the consumption-based tariff is comprised of the Commonwealth Government's Fuel Excise. Table 2.1 gives a high level overview of the two-part tariff which forms the basis of the current light vehicle charging regime in Australia.

▼ TABLE 2.1

CURRENT AUSTRALIAN FIXED AND CONSUMPTION BASED CHARGING FRAMEWORK

FIXED ACCESS CHARGES	CONSUMPTION BASED CHARGE
Registration – depending on the state, these can vary by type of vehicle, vehicle weight or vehicle usage. Paid as an annual fee. Some states also offer discounts for certain concession classes.	**Fuel Excise** – set nationally, paid per litre of fuel purchased (currently 38.14c per litre), paid at the point of sale – but not decoupled from the full cost of fuel.
Stamp duty – depending on the state, varying by vehicle value, paid on initial purchase of the vehicle or subsequent transfer.	
Other charges such as vehicle transfer administration fees (paid on change of ownership) and number plate fees (paid on first vehicle registration).	

Source: Deloitte

The fixed charge components of road pricing can also vary greatly across jurisdictions. Table 2.2 below, shows the substantial variation in the fixed costs of registration across vehicle types and jurisdictions with each jurisdiction taking a different approach to charging for vehicle size or type.

For example, light vehicles in New South Wales attract different registration rates, depending on weight and registered use (e.g. private or commercial). Larger and commercial use attracts higher fees than smaller or private vehicles. Meanwhile, Victoria has a much lower, flat charge irrespective of vehicle type, but includes discounts for hybrid vehicles. Queensland's approach applies a flat fee, similar to Victoria, however Queensland includes an additional cost dependent on the number of engine cylinders.

This is illustrated in Table 2.2, where light commercial vehicles (LCV), which typically have fewer cylinders than larger private vehicles, despite being heavier, are charged less than medium to large sized private vehicles.

▼ TABLE 2.2

SAMPLE OF REGISTRATION CHARGES BY STATE IN 2011

	SMALL	MEDIUM	LARGE	COMMERCIAL
NSW	$266.00	$313.00	$447.00	$664.00
VIC	$191.60	$191.60	$191.60	$191.60
Qld	$328.90	$492.30	$669.80	$328.90

Source: Deloitte

Road use is not free

Many road users currently view the use of roads as 'free'. While most road users understand that they pay a fixed registration fee for the use of their vehicles and many are aware of the Governments' Fuel Excise levy, few understand the real cost (economic, financial and environmental) of the use of their motor vehicles – in essence motoring is 'free at the point of use'.

The user-pays concept is readily understood when it comes to other assets, such as water or electricity – motorists are also exposed to user pays approaches through tolling arrangements for some individual roads in major state capital cities.

Pricing based on time of day or peak demand is also well understood, through peak train fares and peak and off peak electricity pricing.

However, these concepts have not translated to the pricing of the broader road network. Instead, with flat pricing mechanisms for vehicle use – once the fixed costs of ownership and taxation are paid, users are incentivised to 'buy more to save more' because the marginal cost of usage diminishes with every additional kilometre travelled.

In effect, on a per kilometre basis, a vehicle becomes fractionally cheaper to the user with each kilometre they travel.

2.2 WEAKNESSES IN THE CURRENT ROAD USER CHARGING FRAMEWORK

There are a range of weaknesses that mean the current road user charging system will require substantial change in the near future.

For Australia's governments, the most pressing weakness is the falling proportional revenue that is generated from the Commonwealth Fuel Excise. For motorists and the economy, the opportunity to deliver a sustainable model to fund road and rail network investment, reduce congestion and deliver a fairer and more transparent system, while increasing the productivity of the road network, will be of increasing attractiveness; particularly as the existing approach continues to decay.

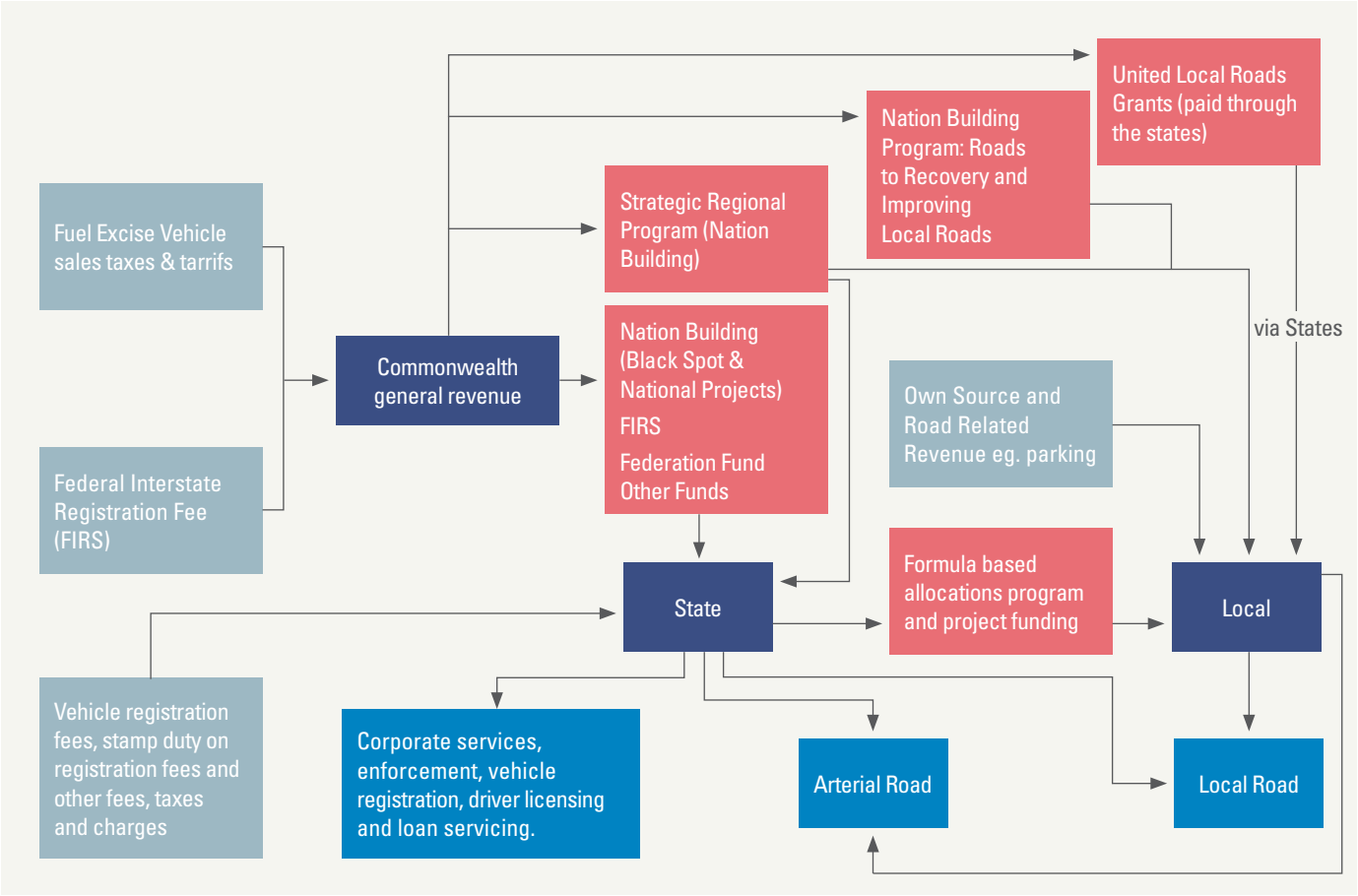
An opaque system of revenue and investment

In 2009-10, Australia's motorists collectively contributed circa $20.4 billion in road related taxation, across all levels of government. This was comprised of some $13.2 billion from the Fuel Excise;[6] a portion of which was returned to selected road users through the fuel tax credit scheme.[7] In the same year, the states and territories collected $7.2 billion through annual motor vehicle registration fees, traffic improvement and number plate charges, and stamp duties collected from the sale of new and used vehicles.[8] The total of $20.4 billion collected does not include GST from petrol and car sales or customs duty; it also excludes Luxury Car Tax.

Existing mechanisms for road revenue and investment see the majority of taxes collected flow through to Commonwealth and state consolidated revenue. The path for returning funds to road operations, maintenance and capital investment is complex and convoluted, heavily limiting taxpayers and consumers visibility of what proportion of, and where, revenue is deployed back into the network. The complexity of current road funding arrangements is illustrated in Figure 2.1.

▼ FIGURE 2.1

OVERVIEW OF CURRENT ROAD FUNDING ARRANGEMENTS[9]



Source: COAG Road Reform Plan, Funding and Implementation Issues Paper

6 Commonwealth of Australia (2011) 2011-12 Australian Government Budget — Budget Paper No. 1, Statement 5: Revenue

7 In 2009/10, fuel tax credit payments amounted to $5.1 billion. The various schemes include the fuel tax credits scheme, product stewardship for oil programme and the cleaner fuels grants scheme (Australian Taxation Office, Annual Report 2009-10). Light vehicles, including vehicles used for business, are generally not entitled to fuel tax credits.

8 Commonwealth Grants Commission (2012), 'About Fiscal Equalisation: Motor Taxes' (website), http://www.cgc.gov.au/fiscal_equalisation/the_commissions_methods/motor_taxes (Accessed 23/01/12)

9 COAG Road Reform Plan, *Funding and Implementation Issues Paper*, 13 April 2011

Both the collection of road related revenue and subsequent expenditure on the road and broader transport network are opaque and confusing. Motorists in Australia have too little visibility of the existing taxes and charges; and there is also a lack of visibility about how these revenues are expended. Indeed, of the $20.4 billion collected from motorists in 2009-10, some $16.9 billion was invested back into roads and bridges.[10] That being said, simple reforms that only balanced revenue from, and expenditure in, Australia's road network would not be possible without much broader reform to government service delivery, because it would leave a corresponding unfunded impact on government budgets.

The status quo is unsustainable, because it means falling revenues and increasing demand for transport

It is widely accepted that the current approach to road pricing is unsustainable. A range of bodies, including *Infrastructure Australia,* the Productivity Commission, the National Transport Commission and the Commonwealth Treasury (among many others) have concluded that the system requires substantial change.

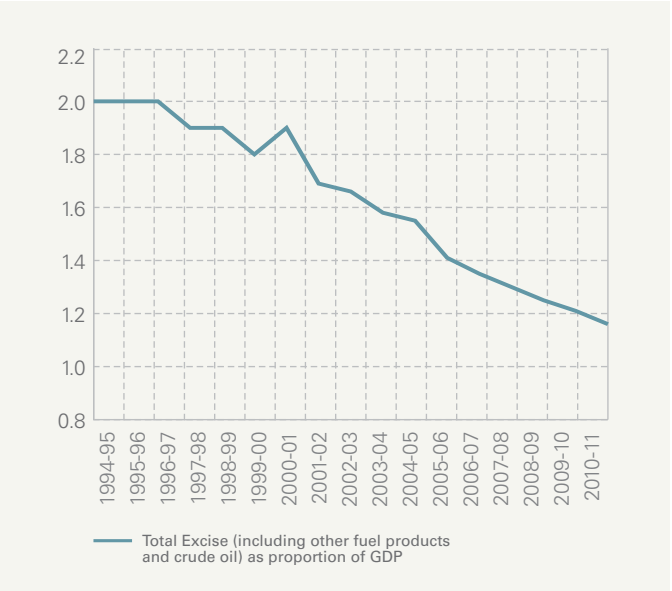
The Henry Review correctly concluded that the current taxation settings for the nation's roads would prove unsustainable in the longer-term.[11]

The Henry Review attributed the decline in Fuel Excise revenue to the cessation of indexation in 2001, which has been compounded by other causes, such as increasing efficiency of the vehicle fleet.

Figure 2.2 shows the declining level of Fuel Excise revenue between the mid-1990s and 2010-11, the trend over that period has seen fuel revenues decline from around 2 per cent of GDP to less than 1.2 per cent in 2010-11.

▼ FIGURE 2.2

TOTAL EXCISE (INCLUDING FUEL PRODUCTS AND CRUDE OIL) AS A PROPORTION OF GDP

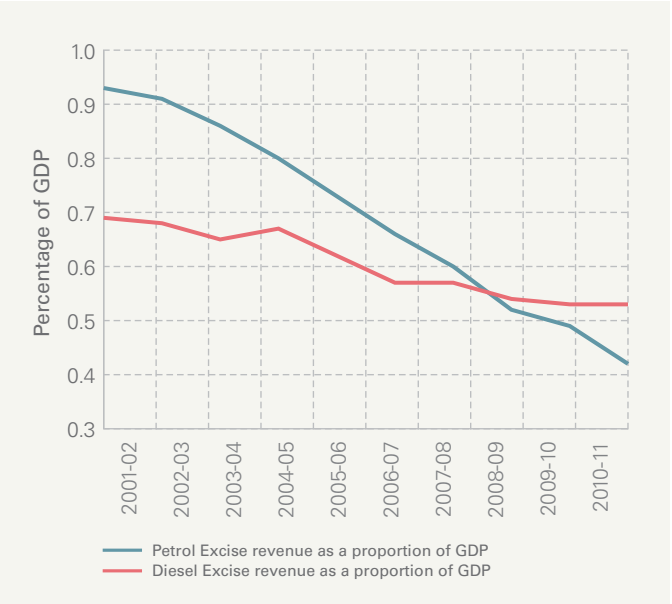


Source: IPA analysis, Budget Paper 1, Commonwealth Budget 2011-12

When petrol and diesel are considered in isolation the relative decline in revenue becomes even more apparent, with petrol excise revenue as a proportion of GDP having more than halved between 2003-04 and 2010-11. The decline of diesel and petrol excise revenue is shown in Figure 2.3.

▼ FIGURE 2.3

FUEL EXCISE REVENUE BY TYPE AS A PROPORTION OF GDP



Source: IPA analysis, Commonwealth Budgets – BP1, 2001-02 to 2010-11

10 National Transport Commission (2011), Annual Report 2011. Total includes expenditure on local roads, a portion of which is funded via local council rates, which are not included in revenue estimates.

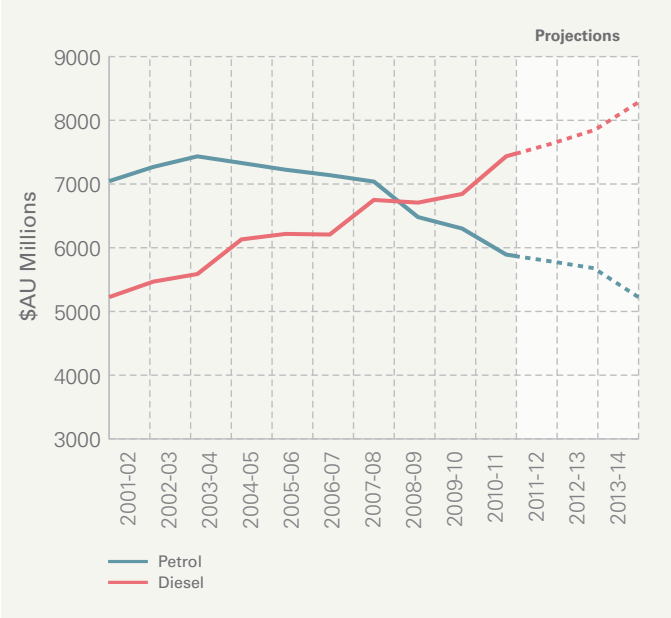
11 Henry Review, Part One, Page 53.

Figure 2.3 lends further credence to the role of increased vehicle efficiency and alternative fuels, given the much more substantial fall in petrol excise revenue over diesel. Assessment of the actual revenue generated from Fuel Excise also shows a decline in the petrol derived portion of the tax, but an increase in the portion derived from diesel – reflecting a relative shift in the fuel mix used by motorists (of all vehicle classes) toward diesel.[12]

Figure 2.4 shows the real revenue to the Commonwealth Government from Fuel Excise year-on-year since 2001-02 showing the fall in petrol excise – projected revenue is shown with a dotted line.[13]

▼ FIGURE 2.4

FUEL EXCISE REVENUE BY TYPE, 2001-02 TO 2013-14



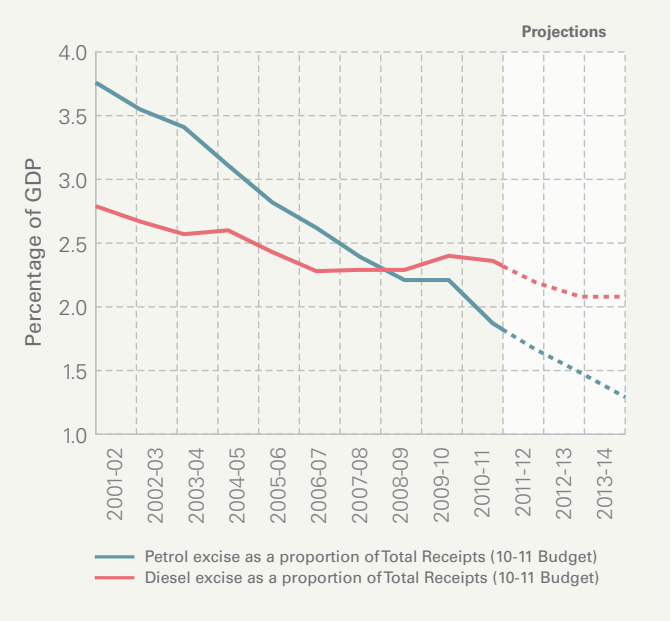
Source: IPA analysis, Commonwealth Budgets – BP1, 2001-02 to 2010-11

It is worth noting that this decline in revenue occurred during a period of substantially increasing demand for both vehicle ownership and use. In 2004, Australia had 13.5 million registered vehicles using the road network. By 2010, that number had surged to more than 16 million registered vehicles. This increase in the number of vehicles saw a corollary increase in consumption of road space, with the number of Vehicle Kilometres Travelled (VKT) surging from 199 billion VKT in 2004, to more than 226 billion VKT by 2010.

Revenue from Fuel Excise has also fallen dramatically as a proportion of total Federal Government receipts since indexation of Fuel Excise ceased in 2001, as shown in Figure 2.5. The fall in receipts from petrol excise as a proportion of total receipts has been particularly striking, falling from 3.76 per cent in 2001-02 to a projection of just 1.31 per cent in 2013-14, while the volume of domestic gasoline sales have remained relatively static ranging between 18,600 and 19,200 megalitres over the same timeframe – as shown in Figure 2.8.[14]

▼ FIGURE 2.5

FUEL EXCISE (BY TYPE) AS A PROPORTION OF TOTAL RECEIPTS 2001-02 TO 2013-14



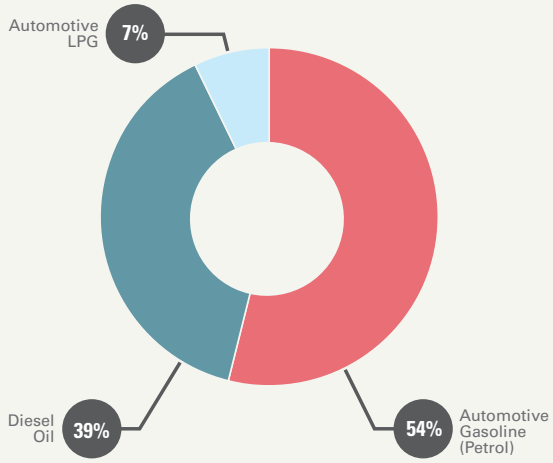
Source: IPA analysis, Commonwealth Budgets – BP1, 2001-02 to 2010-11

12 Department Resources, Energy and Tourism, Australian Petroleum Statistics, Release 90 – Jan 2004 to Release 186 – Jan 2012.
13 Commonwealth Budget 2011-12, Budget Paper 1.
14 Department Resources, Energy and Tourism, Australian Petroleum Statistics, Release 90 – Jan 2004 to Release 186 – Jan 2012.

Figures 2.6 and Figure 2.7 show petroleum product sales for 2001-02 and 2010-11 demonstrating the transfer from gasoline based fuels toward diesel over the decade.

▼ FIGURE 2.6

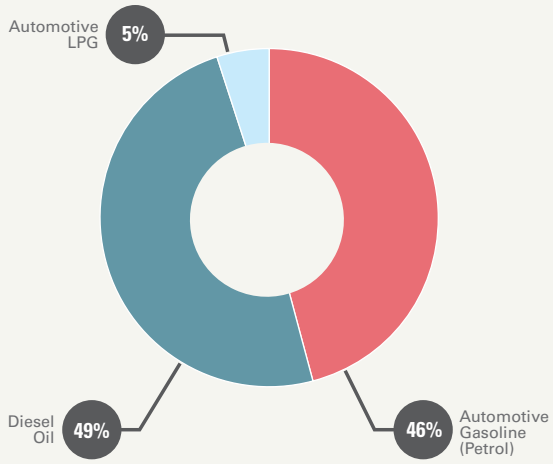
AUTOMOTIVE PETROLEUM SALES (BY TYPE) – 2001-02



Source: Department Resources, Energy and Tourism, Australian Petroleum Statistics, Release 90 – Jan 2004 to Release 186 – Jan 2012

▼ FIGURE 2.7

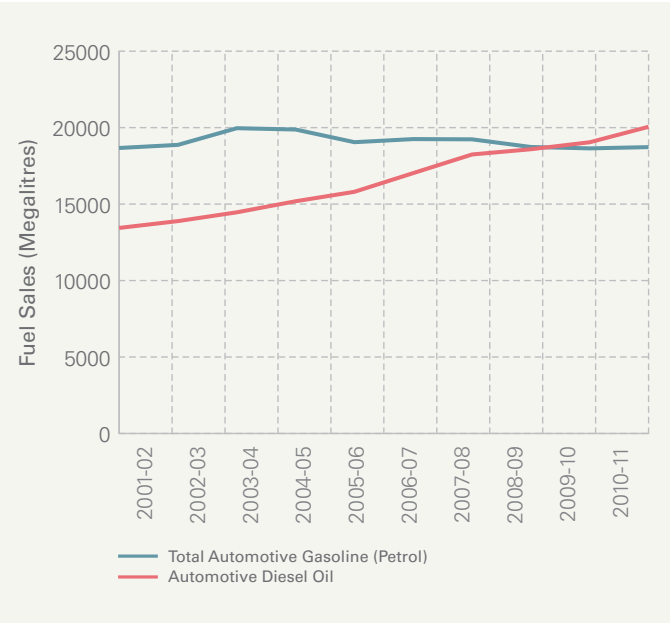
AUTOMOTIVE PETROLEUM SALES (BY TYPE) – 2010-11



Source: Department Resources, Energy and Tourism, Australian Petroleum Statistics, Release 90 – Jan 2004 to Release 186 – Jan 2012

▼ FIGURE 2.8

FUEL SALES BY TYPE – 2001-02 TO 2010-11



Source: Department Resources, Energy and Tourism, Australian Petroleum Statistics, Release 90 – Jan 2004 to Release 186 – Jan 2012

Each of these figures above support the view that the current structure is unsustainable and requires substantial change. Beyond the unsustainable decline in Fuel Excise receipts, there are other serious deficiencies in the way road access is currently priced.

The current system is unfair, and does not incentivise efficient use of the transport network.

The congestion challenges in Australia's major cities are the result of insufficient capacity to meet demand. As with any capacity constraint, there are two essential responses; either the addition of new capacity (such as through building a new lane or motorway) or by managing demand (for example by making it more expensive to drive when demand is high).

Until now, transport policymakers have focussed on a 'supply only' response, either building new capacity or simply allowing inefficient congestion to intensify.

In considering that change is inevitable (because of the falling revenue base described above), there is an opportunity to rebase the current system of road pricing to rectify the substantial inequities, cross subsidisation and inefficiencies that are created or compounded by the status quo.

Inequity or fairness is a central question in reconsidering the structure of transport pricing in Australia. Reform of the scale envisaged in this paper will undoubtedly generate a deep consideration of the winners and losers under any new model; however it must also generate greater transparencies of the shortcomings of the current approach, and options that exist to make it fairer.

For example, within a city, two light passenger vehicles impose similar impacts on other users and infrastructure through comparable consumption of road space, irrespective of their drive train or fuel type.[15] However, under the current pricing arrangements, two otherwise identical vehicles with different drive trains (i.e. one electric or hybrid and one internal combustion engine vehicle) attract markedly different levels of road use taxation, principally because the electric or hybrid vehicle uses substantially less fuel, thereby lowering its Federal taxation contribution.

This subsidy is often extended by varying degrees of discount or premium on fixed state-based charges, as governments seek to encourage lower emission vehicles or offer concessions to particular user groups. For example in Victoria owners of hybrid vehicles can expect to receive a $100 discount on vehicle registration fees, compared to owners of vehicles with internal combustion engine power plants[16] – in addition to the already lower Fuel Excise payments, due to lower consumption of fuel.

A strong public policy argument for incentivising more fuel efficient vehicles does exist, but the current pricing structure also leaves a substantial inequity, because the driver of the more fuel efficient vehicle has contributed lower charges than the owner of the less fuel efficient vehicle, even though their impact on congestion and infrastructure is similar. A restructured pricing framework, which takes into account the time and location of use, could provide the policy levers to address this inequity.

Inequities also exist in the context of journey location, where a litre of fuel used to power a vehicle in Melbourne's CBD attracts the same taxation as a litre of fuel used on the Bruce Highway in Queensland – yet the litre of fuel used at peak hour in Melbourne, Sydney or Brisbane is likely to have a greater impact on other users through urban congestion.

The current system does not incentivise efficient use of road space across periods of high and low demand

Significant road investments in major urban areas, together with expert management of network pinch points by road agencies, have each helped to alleviate the impacts of congestion and 'sweat' the existing network,[17] but there are practical limits to a supply side only approach.

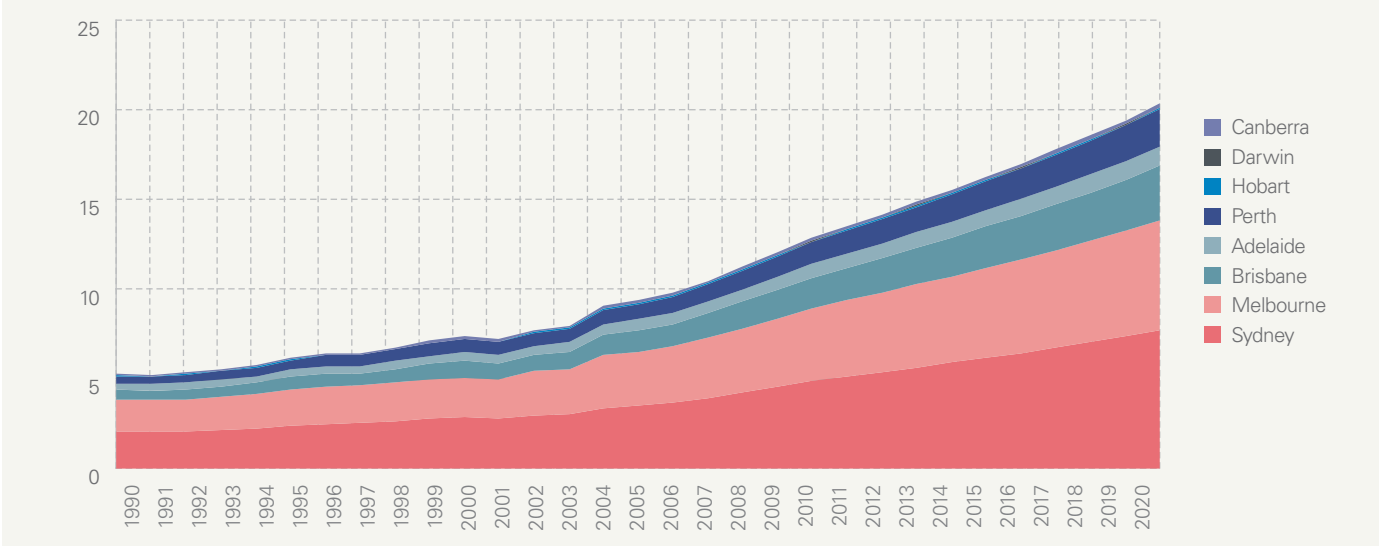
Figure 2.9 shows the Bureau of Infrastructure, Transport and Regional Economics (BITRE) projections for the total avoidable social costs of congestion in Australian urban areas from 1990 to 2020; demonstrating that the failure to adequately address urban congestion is a significant economic burden on Australia.

Current road usage means that inefficient road congestion occurs during peak and shoulder periods, with substantial excess capacity during periods of low demand (such as late evenings and early mornings).

A 'hands on' approach to demand management through price signals based on the time and location of use would allow policymakers the opportunity to spread demand throughout the day, getting much greater efficiency from the road network and delaying the need for inefficient investment in new capacity that may only be required for a few hours per day. However, the benefit of reform would also allow for a much fairer system of revenue collection, based on the time, distance and location of use.

▼ FIGURE 2.9

PROJECTED AVOIDABLE COSTS OF CONGESTION BY CITY 1990 -2020



Source: BITRE, Working Paper 71, 2007.

15 Certain vehicle features such as length and performance may have an influence on the congestion impact they impart on all users – however, two otherwise identical vehicles with distinct fuel types (i.e. one plug-in electric vehicle and one petrol engine vehicle) could be expected to have a similar impact on other users when competing for finite road capacity.

16 VicRoads Vehicle Registration Fee Schedule - http://www.vicroads.vic.gov.au/Home/Registration/FeesFormsAndFAQs/Fees/VehicleRegistrationFees.htm - accessed 22/06/2012.

17 See section 3: Why reform road pricing?

The case for change

From this section, we can see that there is a compelling case for substantial reform because:

1. the existing structure for how revenue is collected and investment directed is complex and opaque;

2. the status quo is unsustainable because it means revenues are falling as demand for transport and the corollary infrastructure investment requirements are increasing;

3. the current system is unfair, and does not incentivise efficient use of the transport network; and

4. it does not incentivise efficient use of road space across periods of high and low demand.

2.3 TRANSPARENT CHARGING REQUIRES EQUALLY TRANSPARENT EXPENDITURE

Moving to a transparent and well-conceived system of direct road user charging offers transport policymakers the opportunity to positively resolve the frailties of the existing system.

A direct system of charging for access to the road network could be structured to achieve an array of outcomes, such as rebasing transport revenue, providing direct price signals to manage congestion and incentivise public transport use, or potentially, to price other externalities, such as vehicle emissions.

The need to increase revenue has often been a key motivator for rationalised user pricing in other jurisdictions. For example, the German Heavy Goods Vehicle charging scheme generates around $5 billion per year; while the London Congestion Charge generates gross revenues of circa $400 million per year.[18]

While there is a very real need for Australia's governments to consider revenue opportunities, it must be noted that significant revenues are already collected from road users, not all of which is reinvested back into the road network.

The experience in other jurisdictions has shown that rationalised road pricing systems increase the transparency of charging, with a corollary expectation from the public that there will be corresponding increases in the transparency of expenditure from a rationalised scheme. Under a 'customer focussed' approach to road funding, as part of a direct charging model, users could reasonably expect their contributions to be invested into the land transport network by being hypothecated (earmarked) to transport capital investment.

A direct approach can also provide fairer arrangements for road use through creation of a stronger signal for users between what they contribute and how they use the transport network. Flat forms of pricing, like fixed registration charges and stamp duty, result in inefficient use of roads, as they can encourage road users to use the network as much as possible – including people who could have substituted a car journey with a public transport trip.

Key points

- Around $20.4 billion is collected annually from road users in taxes. This exceeds spending on roads and bridges, which amounted to $16.9 billion in 2009–10.
- The vast majority of funds collected from road user charges become part of consolidated revenue and the path for returning funds to road operations and maintenance is highly complex and convoluted.
- There are a range of costs that are not, and cannot be, efficiently priced using the traditional 'fuel tax and rego' model, such as the costs of urban congestion as well as the impacts of road-wear caused by some vehicles.
- Direct road charging models can help manage problems associated with the transport system; they can also provide a 'customer focussed' mechanism which strengthens the argument for road related revenue to be reinvested in road infrastructure and public transport.
- A rational approach can also provide fairer arrangements for road use by creating a stronger link between charges and how the transport network is used; giving users' effective signals to better understand their own impact on the network and on other users.

18 US Department of Transport (2009) International Scan: Reducing Congestion & Funding Transportation using Road Pricing

3 Why reform road pricing?

In considering the case for bold reform, it is worth considering the winners and losers and how momentum toward reform might be marshalled and sustained.

Where rational pricing regimes have been achieved in other countries, they have usually done so in the context of mounting congestion and dwindling efficiency across the transport network, which together create a 'burning platform' to encourage change. Australia is now entering similar preconditions, with widespread commentary and frustration in Australia's major cities showing that a 'something needs to be done' view is already well established across the public.

Moreover, the best estimates of Australia's governments show that without change, the customer impact of congestion will broadly double in the decade to 2020.

This means that a well-led, independent and national policy reform process, such as the one outlined in this paper's principal recommendation should be receptive to our policymakers, as the personal frustration and economy wide impacts of transport network congestion and investment continue to grow.

Indeed, the public may welcome an honest discussion about how changed pricing models might offer solutions to complex challenges, such as funding or maintaining roads, funding public transport and promoting a fairer allocation of costs and benefits across the transport network.

3.1 FUNDING DEVELOPMENT OF THE TRANSPORT NETWORK

In Australia's three largest capital cities, there is a long-standing experience with direct user charging to fund road network assets. Australian road users more broadly are also likely to understand that direct user charging extends the capacity to fund the construction, maintenance and operation of roads that would otherwise not exist, or would substitute other funding priorities from the stretched public purse.

Many feasible and desirable transport infrastructure projects have been identified to ease road and rail network congestion, particularly in Australia's three major capital cities. Examples of major transport projects include Sydney's $10 - $15 billion *WestConnex* motorway; Melbourne's East West link; or the completion of new CBD rail links in Melbourne (Melbourne Metro), Brisbane (Cross River Rail), and Sydney (the second harbour crossing).

Global experience has shown that rationalised road pricing schemes, particularly those which price congestion, rely on the hypothecation of revenue to transport network investment to ensure public acceptance of the system.

Both the London Congestion Charge and the German Heavy Vehicle Charging scheme use forms of hypothecation to land transport as mechanisms to provide additional network capacity. In London, net revenues from the Congestion Charge are hypothecated to public transport provision.[19] Under the German scheme, 50 per cent of revenue is allocated to roads, 38 per cent to rail and 12 per cent to waterways.

In both cases, hypothecation was seen as a major factor in underpinning public and industry support. They also generated new funding for investment in transport networks – in London, net revenue (£173.5 million 2011)[20] is invested in areas such as bus network augmentation, cycling facilities, roads and bridges that have served to make public transport an effective alternative to motor vehicle use in the Charging Zone.

As discussed in other areas in this paper, in Australia there is currently an asymmetry between the revenue collected and expended on the road network; however this paper notes if this asymmetry were corrected, governments would have to make up the revenue shortfall outside of transport, through additional charges in other areas of revenue collection.

Nevertheless, a system where transport user charges fund overall network expansion may serve to drive a greater public understanding of the trade-offs between user cost and the quality of service and capacity delivered by the transport network.

19 House of Commons Library Standard Note, SN01480, *Hypothecated taxation*, September 2011.

20 Transport for London, *Annual Report and Statement of Accounts 2010/2011.*

3.2 FUNDING NETWORK MAINTENANCE

Australia's governments expend between $5.6 billion and $7 billion dollars each year on maintaining the condition and quality of road assets.[21] However, in spite of this sizeable annual investment, the backlog of required road maintenance is substantial and worsening.[22]

The need to expand network capacity during the 1990s led to a shift in expenditure away from maintenance of asset quality (such as pothole repairs, sealing and edge repairs) toward rehabilitation (restoring road pavements to original design standard after failure – including large scale patching and reconstruction). A broader shift towards capital investment in the road network, at the expense of maintenance, since the early 2000s has seen a growing backlog in the maintenance task across the network. According to BIS Shrapnel an average of 50 to 70 per cent of the annual total roads spend was allocated to maintenance from the mid-1970s until 2002-03. Since then a shift toward capital investment has seen the proportion fall to a historical low of 35 per cent in 2008-09, and a subsequent slight recovery[23] in 2010-11, largely due to flood-related repairs. The consequence is a maintenance task that is currently not being met, compounded by a protracted period of sub-optimal investment and a series of extreme weather events.

A rational, customer focussed approach to road pricing has the potential to both expose this under-investment and also provide an enhanced revenue stream to address the backlog. Reforms to road user charging mechanisms could provide a more transparent pricing and funding framework – allowing network suppliers to better articulate the true cost of provision. By providing a more direct link between usage and charging, under a customer focussed model, road users would be better placed to insist on minimum maintenance standards across the network. Equally, a whole of network rational approach would provide valuable data for road suppliers to accurately understand usage and condition of assets – providing empirical data to inform asset managers and better allocate maintenance funding for a best of network outcome.

Australia's significant and network wide maintenance deficit and the potential for a rational pricing structure to expose and (at least partially) address that backlog, could be considered as a catalyst for a move toward reforms in the structure of road charging.

3.3 FAIRER ALLOCATION OF COSTS AND BENEFITS

The existing configuration of Fuel Excise and fixed state-based charges results in an imbalance in the allocation of costs and benefits in the transport market. The combination of high fixed charges and consumption taxes that are only marginally linked to usage means that some users are effectively subsidising others. Principally, but not exclusively, lower mileage users of the network where a greater proportion of their total charges comprise fixed components are effectively subsidising heavier users. The result can be a misalignment between what users pay and how they benefit – particularly when considered on a total cost per kilometre basis.

Equally, time and location of usage is not adequately accommodated in the existing pricing structure.[24] Meaning users in remote or low traffic areas may be effectively subsidising users in high traffic areas through an indirect contribution towards funding additional capacity to accommodate peak urban demand and thereby sharing the burden of indirect economic costs of congestion to which they do not contribute. Drivers of more modern or more fuel efficient vehicles may also pay lower overall road taxes through discounts for hybrid vehicles, or a smaller amount of Fuel Excise because of lower consumption per kilometre – despite a comparable contribution to other externalities like congestion and cost of road provision. This does not mean a new structure should seek to disincentivise more fuel efficient vehicles or alterative drivetrain technologies, but should acknowledge that greater fuel efficiency is only part of the solution to existing road problems.

Although unlikely to be an immediate catalyst for change – due to the embedded nature of the imbalance – a fairer allocation of costs and benefits may become a driver over time. With a projected increase in congestion and the shifting dynamics of fuel use and fuel types, these imbalances may grow over time. While adjustments to the current composition of road use taxation could partially address this imbalance – for example through an adjustment to the balance between fixed charges and excise or variations to the taxation for particular fuels – these modifications are unlikely to be enduring or comprehensive. A change to the framework of road user charging could be a viable option to better align the costs of road use to the benefits.

3.4 FUNDING STREAM SECURITY

In combination with a shortfall in the quantum of funding directed to land transport, the security of the funding stream is a further challenge of the existing charging framework. Transport investments are necessarily long-term, often with an intergenerational productive lifespan and an investment commitment in delivery that can cover multiple budget cycles.

The current approach to funding land transport infrastructure has become increasingly less able to meet the demands of the travelling public and businesses. A growing list of essential transport projects that are required, and a maintenance backlog that needs to be addressed, is compounded by a shortage in funding capacity and limited visibility of the forward funding pipeline. The structural origins of that shortage were explored in detail in Section 2.

Multiple reports and bodies – including the Henry Tax Review, the Productivity Commission, the Infrastructure Finance Working Group and the HVCI process – have identified both the need to increase the level and surety of investment flowing into transport infrastructure and the opportunities to harness rational pricing and user pays approaches to achieve it.

There is compelling evidence to suggest a requirement exists for the establishment of a long-term funding structure for transport infrastructure construction and maintenance; a structure that would extend beyond the relatively short-term budget cycles of

21 BIS Shrapnel, Road Maintenance in Australia 2011 – 2026, 2011 and Infrastructure Partnerships Australia, Road Maintenance: Options for Reform, 2011; Commonwealth Grants Commission, 2011; BITRE, 2011; Australian Local Governments Association, Study of local roads funding in Australia 1999-00 to 2019-20, 2010.

22 Engineers Australia, Australian Infrastructure Report Card 2010 and BIS Shrapnel, Road Maintenance in Australia 2011 – 2026, 2011.

23 BIS Shrapnel, Road Maintenance in Australia 2011 – 2026, 2011.

24 A motorist using the network at a peak time, in a high traffic location, could reasonably expect to use more fuel per kilometre than the same vehicle in an uncongested area; due to the stop start nature of congested traffic and the fuel used while stationary – thereby paying more Fuel Excise per kilometre travelled. However, this is an indirect and inefficient price on congestion.

governments and a system that is sufficiently flexible to address current shortfalls, but that also provides long-term stability of funding. A well-structured road user charging scheme could partially or completely address this weakness by providing a secure funding stream that better reflects the costs of provision and maintenance.

3.5 IMPROVING BUSINESS PRODUCTIVITY

Businesses face both direct and indirect impacts of deficiencies and inefficiencies in the transport market. In particular, congestion can have substantial adverse impacts on business productivity. Direct impacts such as additional fuel, labour and vehicle running costs can be compounded by substantial negative impacts on downstream logistics chains – together reducing the benefits of locating operations in, or close, to large urban centres.[25]

These downstream and indirect impacts can be divided into three categories:

- logistics related and business process related productivity impacts;
- market scale and market accessibility impacts; and
- business costs of worker commuting.[26]

In addition to the costs of business delay due to congestion, the costs of trip variability can be substantial. The growth of 'just-in-time' operations has increased the need for predictability in supply chains – where unplanned delays from unreliable travel conditions have considerable impacts causing firms to build in un-productive buffers to delivery schedules or carry expensive on-site inventory buffers. For example, where a logistics chain relies on scheduled delivery, failure to make a delivery due to unexpected traffic delays can require the need for rescheduling and may attract penalties for shippers.

Australian businesses and the broader economy already experience substantial costs due to congestion. Table 3.1 shows the projected annual avoidable costs of congestion impacts on business in Australia in 2020. Across Sydney, Melbourne and Brisbane nearly half (45.5 per cent) of the overall avoidable costs of congestion can be attributed to the impacts on business totalling $7.69 billion per annum in 2020 – including over $2 billion in costs to the economy as a result of business trip variability.

▼ TABLE 3.1

BUSINESS PRODUCTIVITY IMPACTS – 2020 (AVOIDABLE) COSTS OF URBAN CONGESTION (BILLIONS)

	BUSINESS DELAY	BUSINESS TRIP VARIABILITY	TOTAL BUSINESS (AVOIDABLE) COST 2020	TOTAL PROPORTION OF OVERALL (AVOIDABLE) COSTS	2020 OVERALL CONGESTION (SYDNEY, MELBOURNE AND BRISBANE)
Sydney	$2.55	$0.96	**$3.51**	45.26%	**$7.76**
Melbourne	$2.09	$0.75	**$2.84**	46.38%	**$6.12**
Brisbane	$0.99	$0.35	**$1.34**	44.27%	**$3.03**
Total (across Sydney, Melbourne and Brisbane)	**$5.63**	**$2.06**	**$7.69**	**45.49%**	**Total $16.91**

Source: IPA analysis, BITRE, Working Paper 71.

3.6 IMPROVING NETWORK PERFORMANCE

Deterioration in the performance of the road network is perhaps the strongest potential driver of reform to road user charging frameworks. Urban congestion in Australia is projected to have an impact of more than $20 billion per annum in avoidable social costs by 2020[27]. Congestion is also an issue of frustration for road users – in the 2011 IBM Commuter Pain Survey, congestion related factors rated highly as a frustration amongst Australian commuters, with 57 per cent of road users citing stop-start traffic and 36 per cent citing low traffic speeds as a daily frustration on their commutes.[28]

Transport challenges that have eventually contributed to reforms in other jurisdictions have gone beyond motorists being delayed for a few minutes by traffic congestion on isolated occasions, but have been characterised by increasing frustration and lost productivity experienced over a number of years. For example, in London in 2002, 50 per cent of businesses perceived the impact of peak-time congestion to be either critical or very bad for their business. This perception was based on pre-charging average network speeds within the Charging Zone of around 15 km/h (for vehicles in the AM peak) – speeds which had been steadily falling since the 1980s.[29]

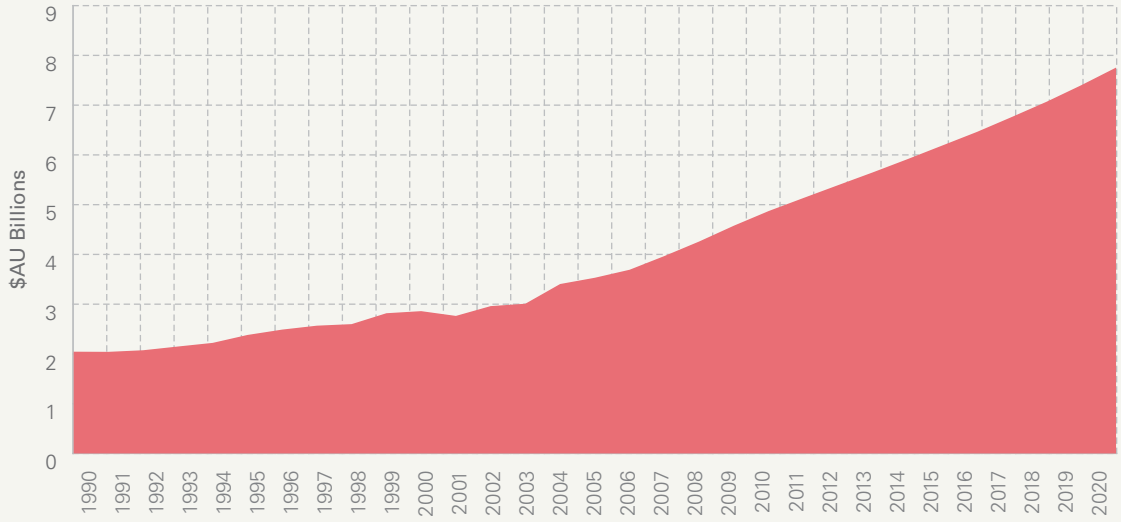
25 European Conference of Ministers of Transport, Organisation for Economic Co-operation and Development (OECD) 2007, Managing Urban Traffic Congestion, page 156-158.
26 Ibid.
27 Bureau of Transport and Regional Economics, 2007, Estimating urban traffic and congestion cost trends for Australian cities, Working paper 71
28 IBM (2011) Commuter Pain Study (Online) http://www-03.ibm.com/press/au/en/pressrelease/33560.wss (Accessed 26/03/2012)
29 Transport for London 2003, Impacts Monitoring – First Annual Report, Central London Congestion Charging Scheme. Available at: http://www.tfl.gov.uk/assets/downloads/Impacts-monitoring-report1.pdf.

Peak spreading, flexible working arrangements and technology have all played an important role in extracting greater supply from road networks without necessarily investing in new road capacity. Australian cities exhibit relatively concentrated peak periods, with 60 per cent of commuters departing for work between 0700hrs and 0900hrs and 53 per cent leaving between 1600hrs and 1800hrs. Other cities around the world have been typically better able to spread peak demand; just 12 per cent of commuters work after 1800hrs in Perth and Brisbane, as opposed to 65 per who stay after 1800hrs in New Delhi, 64 per cent in Moscow and 48 per cent in Madrid.[30]

The comparatively concentrated peaks experienced in Australian cities suggest improved utilisation of the existing capacity could be achieved through peak spreading, however the effectiveness of these behavioural responses is likely to decline over time as a result of growing populations and increasing travel demand. Incentivising peak dispersal through pricing (either as a discrete tool or as part of a broader charging regime) is widely used by other utilities providers such as telecommunications and energy networks, and is one area of road pricing reform that could be considered to extract greater usage from the existing road network.

NETWORK PERFORMANCE: SYDNEY

Projected avoidable costs of congestion: Sydney 1990-2020



Source: BITRE, Working Paper 71.
The social costs of congestion in Sydney have grown from $2.045 billion in 1990 to $5.392 billion in 2012 and are projected to stand at $7.755 billion by 2020.

Figure 3.1 shows results from annual surveys of travel speeds undertaken by the Roads and Traffic Authority of New South Wales between 1990 and 2010. This data suggests that speeds on major roads in Sydney have generally remained constant over the period of examination. While some speeds have decreased, others have also increased as a result of increases in road capacity. This is in light of strong growth of traffic volumes over the period of analysis, suggesting the need for more effective management of the available road space.

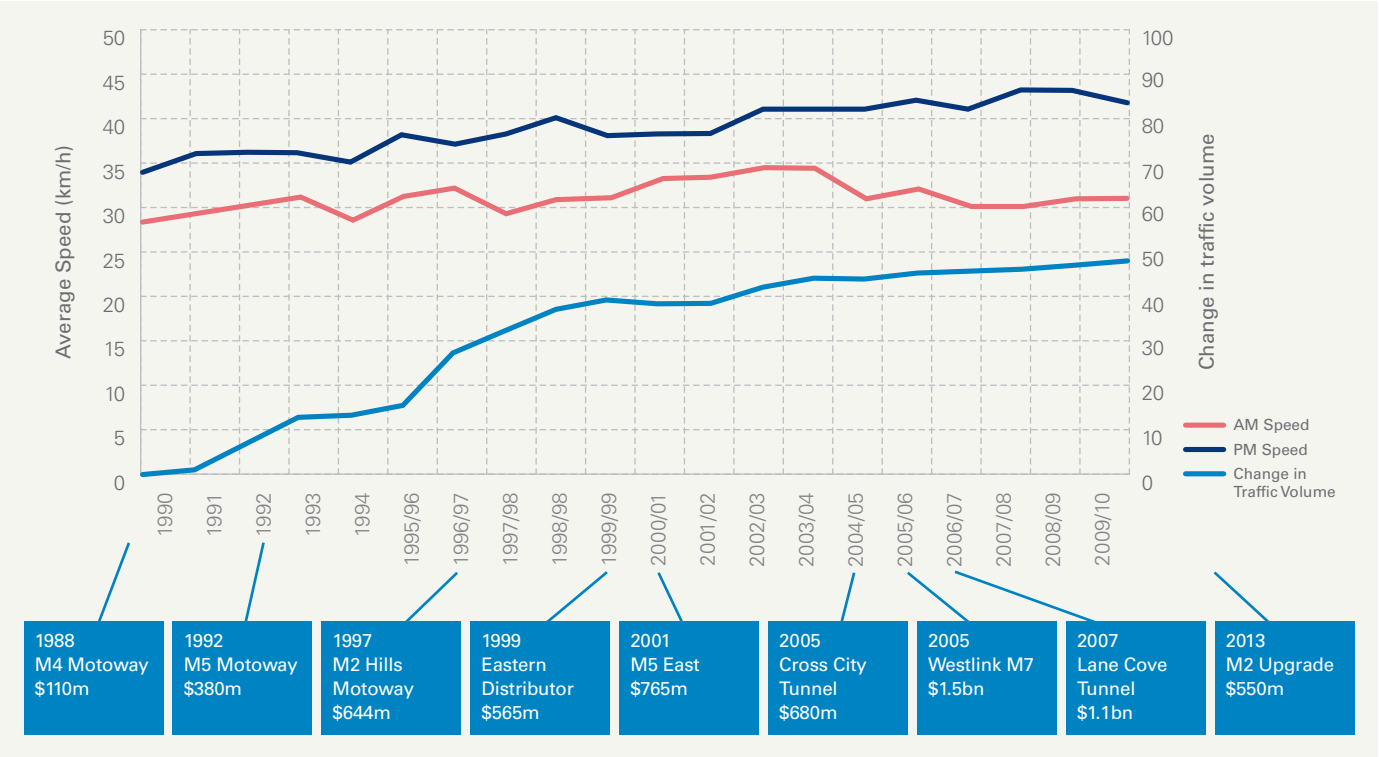
However, it is important to note the number of significant road link construction projects which occurred over the period of examination. These projects, and their cost of construction, are also shown in Figure 3.1. This illustrates the significant investment in infrastructure needed to maintain these road speeds in an environment of traffic volume growth – with close to 50 per cent growth in traffic volume in the two decades to 2009-10. The impact on the seven major routes may also in part be due to traffic diverting along minor traffic routes, possibly leading to greater congestion across a broader area of the secondary road network.

Detailed data for all seven routes published in the New South Wales Auditor General's 2011 Report to Parliament shows severe and growing congestion challenges on specific corridors as shown in Table 3.1. The M4, Military Road and Victoria Road all had average AM peak traffic speeds of at, or below, 25km/h in 2011 and the M5/Eastern Distributor corridor has seen AM peak speeds fall from 40km/h in 2007 to just 34 km/h in 2011.

30 Ibid.

▼ **FIGURE 3.1**

SYDNEY TRAFFIC TRENDS LINKED WITH ROAD CONSTRUCTION PROJECTS[31]



▼ **TABLE 3.2**

AVERAGE SPEED TREND FOR SEVEN MAJOR SYDNEY ROADS 2007-11

YEAR ENDED 30 JUNE	ACTUAL SPEED (km/h)				
	2011	2010	2009	2008	2007
Morning Peak Speeds					
F3/Pacific Highway/F1	**33**	34	35	35	35
M2/ Lane Cove Tunnel/ Gore Hill Freeway	**36**	39	36	31	38
M4/Parramatta Road/City West Link	**25**	28	29	28	25
M5/ Eastern Distributor	**34**	35	41	34	40
Pittwater Road/Military Road/F1	**25**	25	26	26	27
Princes Highway	**29**	31	30	28	28
Victoria Road	**24**	26	21	23	22
Combined seven routes	**29**	31	31	30	30
Afternoon Peak Speeds					
F3/Pacific Highway/F1	**54**	53	50	52	45
M2/Lane Cove Tunnel/Gore Hill Freeway	**60**	65	66	61	47
M4/Parramatta Road/City West Link	**39**	35	39	40	38
M5/ Eastern Distributor	**51**	54	56	48	50
Pittwater Road/Military Road/F1	**35**	34	38	39	38
Princes Highway	**32**	32	32	36	35
Victoria Road	**31**	34	33	32	31
Combined seven routes	**42**	42	43	43	41

Source: New South Wales Auditor General, Auditor-General's Report to Parliament - Volume Eight, 2011, page 60.

31 NSW RTA (2009) Annual Speed and Traffic Volume Data in Sydney

Perceptions of congestion in Sydney

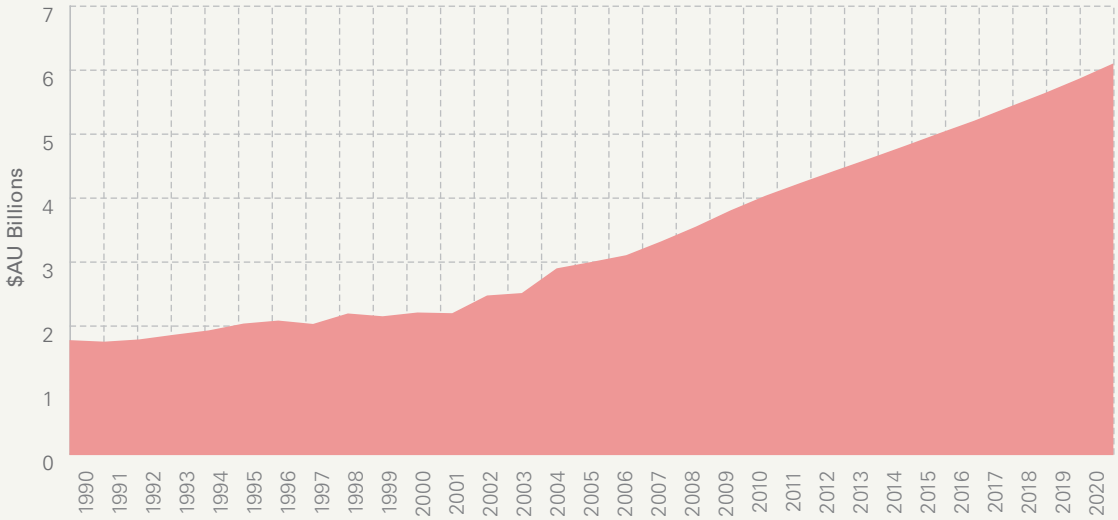
According to the IBM Commuter Pain Survey (2011), as many as 85 per cent of Sydney drivers find aspects of their commute frustrating, with stop-start traffic cited as the biggest frustration. The slow speed of the commute is also a frustration for 40 per cent of Sydney drivers. The IBM survey reveals that 53 per cent of Sydney drivers feel that roadway traffic has become worse in the last three years and 41 per cent of Sydney drivers have been stuck in traffic for one hour or more in the last three years. This has resulted in as many as 84 per cent of Sydney drivers experiencing travel stress. Congestion in Sydney has acted as a relatively blunt demand management tool - in the last three years 27 per cent of drivers indicated that roadway traffic has been so bad that they turned around and went home and 39 per cent decided not to make a driving trip in the last month.[32]

32 A decision not to make journey due to congestion factors may be a rational one with limited or no economic impact; such as where the trip purpose is discretionary or the service requirement being accessed through the trip can be fulfilled by some other means. However, it may also impart a direct financial cost on the user and/or an economic cost on the broader community.


BUS
LANE
BUS
LANE

NETWORK PERFORMANCE: MELBOURNE

Projected avoidable costs of congestion: Melbourne 1990-2020

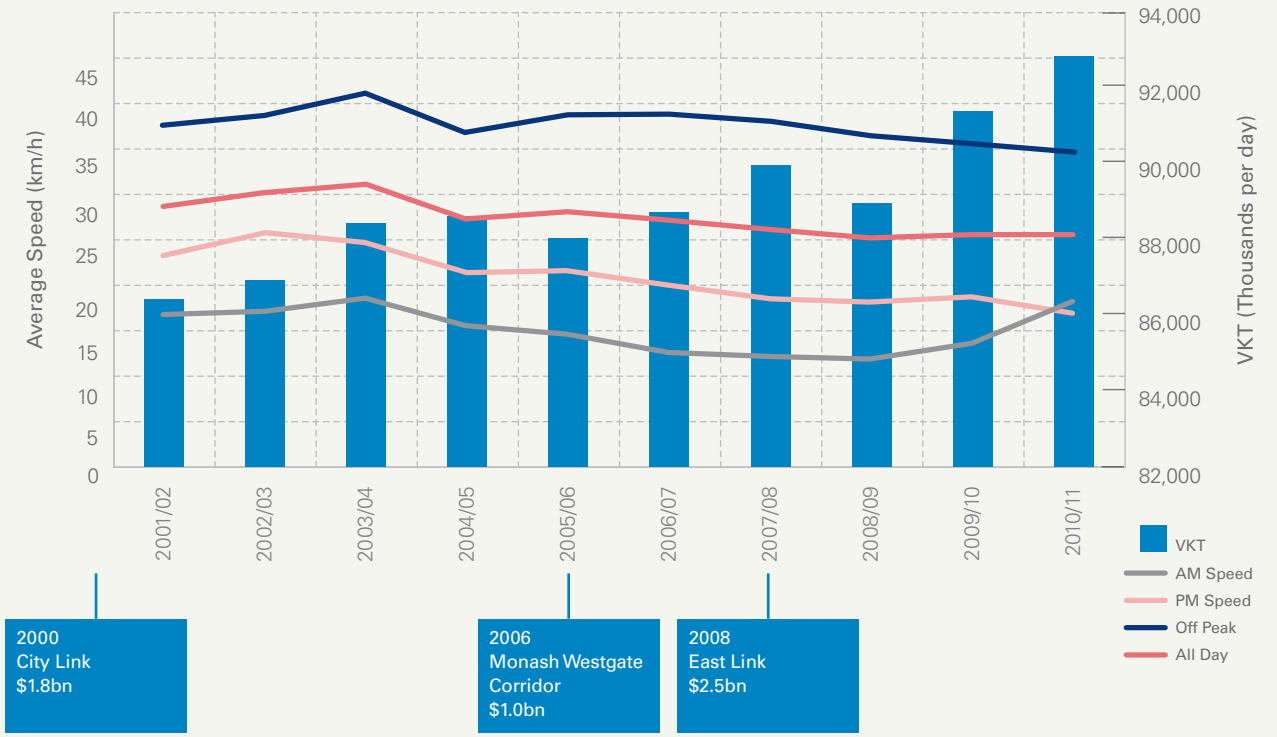


Source: BITRE, Working Paper 71.
The social costs of congestion in Melbourne have grown from $1.797 billion in 1990 to $4.447 billion in 2012 and are projected to stand at $6.123 billion by 2020.

Figure 3.2 shows travel speed data for Melbourne over the last 10 years. This shows a predominant pattern of declining travel speeds in recent years. Whilst a number of new motorways and several major interchange projects have been delivered over this period, the capacity enhancements in Melbourne have not been as significant as in Sydney. The recent increase in AM peak travel speeds may be the result of the opening of the East Link toll road. Consistent with the Sydney scenario, additions to the network have slowed the rate of decline in average speeds by providing new capacity in the context of substantial growth in traffic volumes during the decade to 2010–11.

▼ **FIGURE 3.2**

MELBOURNE TRAFFIC TRENDS LINKED WITH ROAD CONSTRUCTION PROJECTS [33]



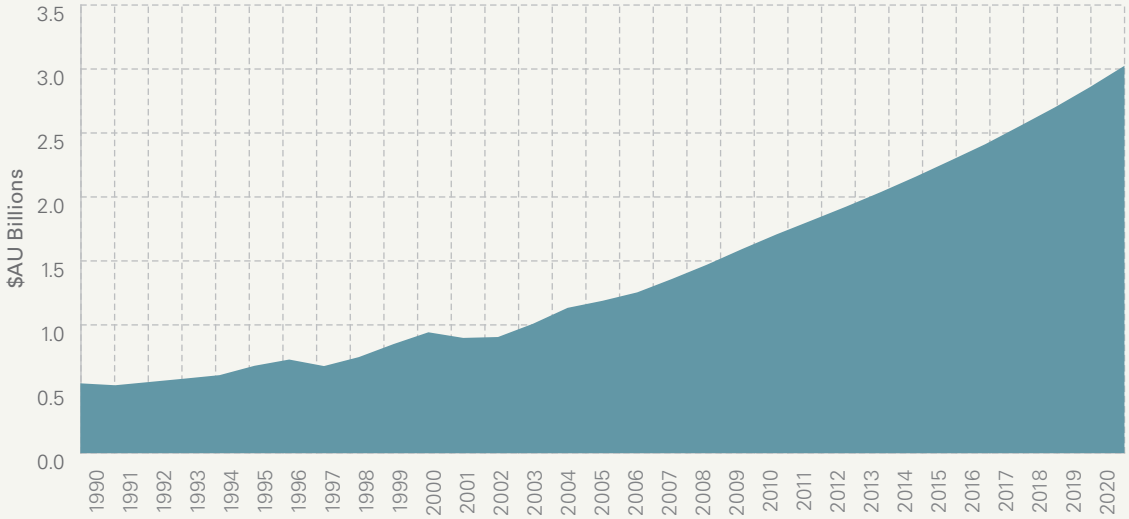
Perceptions of congestion in Melbourne

The IBM Commuter Pain Survey (2011) found 83 per cent of Melbourne drivers find aspects of their commute frustrating, citing stop-start traffic as the biggest frustration. The survey found that average commutes in Melbourne covered 18 kilometres and took 32 minutes at an average speed of 34 kilometres an hour. Twenty-two per cent of motorists in Melbourne said the road traffic had been so severe they had turned around and not completed their journey and 34 per cent decided not to make a journey because of traffic conditions in the last month.

33 VicRoads (2011) Traffic system performance monitoring bulletins

NETWORK PERFORMANCE: BRISBANE

Projected avoidable costs of congestion: Brisbane 1990-2020

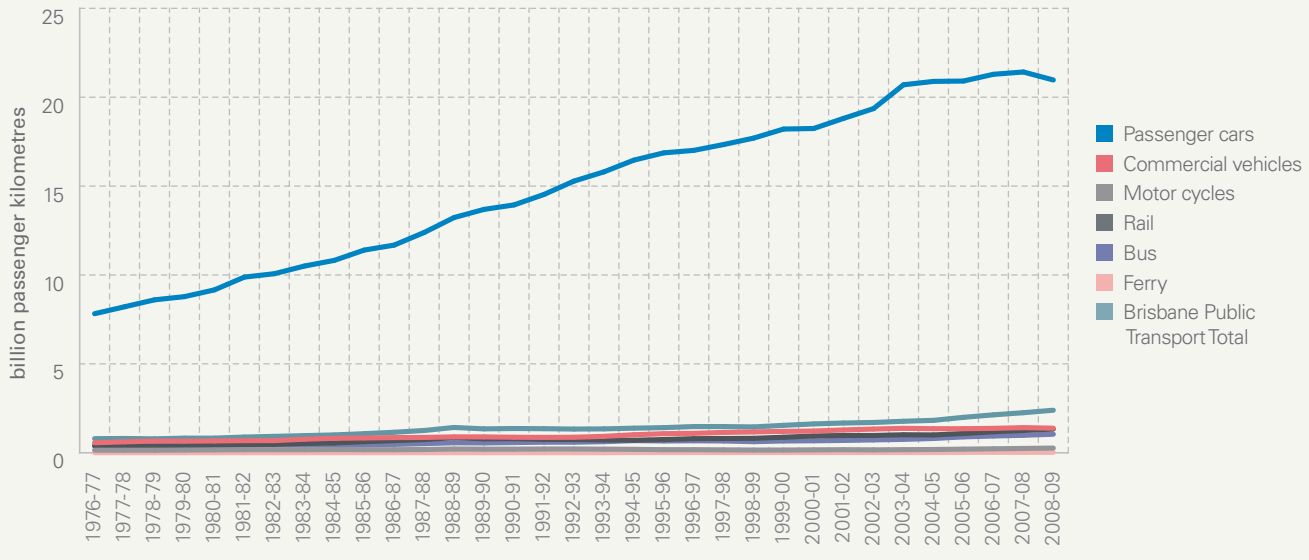


Source: BITRE, Working Paper 71.
The social costs of congestion in Brisbane have grown from $545 million in 1990 to $1.926 billion in 2012 and are projected to stand at $3.027 billion by 2020.

In Brisbane/South East Queensland, recent work by the RACQ suggests that speeds on many key arterials have reduced whilst speeds on other parts of the network have increased as a result of motorways and other road improvements.[34] Longer term trends in South East Queensland are difficult to establish with existing data. Figure 3.3 shows the growth in passenger vehicle use, compared to other modes, in Brisbane between 1976 and 2009, demonstrating the long-term trend in private vehicle use growth.

▼ FIGURE 3.3

TOTAL PASSENGER KILOMETRES BY CAPITAL CITY – BRISBANE, 1976-2009

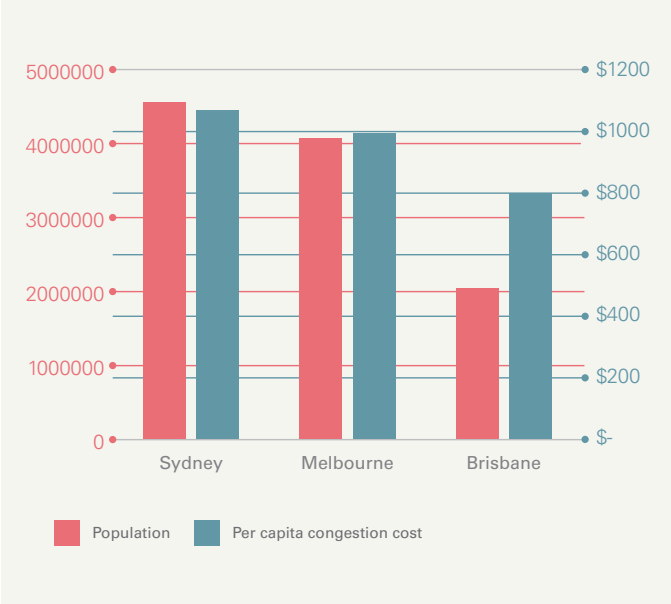


Source: IPA analysis of BITRE, Infrastructure Yearbook 2011, Statistical Report, 2011

34 RACQ (2010) Travel Time Survey, Report prepared by RACQ Traffic and Safety Department

▼ FIGURE 3.4

PER CAPITA COSTS OF CONGESTION



Source: IPA analysis of Australian Bureau of Statistics 3220.0 and BITRE Working Paper 71

Whilst Brisbane currently experiences less congestion compared to Sydney and Melbourne,[35] rapid population growth and a doubling of the road freight task from 2006 levels by 2026 are expected to place increasing pressure on the region's transport network in the future.[36] When congestion is assessed on a per capita basis, the extent of the impact of congestion in Brisbane is exposed. While Brisbane has less than half the population of Sydney and Melbourne, per capita congestion costs run at about 80 per cent of Sydney and around 85 per cent of those experienced in Melbourne (see Figure 3.4).

Perceptions of congestion in Brisbane

More than half (55 per cent) of motorists felt traffic had become worse in Brisbane over the last three years according to the 2011 IBM Commuter Pain Survey. The average commute observed by the survey in Brisbane took 29 minutes, covering 19 kilometres at an average speed of 39km/h. Frustration with aspects of the commute was acknowledged by 80 per cent of commuters, with stop-start traffic cited as the biggest problem. Thirty-one per cent of drivers surveyed had chosen not to make a journey in the last month due to traffic conditions.

35 Bureau of Infrastructure, Transport and Regional Economics (2007) Working Paper 71 – Estimating urban traffic and congestion cost trends for Australian cities

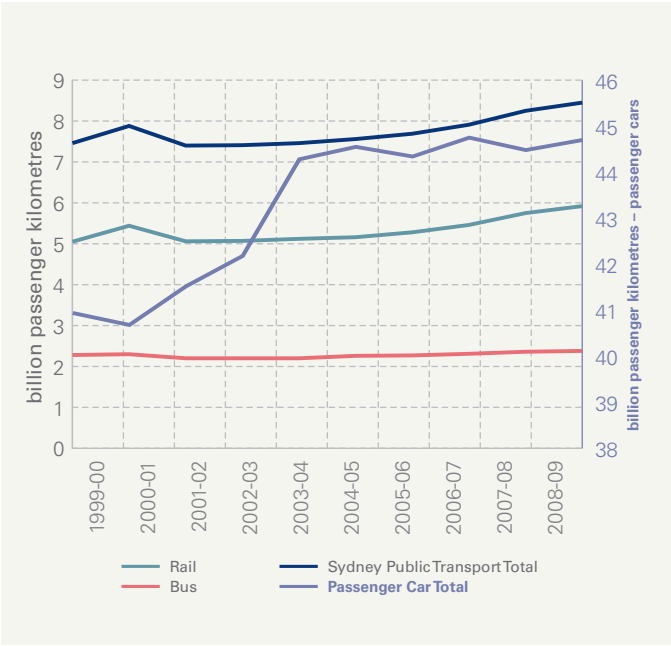
36 Saha International (2009) Urban Transport Challenge: Planning for South East Queensland, Report prepared for Infrastructure Partnerships Australia

3.7 IS AUSTRALIA READY FOR CHANGE?

Evidence suggests that while our cities are not experiencing 'London levels' of congestion, strong population growth appears to be catching up with our transport network. Road speeds have not shown uniform trends – some corridors have experienced declining average speed and other have experienced consistent or increasing average speeds. Traffic volumes measured in total passenger kilometres travelled by passenger vehicles in major cities have also shown consistent growth over the past three decades;[37] however, over the past few years, overall passenger kilometres by car have plateaued or declined marginally in Sydney, Melbourne and Brisbane as shown in Figures 3.5, 3.6 and 3.7. During the same period there has been a marginal increase in the mode share of urban public transport (UPT). Figure 3.8 shows that between 2004 and 2010 the mode share of UPT in Australia's capital cities experienced an upward trend, which levelled out in 2010. This change in growth trajectory and contingent modal shift could be attributable to a number of factors including rising fuel prices, effects of congestion, availability of other modal options and broader economic conditions including the impacts of the Global Financial Crisis.[38]

▼ **FIGURE 3.5**

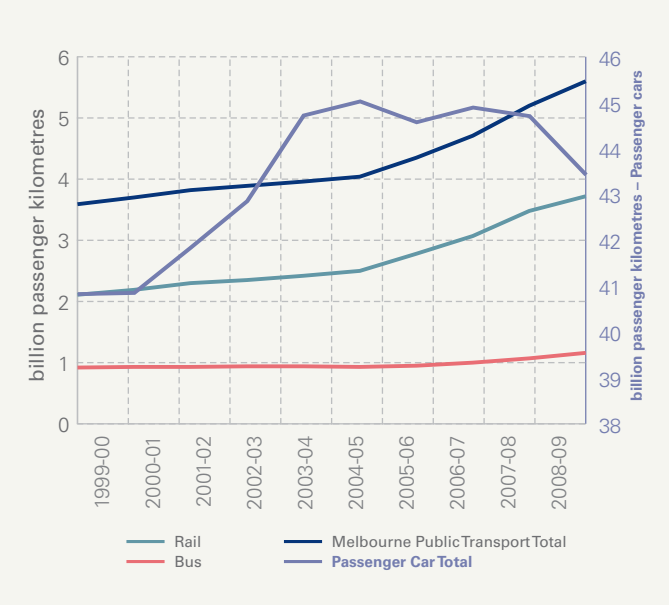
TOTAL PASSENGER KILOMETRES TRAVELLED BY CAPITAL CITY – SYDNEY, 1999 - 2009



Source: IPA analysis of BITRE, Infrastructure Yearbook 2011, Statistical Report, 2011

▼ **FIGURE 3.6**

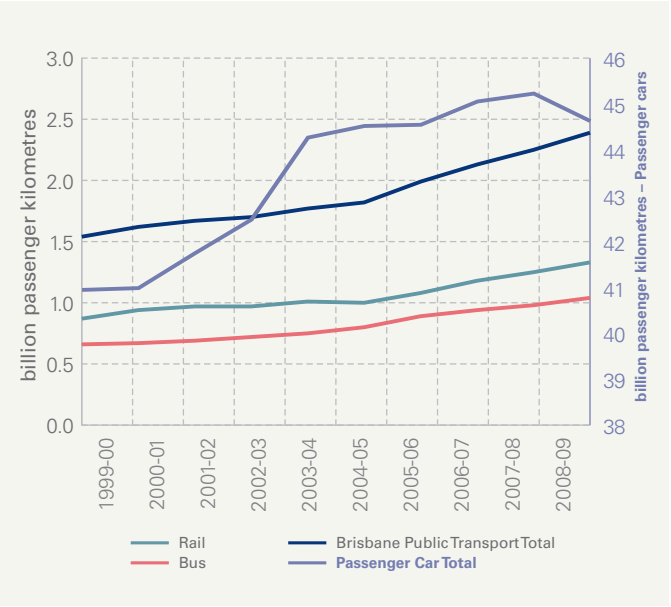
TOTAL PASSENGER KILOMETRES TRAVELLED BY CAPITAL CITY – MELBOURNE, 1999 – 2009



Source: IPA analysis of BITRE, Infrastructure Yearbook 2011, Statistical Report, 2011

▼ **FIGURE 3.7**

TOTAL PASSENGER KILOMETRES TRAVELLED BY CAPITAL CITY – BRISBANE, 1999 – 2009



Source: IPA analysis of BITRE, Infrastructure Yearbook 2011, Statistical Report, 2011

37 BITRE, *Infrastructure Yearbook 2011*, Statistical Report, 2011

38 BITRE, *Public transport use in Australia's capital cities: modelling and forecasting*, Research Report 129, p. v.

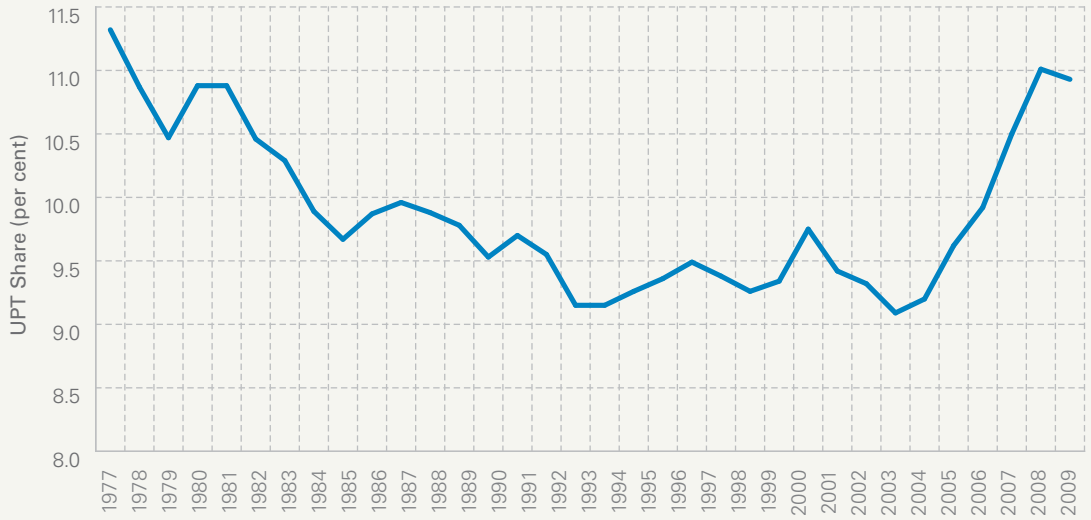
Whilst there has not necessarily been a uniform decline in travel speeds within major Australian cities, road users' perceptions of congestion have reflected a growing frustration with crowding and bottlenecks on particular sections of urban networks.[39]

A driver's perceived level of congestion and resulting level of frustration could be a major factor in their willingness (or otherwise) to accept a new approach to the way road use is priced. Where congestion is perceived as becoming 'unbearable' and delays unacceptable, users could be more likely to consider changes to the current road user charging regime.

Maintenance and improvement of current network performance will continue to require significant investments in capacity, but opportunities to expand road capacity are likely to become more limited and costly, particularly in cities with mature motorway networks such as Sydney. Reforms to address challenges in the current charging structure can help get more out of our existing transport network and ensure future investments in capacity enhancement deliver the best possible value for money. The best time for evaluating options and planning for the future is while the problems with the system are still manageable.

▼ FIGURE 3.8

URBAN PUBLIC TRANSPORT MODE SHARE, METROPOLITAN AUSTRALIA, 1977-2009



Source: IPA analysis of BITRE, Public transport use in Australia's capital cities, Research Report, 2013

Key points

- Important drivers for change include the need for more road network expansion funding, greater maintenance funding, a fairer allocation of costs and benefits of road use or the need to improve network performance.
- A well-structured road user charging scheme could help to secure a consistent funding stream for investment in land transport – meaning capital investment and maintenance spending can be allocated with a visibility of future funding streams.
- Evidence suggests that while our urban areas are not experiencing 'London levels' of congestion, robust population growth and other factors are exposing capacity constraints on urban transport networks.
- Opportunities to expand road network capacity to meet demand growth are likely to become increasingly limited and costly – reforms to the structure and application of road user charging have the potential to extract greater utility from the existing network and structurally embed those system benefits.
- In 2012, the avoidable social costs of congestion in Australia will be $14.2 billion. By 2020, congestion will strip more than $20 billion from the economy annually.

39 IBM (2011) Commuter Pain Study.

4 Principles and options to better price road use in Australia

Whereas the preceding chapters have focussed on the weaknesses of the current model and the broad opportunities that might be realised through reform, this chapter concerns itself with a basic description of how different pricing models might be used to achieve different outcomes. Beyond identifying the problems a road pricing regime may seek to solve, any future structure would need to establish a set of objectives and principles for reform.

4.1 AVOIDING COMPETING OBJECTIVES

In considering reform to the system of road user charging, policymakers will need to first clarify the objectives that are being sought. For example, is the scheme designed to maximise revenue; manage congestion; incentivise particular technology types (such as hybrids); or is it a mixture of all of these?

This section will seek to highlight that clarity about the outcome will largely dictate the design and impact of a reformed road pricing scheme.

For example, if the only outcome sought was to manage CBD congestion, then transport policymakers would likely pursue a more modest scheme, like the London Congestion Charge. However, if transport policymakers instead seek to address the range of challenges identified in the earlier sections of this paper, then it will necessarily demand a more careful consideration of scheme objectives, and the relative priorities of each.

This careful consideration is required to ensure that outcomes do not ultimately deliver a system with competing, or unmet, objectives.

At its most basic, direct road pricing is an opportunity to shape behaviour and change demand profiles, delivering more efficient signals for new investment and the allocation of capacity within and across transport networks.

Table 4.1, below, considers the broad policy objectives that have been sought in direct pricing schemes in other jurisdictions.

▼ TABLE 4.1

OBJECTIVES OF SELECTED ROAD USER CHARGING SCHEMES

SCHEME	MAIN POLICY OBJECTIVES
Germany – heavy vehicle road user charging	Raise revenue based on a user pays system
Singapore – area network charging	Demand management
Stockholm – cordon pricing scheme	Reduce congestion, increase accessibility and improve the environment
London – area-wide scheme	Reduce traffic and congestion in central London, and also to provide funding for transport investments
Trondheim – multi zonal charging	Raising private sector revenue to support needed urban transport infrastructure investment
Manchester – multi cordon pricing (rejected 2008)	Raise revenue for public transport investment and control congestion

Source: Deloitte

4.2 PRINCIPLES FOR REFORM

The following principles have been developed from Infrastructure Partnerships Australia's previous study on universal road user charging, *Urban Transport Challenge: a discussion paper on a role for road pricing in the Australian context,*[40] and has been further informed through consultation with Australia's peak motoring organisations, in response to the issues and problems identified in the preceding sections of this paper.

The reform principles outlined in Table 4.2 have been developed to inform the design of the indicative road user charging framework presented in this paper.

▼ TABLE 4.2

PRINCIPLES FOR AUSTRALIAN ROAD PRICING REFORMS

Objectives	A rationalised road user charging scheme should provide: • a mechanism to sustainably fund additions to the transport network; • a mechanism to sustainably fund maintenance of the network; • a fairer allocation of costs of benefits in the transport market; • funding stream security; and • an opportunity to improve network performance.
Scope and pricing	Prices should be set so that the total revenue generated by direct charging matches the current total revenue collected from road users. Any future scheme should be structured in a way that does not discourage private sector investment to address Australia's land transport infrastructure deficit.
Revenue allocation	Revenue generated through any scheme should be re-invested in the construction, maintenance and operation of infrastructure to facilitate mobility, including public transport.
Implementation	A new road user charging scheme should balance simplicity against the need to achieve complex reform objectives. If a scheme ultimately seeks to balance a range of objectives, then clear articulation and relative priority will have to be considered and priced. Potential impacts of new charging arrangements should be tested through pilot trials.
Privacy	Protecting the privacy of road users should be a central consideration in the design of the scheme.
Technology	Technology should be driven by scheme design, with final solutions to be developed through trials and competitive processes – including the flexibility to be delivered using a variety of technology solutions and allowing the market to determine the best approach.

4.3 WHICH ROAD USER CHARGING MODELS MIGHT BE CONSIDERED FOR AUSTRALIA?

In designing a new pricing scheme, transport policymakers must consider the effectiveness of particular models in resolving (or further complicating) the key challenges that exist under current arrangements, as well as the likelihood of unintended negative consequences from reform options.

This section examines the broad options that exist to price road networks, ranging from smaller, discrete pricing models, through to broader schemes that seek to change behaviours across the entire road network.

This section will explore the trade-off between scheme simplicity on the one hand, and the utility of the scheme to address a broader range of transport policy challenges on the other.

For example, road pricing schemes like the London Congestion Charge have the benefit of being relatively simple and thus, easily understood by the public. However, a model like the London Congestion Charge is unlikely to offer the opportunity to deal with the broader array of transport challenges that were discussed in the earlier sections of this paper – pointing to a need to consider a more sophisticated pricing system.

In designing a pricing scheme, transport policymakers have the opportunity to use price signals to change broader behaviour. For example, consideration of pricing models could include:

- The time of day the network is accessed;
- The distance travelled (e.g. the amount of road space consumed);
- The location of travel (e.g. CBD/urban, rural, specified area);
- Vehicle mass;
- The creation of externalities (e.g. noise, congestion, pollution); and/or
- The model of vehicle (e.g. hybrids, safer vehicle design etc.).

Adjusting the balance of these elements within a pricing framework can be used to achieve different outcomes. For example, a whole of network pricing model may include each of these elements to deliver a rational price on road usage, while specific components could be used to address discrete problems – such as a location based system to tackle a particularly congested urban area or corridor.

40 See Infrastructure Partnerships and SAHA International, *Role for Road Pricing in an Australian Context*, April 2010.

The following section outlines some examples of partial network charging models and whole-of-network rational pricing frameworks – including those covering specific vehicle classes and a model covering all vehicles.

The examples given below are not exhaustive, but seek to present a range of schemes that could be considered.

4.4 PARTIAL NETWORK PRICING

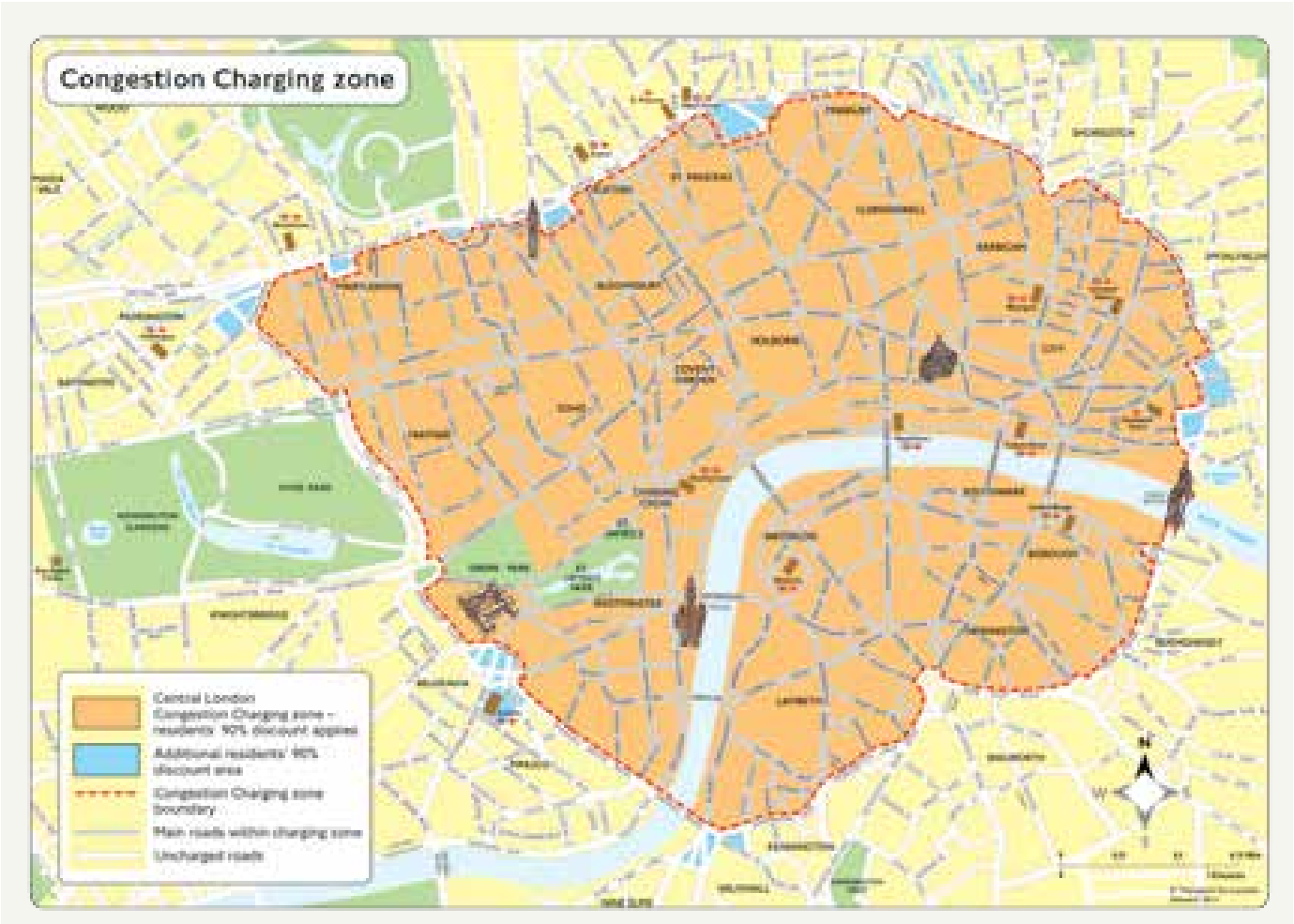
Location specific charging schemes – Cordon and area congestion charges

While they are slightly different, cordon and area charging systems can be considered together because they have a common approach of pricing access to a particular area at particular times of high demand (such as peak periods). A cordon or area scheme generally applies a fee or tax on all road users entering a defined area, usually within a city centre or central business district.

A cordon or area charge will usually have a simple, single objective of pricing congestion, providing an incentive for motorists to consider alternatives to private vehicle use within the cordon or area – but it will often be combined with a transport or public transport funding mechanism. The broader community is relatively familiar with this sort of approach, because they have been applied successfully in other jurisdictions (including London – see Figure 4.1, Stockholm, Milan and Singapore, among many others).

▼ **FIGURE 4.1**

THE LONDON CONGESTION CHARGING ZONE (A CORDON CHARGING SCHEME)



Source: Transport for London, 2013

This approach has proven successful in managing congestion. Because a price is applied for access to or use within the priced area or cordon at times of high demand, it creates a strong incentive for private vehicles or low-value journeys to avoid the area, seek access at times when the price is not in effect or change transport modes.

The simplicity of the scheme is also attractive for policymakers. It allows for the most damaging aspect of inefficient network congestion to be priced, creating a new revenue stream that can be used to invest in better road and mass transit options. Because of the discrete coverage of these kinds of schemes, it also means that the motorists affected by the scheme are the principal beneficiaries, through reduced congestion and complementary investment of the revenues in the broader transport network.

Efficacy in an Australian context

Global experience has shown that cordon or area pricing schemes work well to manage congestion and may offer solutions in Australia's major CBDs.

Because these schemes are trying to modify a simple behaviour (the time of access to a congested area) these schemes are relatively simple to design and implement. However, as shown in Table 4.3 below, the modest reach of an area scheme offers diminished opportunities to resolve the other objectives considered within a road pricing reform agenda.

▼ TABLE 4.3

DOES A CORDON/AREA PRICING MODEL MEET THE REFORM OBJECTIVES?

CAN CORDON/AREA PRICING	CORDON/AREA PRICING
Fund additions to the transport network	✔
Fund network maintenance	●
Provide a fair allocation of costs and benefits	✔ ●
Provide a secure funding stream	✔
Provide the opportunity to improve network performance	●

Corridor specific charging schemes – National Highway Improvement Charge model

Corridor specific pricing schemes, referred to in this paper as a National Highway Improvement Charge (NHIC) model, are another option that could be considered to better price strategic road corridors in Australia.

These models collect road user fees for access to a particular highway, or section of highway, working in a similar way to a capital city toll road, or turnpikes in other jurisdictions.[41]

Revenues are usually earmarked for investment in the priced road corridor. On this basis, the system is attractive to motorists and the community, because it transparently funds upgrades and improvements within the corridor for which a fee is charged.

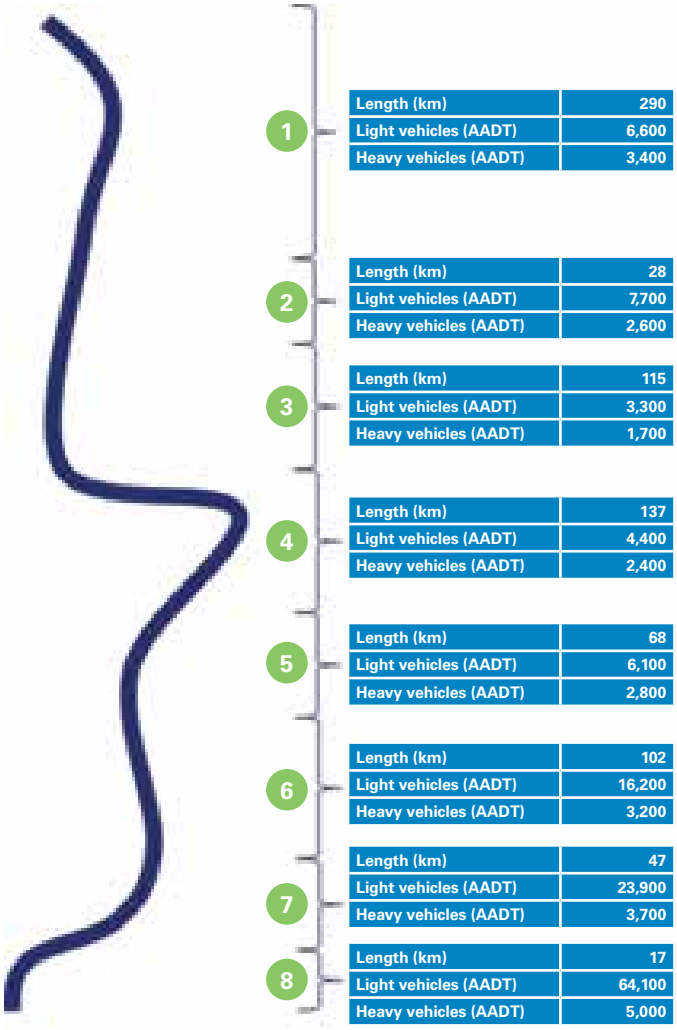
A NHIC may have merit within the Australian context, because it could shift the cost of completing, maintaining and operating the national highway network away from the Federal and state governments. Options might include a NHIC levied for use along the Hume, Pacific and Bruce Highways, thereby increasing the funding available to Australian governments to complete upgrades along these corridors to highway standard.

Figure 4.2, opposite, considers a theoretical highway which might be selected for a NHIC style pricing regime. In this example, the road is divided into eight sections, based on hypothetical boundaries (which might be guided by geographic boundaries, strategic road connections or other matters). In this example, the road corridor is segmented into eight areas, with estimates of the Annual Average Daily Traffic (AADT) based on vehicle type. This corridor could be charged on a per kilometre basis, or for the number of sections accessed in a journey.

41 This concept was explored in a feasibility study undertaken by the Department of Transport and Regional Services in 2005.

▼ FIGURE 4.2

INDICATIVE HIGHWAY IMPROVEMENT CHARGING MODEL



Efficacy in an Australian context

Obviously, equity considerations such as the price paid by local residents along the corridor (for whom it is necessarily a local road), would need to be resolved.

A corridor specific charging model has previously been applied to some sections of intra-urban highways, such as the F6 and F3 corridors in Sydney. These charges were discontinued in the 1990s. More recently, the efficacy of this approach on the Pacific Highway was subject to consideration by the Federal Government, but it is understood that it was found to be unviable.

While this model may offer utility in terms of completing, maintaining and upgrading discrete sections of Australia's national highway network and modestly increasing the public sector's revenue take, this model again fails to meet broader aims because it does not address urban congestion, or address the broader challenge of diminishing, transport related revenues.

Table 4.4 gives a broad evaluation of the NHIC model against the reform objectives developed earlier in this paper.

▼ TABLE 4.4

DOES A NATIONAL HIGHWAY IMPROVEMENT CHARGE MODEL MEET THE REFORM OBJECTIVES?

CAN A NATIONAL HIGHWAY IMPROVEMENT CHARGE	NATIONAL HIGHWAY IMPROVEMENT CHARGE
Fund additions to the transport network	●
Fund network maintenance	✔
Provide a fair allocation of costs and benefits	✔ ●
Provide a secure funding stream	✔ ●
Provide the opportunity to improve network performance	✘

Selected vehicle class, partial network schemes

A scheme covering selected vehicles on a partial network basis would see a particular part of the vehicle fleet (for instance, heavy vehicles or light commercial vehicles) charged a road user charge for use of particular parts of the network. The system would differ from a congestion charge on the basis that it would price usage for a particular type of vehicle on a particular type of road – such as commercial vehicles on the National Highway network, charged on a mass and distance basis – rather than targeting a particular area of acute congestion through a cordon or area charge on all vehicles.

The German Heavy Goods Vehicle scheme uses a selected vehicles, partial network approach to road user charging with distance based tolling of vehicles over 12 tonnes on 12,000 km of major highways and arterials using Global Positioning System (GPS) tracking. Charges are aligned to the route, the emission class of the vehicle, maximum gross vehicle mass, and the number of axles.[42]

Efficacy in an Australian context

A selected vehicle class, partial network scheme may have some benefits for the Australian context – including as an opportunity to concept test road pricing reforms and as a mechanism to price assets that largely benefit a particular class of users. Revenue could be used to provide infrastructure or upgrades where the particular vehicle class is the principal beneficiary on the portions of the network from which the revenue is collected – such as infrastructure that largely benefits freight vehicles on a National Highway network.

It may also provide some opportunities to manage particular areas of demand and provide funding to make discrete supply side additions. In addition, by applying to a particular vehicle class, a scheme of this nature could provide detailed data about the needs of certain types of user.

However, a scheme that only covers selected vehicles over particular portions of the network does not provide options to address broader network issues – such as systemic network congestion and funding required additions and maintenance for the full network.

Table 4.5 shows how a model applied to selected vehicle classes for selected portions of the network meets the reform objectives.

▼ TABLE 4.5

DOES A SELECTED VEHICLE CLASS, PARTIAL NETWORK MODEL MEET THE REFORM OBJECTIVES?

CAN THE SELECTED VEHICLE CLASS(ES), PARTIAL NETWORK REGIME	SELECTED VEHICLE CLASS(ES), PARTIAL NETWORK
Fund additions to the transport network	●
Fund network maintenance	●
Provide a fair allocation of costs and benefits	✔ ●
Provide a secure funding stream	✔ ●
Provide the opportunity to improve network performance	● ✘

42 Association of European Vehicle and Driver Registration Authorities, Road Pricing in Europe 2012: Second version, pp. 93 – 4. Available at: https://www.ereg-association.eu/downloads/public/general/Publications/Road%20Pricing%20in%20Europe/Roadpricing%20in%20Europe%20(Second%20Version,%202012).pdf

4.5 WHOLE OF NETWORK PRICING

Selected vehicle class, whole-of-network pricing schemes

Another option would be to apply a pricing scheme to all vehicles of a particular type (e.g. heavy vehicles or light commercial vehicles) across the entire road network. It is likely that this kind of approach would require the proceeds collected from users to be directed to investments that support the vehicle class that is subject to the charging scheme.

A selected vehicle class, whole-of-network approach is used for the Switzerland performance-related Heavy Vehicle Fee (HVF) system[43] and forms the basis of the approach for the COAG HVCI process which would see alternative models of heavy vehicle road pricing and funding either on a whole-of-network or partial network basis. The Swiss HVF scheme applies to vehicles over 3.5 tonnes and uses a tonne per kilometre fee based on Euro Emission classes with usage data collected via an on-board unit or periodic declarations.[44]

Efficacy in an Australian context

A partial market, whole-of-network system would provide a detailed trial and concept test for a broader road pricing reform and could conceivably be progressively rolled out to cover additional vehicles classes. However, the full benefits of the pricing signals offered by a whole of network model would not be realised when only particular vehicles are covered. As such, in a similar result to the selected vehicle, partial network model, the scheme only partially meets most of the objectives laid out for road pricing reform. Table 4.5 shows the rating against each evaluation criteria.

▼ TABLE 4.6

DOES A SELECTED VEHICLE CLASS, WHOLE-OF-NETWORK MODEL MEET THE REFORM OBJECTIVES?

CAN THE SELECTED VEHICLE CLASS(ES), WHOLE-OF-NETWORK REGIME:	SELECTED VEHICLE CLASS(ES), WHOLE-OF-NETWORK
Fund additions to the transport network	●
Fund network maintenance	●
Provide a fair allocation of costs and benefits	●
Provide a secure funding stream	✔ ●
Provide the opportunity to improve network performance	● ✘

All vehicles, whole of network pricing schemes – Universal Road User Charging model

A URUC model would cover all vehicles and the entire road network. In place of existing Fuel Excise taxation and fixed access and registration charges, vehicles would likely attract direct user charges that include elements to price vehicle mass, distance travelled and location of travel and time of journey. A URUC approach offers strong opportunities to rationally price access to and usage of the road network – providing a mechanism to fund network additions, fund maintenance and improve network performance by aligning supply and demand.

A URUC style framework was considered, and legislated for introduction, in the Netherlands between 2007 and 2010.

In 2009 the Dutch Government passed a bill approving the gradual implementation of a road pricing framework, based on a per kilometre tax and including variable charges for the place and time of use and the environmental characteristics of different vehicles.[45] The charging framework, which was to be first applied to foreign heavy goods vehicles in 2012 followed by light vehicles by 2016, covered all Dutch roads, with total revenue collected under the scheme to be earmarked for infrastructure investment.[46] All vehicles were to be fitted out with a recording device which utilised GPS to establish distance, time and location of use.

Although legislated, the proposed road pricing framework was never introduced. Support for the policy stalled following the collapse of the ruling coalition in early 2010 and following general elections the new ruling coalition halted implementation of the new system.

Efficacy in an Australian context

A URUC approach has potential to deliver the broadest range of benefits in the Australian context. However, it would represent the deepest and widest reform of any of the options presented in this paper. Executed well, reform along the lines of a URUC could meet each of the objectives set out in this paper - including being the only model assessed which provides an opportunity to improve whole-of-network performance by offering appropriate pricing signals for road users and road providers. Table 4.4 outlines the extent to which a well-considered URUC could meet the objectives for reform developed in this paper.

▼ TABLE 4.7

DOES A URUC MODEL MEET THE REFORM OBJECTIVES?

CAN UNIVERSAL ROAD USER CHARGING	UNIVERSAL ROAD USER CHARGING (ALL VEHICLES, WHOLE NETWORK)
Fund additions to the transport network	✔
Fund network maintenance	✔
Provide a fair allocation of costs and benefits	✔
Provide a secure funding stream	✔
Provide the opportunity to improve network performance	✔

43 Swiss Federal Customs Administration - http://www.ezv.admin.ch/zollinfo_firmen/steuern_abgaben/00379/index.html?lang=en

44 Australian Transport Council, COAG Road Reform Plan Phase I Report, May 2009 and Swiss Federal Customs Administration - http://www.ezv.admin.ch/zollinfo_firmen/steuern_abgaben/00379/index.html?lang=en

45 Association of European Vehicle and Driver Registration Authorities, *Road Pricing in Europe 2012: Second version*, pp. 93 – 4. Available at: https://www.ereg-association.eu/downloads/public/general/Publications/Road%20Pricing%20in%20Europe/Roadpricing%20in%20Europe%20(Second%20Version,%202012).pdf

46 Bert van Wee 2010, *The New Dutch Per-Kilometre Driving Tax*, p. 65. Available at: http://webcache.googleusercontent.com/search?q=cache:ov_VroII8UoJ:www.cesifo-group.de/portal/pls/portal/ifo_applications.switches.DocLinkIfoDL%3FgetDoc%3Ddicereport210-rm1.pdf+&cd=1&hl=en&ct=clnk&gl=au

4.6 SELECTING THE 'RIGHT' MODEL?

Selecting the 'right' model to reform road pricing in Australia will require a much deeper analysis of scheme design, implementation, incentives and equity considerations than can be advanced in this paper.

However, for the purposes of this paper, this section considers the utility of each potential reform model to address the challenges that exist under the current approach. Table 4.8 shows the simplified options analysis; with the existing framework of road user charging used as the base case for assessment, shown in the first options analysis column.

▼ TABLE 4.8

OPTIONS ANALYSIS

CHARGING REGIME 'Problem to solve'	EXISTING FRAMEWORK	CORDON/AREA PRICING	NATIONAL HIGHWAY IMPROVEMENT CHARGE	SELECTED VEHICLE CLASS(ES), PARTIAL NETWORK	SELECTED VEHICLE CLASS(ES), WHOLE-OF-NETWORK	UNIVERSAL ROAD USER CHARGE (ALL VEHICLES, WHOLE NETWORK)
Funding additions to the transport network – can the charging regime provide a sustainable funding mechanism to provide capacity enhancements to the transport network?	🔴	🟢	🟡	🟡	🟡	🟢
Funding network maintenance – can the charging regime provide a secure and reactive funding source for network maintenance?	🔴	🟡	🟢	🟡🔴	🟡	🟢
A fair allocation of costs and benefits – can the charging regime ensure a fair distribution of costs between users, where those who use more, pay more and those who use less, pay less?	🟡🔴	🟡	🟢🟡	🟡	🟡	🟢
Funding stream security – can the charging regime offer a secure funding stream that reflects changing demand for road usage and promotes longer term investment planning?	🔴	🟢🟡	🟢🟡	🟢🟡	🟢🟡	🟢
Improving network performance – can the charging regime provide appropriate pricing signals for road users and road providers to improve the performance of the network?	🔴	🟡	🔴	🟡	🟡🔴	🟢

🟢 Meets the parameter

🟡 Partially meets the parameter

🔴 Fails to meet the parameter

Models not considered further

A cordon or area charging option similar to those that have been introduced in Europe is not considered further in our work. A cordon based charge was considered to only partially meet the objectives, principles and parameters developed at the start of Section 5. Australian cities present a number of unique features which may render a cordon based charging system sub-optimal when compared to the other options under evaluation. Evidence suggests that cordon pricing is most effective when travel is currently heavily city-centric and there is a large portion of users currently entering the CBD area using private motor vehicles. The low density and increasingly decentralised nature of employment centres in some of our cities may work against the effectiveness of a cordon charge (e.g. Sydney is often described as a "city of cities").

A NHIC is also not considered further in the paper. However, the model remains a candidate for additional investigation as a mechanism to fund improvements of the national highway network, along with providing financing partnership opportunities with the private sector – where innovative funding and financing arrangements could be utilised to speed up delivery of critical road infrastructure. Separate consideration of the viability and implementation of a national highway improvement charging model may be warranted in the future – particularly if pursued in combination with any whole of network road user charging framework.

Neither the selected vehicle class, partial network, nor the selected vehicle class, whole of network schemes are evaluated further in this paper. Both models have merit, and in particular could be considered as incremental steps toward whole of market, whole of network reform. However, neither partial scheme was considered to meet the objectives in regard to providing a mechanism for demand management. The partial schemes were also considered to provide sub-optimal mechanisms in regard to provision of road user price signals and a fairer allocation of costs and benefits.

The selected model

Based on this analysis, the model selected for further evaluation in this paper is the URUC, which is assumed to include mass, distance, time and location based charging components.

The URUC is discussed in further detail below, before considering the pricing impacts in the ensuing chapter.

Development of the Universal Road User Charging model

While conceptual frameworks for a broad Australian road user charging system have been put forward from time to time, little detailed work has been done to refine the case for change. In particular, there is scant analysis in the public domain that considers the user cost impact of different options to reform road user pricing.

This paper makes a series of assumptions to refine the structure and operation of an Australian URUC.

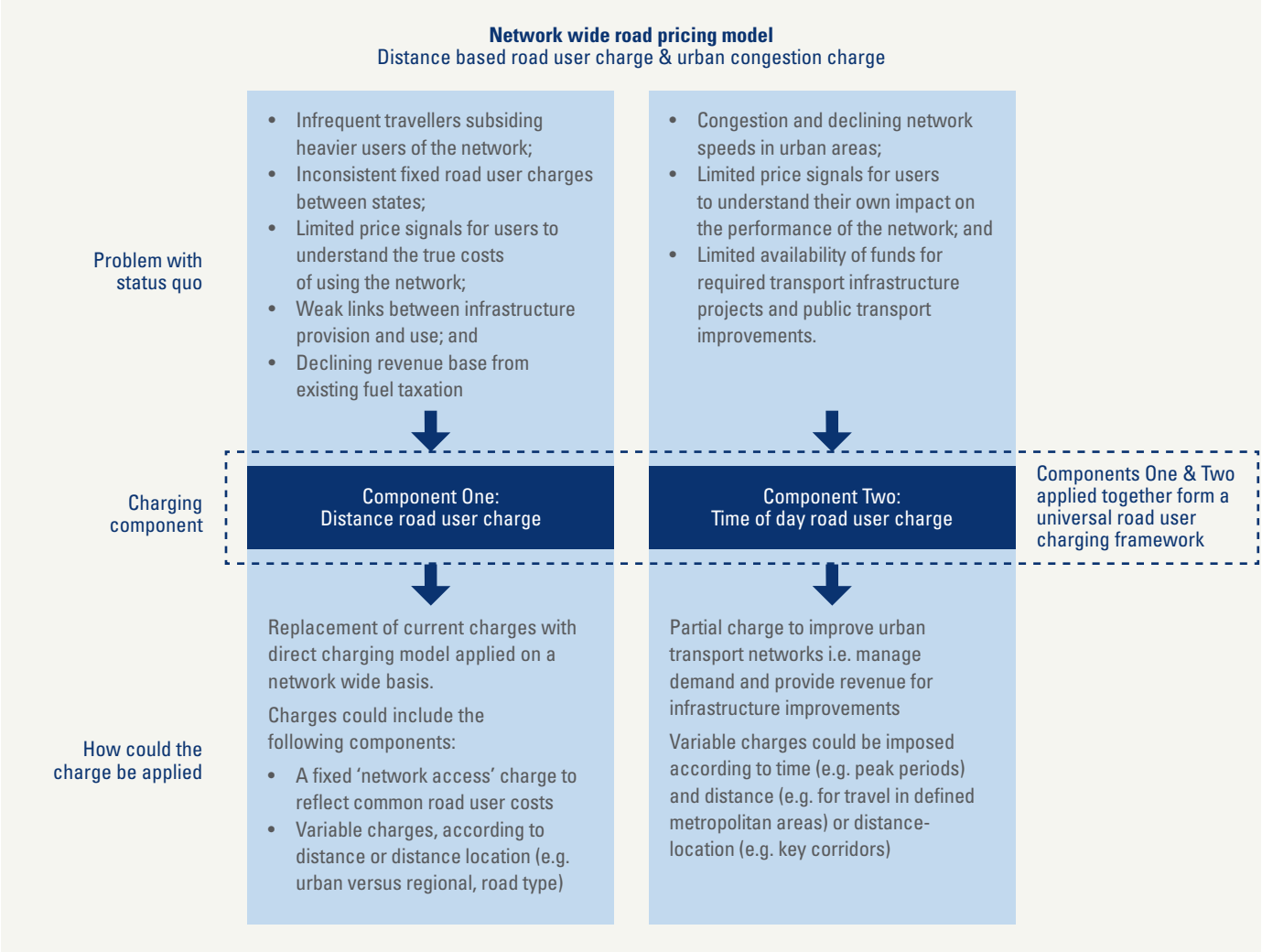
These assumptions include:

- The URUC would replace all existing road user taxes and charges, which would be abolished;
- The URUC would calculate the price paid by a road user, based on the time, distance, location and mass of the vehicle accessing the road network;
- All revenues raised by the scheme would be hypothecated (earmarked) for transport investments; and
- The URUC would be designed to be revenue neutral, meaning that the revenue of the new scheme would be equal to the current road-related revenues collected by Federal and state governments.

Figure 4.3 provides an overview of the URUC's two fundamental components, namely a distance road user charge and a time of day road user charge.

▼ FIGURE 4.3

POTENTIAL MODEL FOR AN AUSTRALIAN UNIVERSAL ROAD USER CHARGING MODEL



Source: Deloitte

The conceptual application of each component is considered below.

Component One: Distance road user charge

The distance road user charge would consist of multiple layers. The first would be a base road access charge, which would recover administrative costs, such as registration and licensing and would be a common flat charge, applying to all light vehicles.

The distance road user charge component would also put a variable price on consumption, based on the distance travelled by a vehicle, varying according to a vehicle's mass.

Component one would see:

- Smaller vehicles pay relatively less than larger vehicles (who have a greater impact on the network);
- Motorists who travel longer distances would pay more; and
- Motorists who travel shorter distances would pay less.

Component Two: Time of day road user charge

The second component of the scheme would apply additional charges to road users in specific areas affected by congestion. In this paper, we assume that Australia's three major capital cities, Sydney, Melbourne and Brisbane, would be subject to this component.

Under this option, the charges paid by road users would vary according to the point in time and place that they use the road network. Motorists travelling during peak periods in capital cities would pay a greater charge per kilometre than motorists that use these roads during less busy periods. Depending on the technologies or system used, this component could be applied to any particular area experiencing acute congestion, or across wider sections of urban transport networks.

Because driving in peak periods would be more expensive, this second charging component would provide an incentive for motorists to consider alternative options, such as mass transit. Motorists who pay higher charges for using the road network in peak periods could also expect to receive benefits, through reduced congestion and more reliable journey times.

Component two would see:

- Motorists in capital cities pay more to use the road network in peak periods;
- Motorists in regional or rural areas would experience lower charges than urban users;
- Peak hour motorists could expect more consistent, faster journey times; and
- Motorists travelling in capital cities outside of the peak would pay less than peak period users.

Key points

- A suite of approaches to road user charging are available to achieve different objectives and could be applied individually or in combination.
- Defining the principles and objectives of a reform to road user charging should drive decisions on which model (or combination of models) are pursued.
- The objectives put forward recognise that the initial pricing structure should not make road users worse off (in aggregate financial terms) under any new road charging scheme, i.e. total revenue raised by one or several new charging systems should not exceed the amount of revenue currently collected from road users.
- Potential models should be transparently evaluated against agreed principals and objectives for reform.
- The URUC model was selected for further consideration in this paper. The model consists of two components: a distance based road use charge applied to all motorists, and a variable time of day charge applied to road users in urban areas.


VIA
PARRAMATTA RD 440
PLEASE
SIGNAL DRIVER
Sydney Buses

5 Road pricing scheme design

This section details how a URUC could be structured and prices set across the light vehicle market.

5.1 SCHEME DESIGN: UNIVERSAL ROAD USER CHARGING

Revenue Assumption

Present arrangements see Commonwealth and state governments collectively recover $20.4 billion from road users (2009-10), but for the purposes of this paper (which excludes heavy vehicles) we assume that a revenue neutral approach to reform will collect $18.1 billion from light vehicles.

This assumption deducts the $2.3 billion in costs attributable to heavy vehicle users in that year, which are recovered separately under the PAYGO model.[47] This revenue also includes a portion of revenue returned under the Fuel Tax Credit Scheme.

Together, components one and two of the URUC have been structured to achieve this revenue target. Under the scenario modelled:

- 60 per cent of revenue will be collected under Component One (distance charge); and
- 40 per cent will be collected under Component Two (time of day charge).

This balance has been selected to broadly reflect the impact of road users on the network but could be adjusted to a different balance of revenue share derived under each component. The model assumes that all existing road related fees and charges as outlined in the section above will be abolished and replaced by the URUC.

47 National Transport Commission (2010) Annual Adjustment Consultation Paper 2010

Methodology for Component One: Distance based road user charge

The model discussed in this paper would make substantial changes to the way charges are calculated and accrued by motorists. In effect, Component One would serve to operate as a more sophisticated two part tariff, based on a reduced fixed charge reflecting administration costs, and a differential distance based charge, varying by vehicle size.

Whereas the current model relies on comparatively high fixed charges based on vehicle ownership (e.g. registration fees), the reformed model would reduce the annual fixed charges to reflect only the basic costs of administration, assumed here at $50 per vehicle per annum across all light vehicle types.

The second layer of charges within Component One would be a differential distance based charge. This charge would remain fixed for all journey types, irrespective of time or location on the road network (which are priced in Component Two, discussed below). The rate charged per kilometre would reflect vehicle size, ensuring that larger vehicles (which have greater impacts on the road network) would pay a high rate than smaller, more efficient and less damaging vehicles.

The methodology used to model Component One is shown in Figure 5.1, below.

▼ FIGURE 5.1

CHARGING APPROACH – COMPONENT ONE: UNIVERSAL ROAD USER CHARGING

Light vehicles (those under 4.5 tonnes) were categorised into nine categories based on those considered in the Australian Bureau of Statistic (ABS) for the Survey of Motor Vehicle Use (SMVU). The categories are:

- Motor cycles;
- Passenger cars (small and medium);
- Passenger vans & Light buses;
- 4WDs: passenger;
- 4WDs: light commercial;
- Light commercials & Other light vehicles;
- Light rigid trucks; and
- Buses: 2 axles: GVM 3.5 to 4.5 tonne.

The passenger car category was broken into small and medium categories. The Vkt (vehicle kilometres travelled) recorded in the 2007 ABS SMVU was used to determine the proportion of Vkt travelled by each category of vehicle. This was then applied to the total Vkt travelled by light vehicles (208 billion km) in 2010 (ABS data).

A vehicle 'impact weighting' was given to each category to reflect the different levels of impact that vehicles have on infrastructure and the environment (e.g. road damage, pollution and other environmental factors). A small passenger car is considered to have a vehicle impact weighting of 1.00 with all other vehicles rated relative to that vehicle class – for example, motorcycles attract a 0.50 impact weighting and light commercial 4WDs a 1.70 weighting. These values are indicative only, and further work would be needed to understand the relative impact imposed by different classes of vehicles. A weighted Vkt was then derived by multiplying 2010 Vkt by the vehicle weighting.

An overall cost per km was derived from the revenue target and total weighted Vkt. This was assigned to each vehicle category, depending on the impact weighting. Weightings and estimated per kilometre charges for Component One of the model are shown in Table 5.1 below. Based on existing road usage profiles this charging structure would deliver 60 per cent of the revenue target.

▼ **TABLE 5.1**

WEIGHTINGS AND CHARGES – DISTANCE BASED ROAD USER CHARGE

VKT BY VEHICLE	ESTIMATED PROPORTION VKT 2007 (%)	VEHICLE IMPACT WEIGHTING	ESTIMATED CHARGE (C/KM)
Motor cycles	0.95%	0.50	2.29 c/km
Passenger cars			
Small	39.21%	1.00	4.57 c/km
Medium	26.14%	1.20	5.49 c/km
Passenger vans & Light buses	1.30%	1.30	5.95 c/km
4WDs: passenger	12.45%	1.50	6.86 c/km
4WDs: light commercial	6.37%	1.70	7.78 c/km
Light commercials & Other light vehicles	12.58%	2.00	9.15 c/km
Light rigid trucks	0.95%	2.30	10.52 c/km
Buses: 2 axle: GVM 3.5 to 4.5 tonne	0.04%	2.50	11.43 c/km

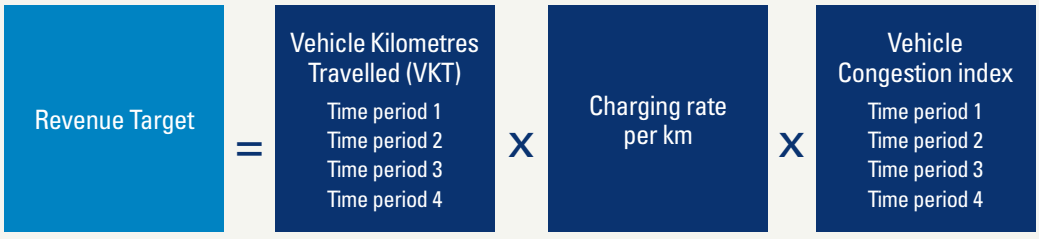
Methodology for Component Two: Time of day road user charge

This second component represents the most fundamental change to the established system of road user charging, because it introduces an additional price component for major capital cities (or other areas of high demand) based on the time and location at which the road network is accessed. While this represents a substantial departure from the established, supply only approach to road network operation, it also offers the most substantial opportunity to manage demand and increase allocative efficiency within the transport market.

In effect, this charge would mean that road users travelling during weekday and weekend peak periods would pay a greater charge per kilometre, than motorists that use roads during less busy periods.

▼ **FIGURE 5.2**

CHARGING APPROACH – COMPONENT TWO: UNIVERSAL ROAD USER CHARGING



While this charging aspect could be applied either to particular areas of the network, or on a wider basis across all urban areas – for the purpose of the modelling in this paper, Component Two is assumed to apply only to the east coast capitals, Sydney, Melbourne and Brisbane.

An overview of the methodology used to estimate the distance based road user charge is shown in Figure 5.2.

The first step in the charges estimation process was to divide the travelling week into time periods reflecting similar levels of travel activity. These were based on the following time periods which are commonly adopted in strategic transport models:

Weekday – AM Peak (7am - 9am);

- Weekday – (9am - 3pm);
- Weekday – PM Peak (3pm - 6pm);
- Weekday – Night time (6pm - 7am);
- Weekend – 7am - 9am;
- Weekend – 9am - 3pm;
- Weekend – 3pm - 6pm; and
- Weekend – 6pm - 7am.

Data on the Vkt in the Sydney region (urban only) for these periods was obtained and the proportion of travel conducted within each period calculated. These proportions were applied to the total Vkt in Sydney, Melbourne and Brisbane areas for 2010 to determine total Vkt in each time period.

Adopting a similar approach to the weighting process for Component One (the distance based road user charge), each time period was then given an index, depending on its relative contribution to congestion. These indicative values are shown in Figure 5.2, opposite.

The weekday AM peak was considered to be the most congested period, with other periods referenced against this. Congestion during the PM peak was considered to be 90 per cent of levels experienced during the AM peak, with day periods on weekends considered to be 30 per cent of levels during the same period. Night time and other weekend periods were given a zero index (meaning a $0/km time of day charge in those periods).[48]

A weighted Vkt was then derived by multiplying 2010 Vkt by the congestion index. An overall cost per km was derived from the revenue target and total weighted Vkt. This was assigned to each time period, depending on the congestion weighting. Weightings and estimated charges for Component Two of the model are shown in Table 5.2.

▼ TABLE 5.2

WEIGHTINGS AND CHARGES – TIME BASED ROAD USER CHARGE

TIME PERIOD	PROPORTION VKT	TIME OF DAY WEIGHTING	ESTIMATED CHARGE (C/KM)
Weekday - AM Peak (7am - 9am)	12.18%	1.00	14.42 c/km
Weekday - InterPeak (9am - 3pm)	24.54%	0.40	5.77 c/km
Weekday - PM Peak (3pm - 6pm)	18.31%	0.90	12.98 c/km
Weekday - Night time (6pm - 7am)	19.20%	-	
Weekend - 7am - 9am	1.95%	-	
Weekend - 9am - 3pm	11.70%	0.30	4.33 c/km
Weekend - 3pm - 6pm	5.56%	-	
Weekend - 6pm - 7am	6.57%	-	

Key points

- Charges for the URUC model under consideration were derived by considering the amount of revenue (Commonwealth and state taxes) that is recovered under the current system.
- The scheme design provides flexibility to adjust user payment contributions to allow for different policy settings.
- Based on existing road use patterns, Components One and Two combined would deliver revenue equivalent to that currently raised from Fuel Excise and state based charges. Adjustments to the target revenue could be achieved within the framework.
- Distance based charges (Component One) were assumed to vary according to the type of vehicle used, to reflect the impact of different vehicles on the transport network and environment. Under the scenario modelled, Component One would deliver 60 per cent of existing revenue.
- Road users travelling in areas experiencing acute congestion would be required to pay a time of day charge (Component Two). This could be applied to particular areas of the network or on a wider basis across all urban areas. Under the scenario modelled, Component Two would deliver 40 per cent of existing revenue.

48 The derivation of these indexes was supported by Austroads National Performance Indicators (Austroads 2008).

6 Impacts on users

6.1 DEFINITION OF TEST USERS

To allow a thorough assessment of the typical user price impacts that might be expected under the proposed URUC, a number of 'test users' have been defined. The rationale for generating test users is to provide a sample of different types of light vehicle, to compare and contrast the different components, and provide 'real-world' user comparisons against the existing charging regime.

These test users are shown in Table 6.1 below.

Importantly, this analysis has not considered demand elasticity. Future work on the URUC framework outlined in this paper should evaluate the implications of demand elasticity for both user behaviour and scheme design. Furthermore, commercial and fleet heavy vehicles have not been tested, given that pricing reform to these users is being pursued under a complementary reform process, through HVCI.

▼ TABLE 6.1

CHARACTERISTICS OF TEST USERS

USER	AGE	LOCATION	TRAVELLING CHARACTERISTICS
1. Peter 	62	Victoria, Regional City	• Owns one car – 2009 Holden Cruze (Vehicle 1) • Owns one light commercial vehicle – 2005 Toyota HiAce (Vehicle 2) • Operates own furniture restoration business, is required to use van for pick up and deliveries • At least once a week, travels on national highway network to make deliveries • Uses car three to four times per week for personal use, travelling only short distances
2. Graham 	45	NSW, Sydney, outer suburbs	• Family owns 2 cars – 2009 Audi A4 (Vehicle 1) and Jeep Grand Cherokee (Vehicle 2) • Graham drives to work every day and parks at office (Audi), drives on motorways (one way journey length 26 km) • His wife uses 2010 Jeep Grand Cherokee to short distances in local area (e.g. school drop off and pick up, other personal business) • Frequent weekend usage (both vehicles)
3. Leanne 	32	South East Queensland, outer urban area	• Owns one car – 2007 Toyota Corolla (Vehicle 1) • Night shift worker, travels to work (cross city, non-CBD) in the early evening and returns home before the AM peak period • Occasional weekend usage, generally travelling short distances in local area

6.2 WHAT DO USERS PAY UNDER THE CURRENT SYSTEM?

Table 6.2 below shows current weekly road use charges paid by the test users selected. This includes registration charges, Fuel Excise, stamp duty and other costs (e.g. plate fees, transfers). To provide a consistent base case, estimates were based on an average of road use charges across New South Wales, Queensland and Victoria. It was assumed that stamp duty payments and transfer fees were incurred once every five years (based on the assumed period of ownership). Weekly travel distances are also shown for reference. Costs exclude tolls, insurance and other non-government charges.

Under the existing system, total weekly road use charges are in the range of approximately $15 to $50 for the respective users. Fuel Excise represents a significant portion of costs for users travelling longer distances (e.g. Peter, Vehicle Two and Leanne). Stamp duty is noticeably higher for Graham due to his vehicles being more expensive relative to other users.

The estimates highlight some of the key short comings of the current charging system. In particular, infrequent/low distance travellers pay substantially higher road use charges on a per kilometre basis compared to those using the network more frequently. For example for Vehicle One, Graham travels approximately seven and a half times the distance of Peter, but pays only two and a half times the cost on weekly basis. Graham enjoys a substantially lower per kilometre charge as a result of using his vehicle to drive greater distances than Peter.

▼ TABLE 6.2

ESTIMATE OF CURRENT ROAD USE CHARGES (2012 DOLLARS)

BASE CASE	PETER		GRAHAM		LEANNE	
Vehicle One	**$**	**%**	**$**	**%**	**$**	**%**
Distance travelled	46 km		346 km		260 km	
Registration Charge	$6.02	54.9%	$6.02	23.1%	$5.12	32.8%
Fuel Excise Charge	$1.32	12.0%	$9.90	37.9%	$7.44	47.6%
Stamp Duty	$3.46	31.5%	$10.00	38.3%	$2.88	18.5%
Other Costs	$0.18	1.6%	$0.18	0.7%	$0.18	1.1%
Vehicle 1 Charges - Base Case ($ per week)	**$10.97**	**-**	**$26.09**	**-**	**$15.61**	**-**
Vehicle 1 Charges - Base Case ($/km)	*$0.24*	-	*$0.08*	-	*$0.06*	-
Vehicle Two (if applicable)	**$**	**%**	**$**	**%**	**$**	**%**
Distance travelled	418 km		98 km			
Registration Charge	$12.77	33.5%	$8.60	42.6%	-	-
Fuel Excise Charge	$20.73	54.4%	$5.23	26.0%	-	-
Stamp Duty	$4.40	11.6%	$6.15	30.5%	-	-
Other Costs	$0.18	0.5%	$0.18	0.9%	-	-
Vehicle 2 Charges - Base Case	**$38.07**	**-**	**$20.16**	**-**	**-**	**-**
Vehicle 2 Charges - Base Case ($/km)	*$0.09*	-	*$0.21*	-	-	-
Total Weekly Charges - Base Case	**$49.04**		**$46.25**		**$15.61**	

6.3 THE IMPACT OF A UNIVERSAL ROAD USER CHARGING MODEL

Table 6.3 presents the new charges estimated under the URUC model in comparison with charges under the current system. As anticipated, those users travelling relatively short distances would experience cost savings under this model.

▼ TABLE 6.3

ESTIMATE OF NEW ROAD USE CHARGES (2012 DOLLARS)

USER	BASE CASE	UNIVERSAL ROAD USER CHARGING			TOTAL NEW CHARGES	% CHANGE
		BASE CHARGE	DISTANCE ROAD USE CHARGE	TIME ROAD USE CHARGE		
Peter						
Vehicle One	$10.97	$0.96	$2.40	$0.00	$3.36	-69.4%
Vehicle Two	$38.07	$0.96	$33.53	$0.00	$34.49	-9.4%
Total	**$49.04**	**$1.92**	**$35.93**	**$0.00**	**$37.85**	**-22.8%**
Graham						
Vehicle One	$26.09	$0.96	$18.04	$18.94	$37.95	45.4%
Vehicle Two	$20.16	$0.96	$5.90	$6.07	$12.93	-35.9%
Total	**$46.25**	**$1.92**	**$23.94**	**$25.01**	**$50.87**	**10.0%**
Leanne						
Vehicle One	$15.61	$0.96	$10.43	$0.57	$11.96	-23.4%
Vehicle Two	$0.00	$0.00	$0.00	$0.00	$0.00	
Total	**$15.61**	**$0.96**	**$10.43**	**$0.57**	**$11.96**	**-23.4%**

As a low mileage network user driving a medium sized car in a regional area, Peter (Vehicle One) would experience the greatest cost savings of 69 per cent under the new model. While Peter travels the greatest distance each week (across both vehicles) and would incur a decrease in road charges of 22.8 per cent, however all of his trips are regional and away from dense urban areas where congestion generally occurs – and consequently away from where Component Two of the model would apply.

Graham would experience a modest cost increase for Vehicle One due to travelling relatively long distances on the urban road network during peak periods. While charges would decrease for Vehicle Two, this does not outweigh cost increases for Vehicle One, leading to an overall increase in road use charges of 10 per cent. Graham could reduce this impact if he were able to change the time of day he travels or his vehicle profile, or he may benefit from reduced journey times and improved reliability in continuing to travel at peak periods, if other network users change their time and/or mode of travel away from peak period road use.

Leanne would experience a cost saving of 23.4 per cent under the URUC model as she mainly uses the road network during non-peak periods, consequently largely avoiding charges under Component Two.

6.4 IMPLICATIONS FOR DEMAND

This analysis has not modelled the specific implications for demand as a result of a re-aligned framework for road user charging. A modified demand profile would be an intentional outcome of the structure discussed in this paper, particularly with regard to Component Two which seeks to shape demand away from peak periods.

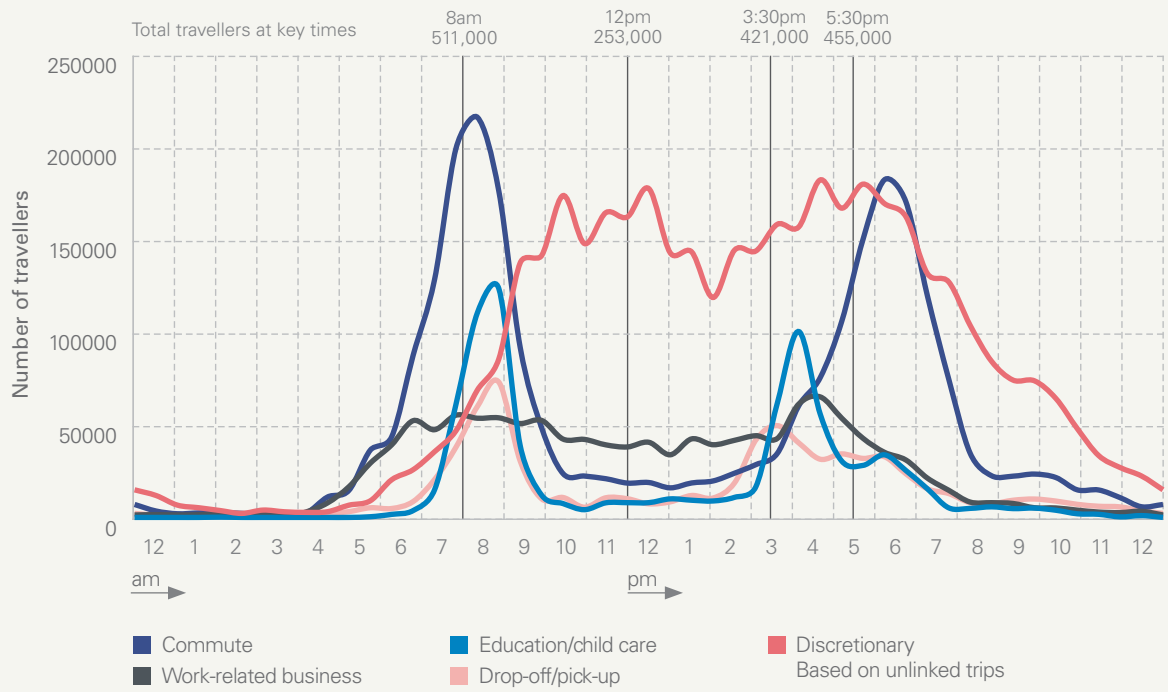
The structure put forward would see no greater cost burden on users as a whole; rather it would re-distribute charges to better reflect true costs (including externalities) and benefits. Before implementation of a similar scheme (or any reform to road user charging) detailed analysis of the price elasticity of demand will be required. However, if structured correctly and priced efficiently, a rational road user charging model would see appropriate and intended shifts in the demand profile.

Whilst detailed analysis would be required some broad assumption can be made about the impacts for demand flowing from a URUC. The current 'rego and excise' model for road pricing does not provide for pricing to disincentivise peak time usage (or incentivise off-peak use) – other than in a relatively blunt sense through the additional cost of time and additional fuel consumed by vehicles in congested conditions compared to free-flow usage.

One consequence of this pricing inadequacy is that users who have the flexibility to move their journey outside of peaks are not incentivised to do so. Some studies have suggested that as much as 40 per cent of travel during some peak periods is considered discretionary.[49] Figure 6.1 shows the 24hr travel demand profile in Sydney by trip purpose.

▼ FIGURE 6.1

DISTRIBUTION OF TRAVEL IN SYDNEY THROUGH AN AVERAGE WEEKDAY ACCORDING TO PURPOSE



Source: Transport for NSW, Draft NSW Long Term Transport Master Plan

Under a URUC structure with pricing appropriately aligned to demand elasticity users at peak period with the flexibility to transfer modes may choose to do so – freeing up available network capacity for those prepared to pay more and themselves avoiding the additional costs of peak road use. Consequently, those paying the additional cost of travel at peak times could expect less congested roads and more consistent travel times. Road users shifting their travel outside of traditional peak periods would face lower charges and would save money compared to continuing to travel in the peak, and may also benefit the community overall by deferring the need for some infrastructure investments by making better use of existing capacity.

49 *Transport for NSW, Draft NSW Long Term Transport Master Plan*, Page 94, September 2012.

Key points

- To assess the impacts of a new URUC charging regime a number of 'test users' were defined. A base case road use cost was established for each user and vehicle under the existing road use revenue framework.
- Prices considered in the analysis of user impacts were derived on the basis that the charging system would recover the full amount of revenue currently collected from light vehicle users.
- Road use costs were then generated for each user under the selected URUC model and compared to the base case scenario.
- Findings from the modelling highlight some of the key short comings of the current charging system. In particular, infrequent/low distance travellers pay substantially higher road use charges on a per kilometre basis compared to those using the network more heavily.
- Under the analysed model, those users travelling relatively short distances would experience cost savings compared to the current charging system.
- Example road user Leanne, who drives a small car and generally travels at off-peak times, would save 23 per cent under the modelled URUC when compared to her road use costs under the current framework.
- The vehicle Graham drives to work in a congested CBD area at peak hour would attract 45 per cent higher charges, exposing the cost of Graham's choice of vehicle and his contribution to urban congestion. Graham's higher costs for one vehicle would be partially offset by lower charges on his family's second vehicle, which has a much lower network usage and would consequently attract 36 per cent lower usage charges.
- Whilst some users could pay more under a reformed charging system, it is important to recognise that new charges could – if structured correctly – provide broader benefits, such as reduced journey times, a consistent funding stream, and improved road safety.

7 Pathways for reform

7.1 AGREEING ON OBJECTIVES FOR REFORMS

In considering the reform of road user pricing, it is easy for the debate to accelerate too quickly to focus on options for implementation, with too little regard or analysis of the ultimate outcomes that are being sought.

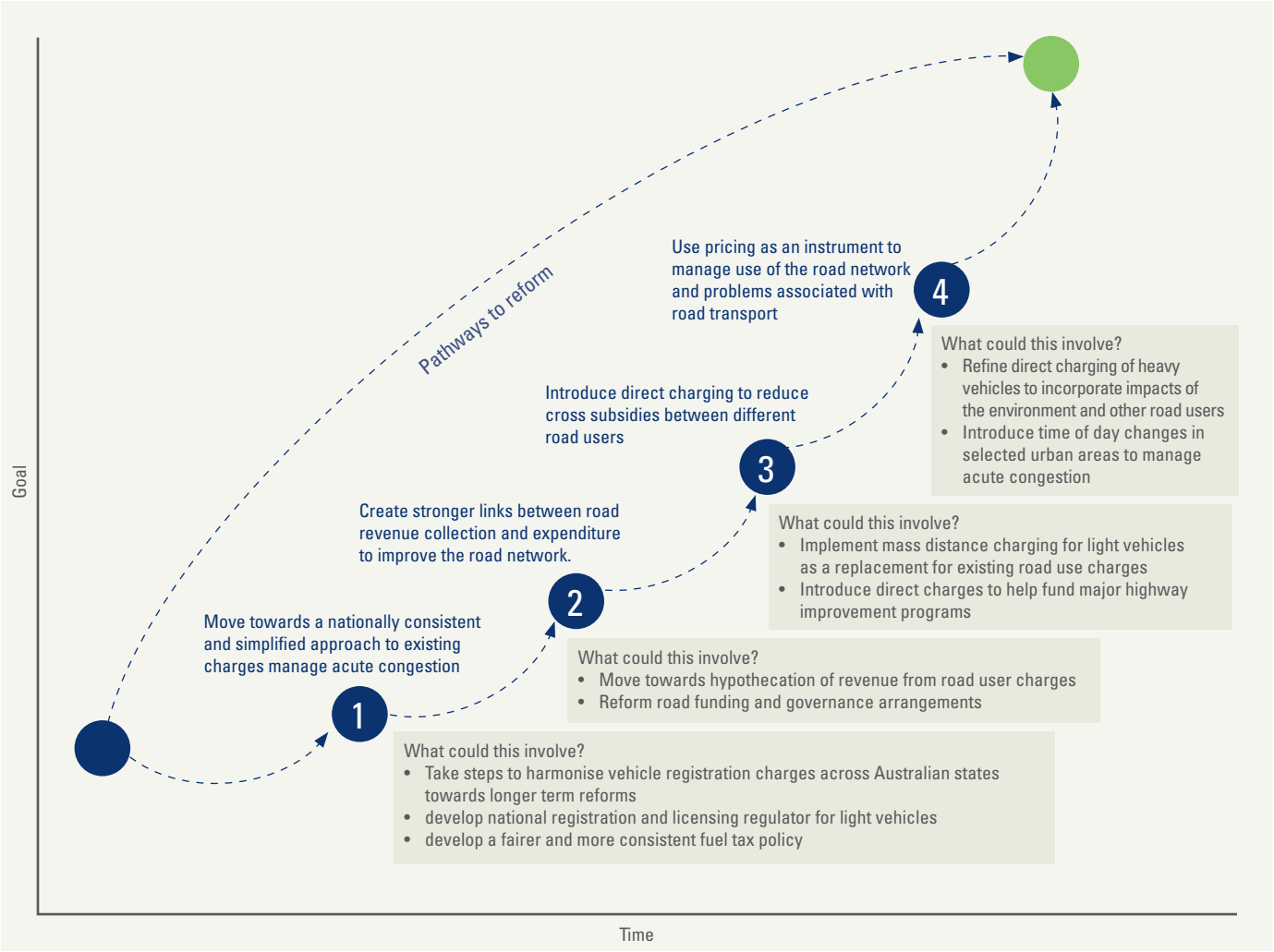
There are a large array of potential models to manage, fund and allocate capacity within the transport network, with a trade-off between the relative efficiency, utility and simplicity in achieving those outcomes.

It is likely that reform in Australia will be approached in a number of incremental steps, meaning that an upfront consensus about the principles and objectives will naturally help to articulate the need, identify the best solution and resolve the pathway to achieve reform.

This paper does not seek to endorse any particular objective or charging model to achieve reform. Rather, the paper uses an indicative model to provide a detailed scenario that might be achieved through well-considered and well-implemented reform. Drawing on global experience and the modelling of the URUC, this paper has developed an indicative process to reform road pricing. This is described below in Figure 7.1.

▼ **FIGURE 7.1**

PATHWAYS FOR REFORM



To provide a foundation for longer term reforms, immediate efforts could focus on addressing obvious distortions within the current charging system. These include inconsistencies in state road use taxes and fuel charges.[50] Options involving use of discreet pricing mechanisms as instruments to manage demand (e.g. time of day charges) could be introduced as a longer term reform to complement more fundamental forms of direct charging. The indicative pathway outlined in Figure 7.1 is not fixed, and the sequence and timing of reform steps could be adjusted.

7.2 MAKING THE PUBLIC CASE FOR ROAD PRICING REFORM

It is self-evident that successful reform of road pricing will substantially rely on the acceptance and appetite of the broader community. The debate will need to be well-led by transport policymakers, and must start with a forensic analysis of the problems under the current approach, a clear explanation of the best solution; and a detailed articulation of the benefits offered through change.

Defining the problem

Achieving a public consensus about the need for change demands consensus that a problem exists, and will also require a high degree of policy leadership and consensus across Australia's governments.

The introduction of the London Congestion Charge provides a useful case study for Australia, because of the lengthy process that was used to garner public consensus about the problem to be solved.

Before London's scheme was introduced, congestion was widely acknowledged as the major transport policy challenge facing that city. In 2002, around 15 per cent of commuter journeys to the centre of London were undertaken by private vehicle, with around half an hour per journey spent either stationary, or in very slow moving traffic.[51]

Moreover, average network speeds had consistently declined in central London as a result of congestion. Indeed, between 1986 and 2002 average kilometres travelled per hour during the evening peak had declined from 18.5 to 13.2 kilometres (see Table 7.1).[52]

▼ TABLE 7.1

AVERAGE NETWORK SPEEDS (KM/H) WITHIN THE CHARGING ZONE, 1986 TO 2002

YEAR	AM PEAK	INTER-PEAK	PM PEAK
1986 June/July	18.0	16.3	18.5
1990 June/July	15.1	15.6	16.1
1994 June/July	17.3	15.9	16.2
1997 June/July	15.4	14.5	15.1
2000 June/July	15.2	13.2	15.1
2002 Nov/Dec	14.7	12.7	13.2

Source: Transport for London

The perception that congestion was a problem was commonly agreed upon by London residents; 90 per cent of London residents surveyed before the charge was introduced believed that there was too much traffic in the capital.[53]

The public perception regarding the need to address London's congestion problem was translated into a political consensus by Ken Livingstone, the first Mayor of London, elected in 2000. Livingstone campaigned and was elected on a platform to address congestion in London, through the introduction of a cordon congestion charge.

Ken Livingstone, backed with electoral support and the powers attached to the newly-created position of London's Mayor, successfully implemented the London Congestion Charge in 2003.[54]

London provides a contemporary case study, in the process to build community support to facilitate substantial reform. The London case study also presents a number of important considerations for Australian policymakers, including the availability of viable alternative options for road users – such as access to public transport, the option to re-mode, adjusting travel time or choosing not to make a journey.

50 For example, See Australian Automobile Association (2001) 'Towards a fairer fuel tax policy' Submission to the Fuel Tax Inquiry Committee, October 2001
51 Banister, D 2003, 'Critical pragmatism and congestion charging in London', International Social Science Journal, Vol. 55, No. 176, pp. 249-264.
52 Transport for London 2003, Impacts Monitoring – First Annual Report, Central London Congestion Charging Scheme. Available at: http://www.tfl.gov.uk/assets/downloads/Impacts-monitoring-report1.pdf.
53 Turton, E 2000, Road Charging for London: A Technical Assessment, HMSO, London.
54 Ison, S & Rye, T 2005, 'Implementing road user charging: the lessons learnt from Hong Kong, Cambridge and Central London', Transport Reviews, Vol. 25, No.4, pp. 451 – 465.

Articulating road pricing as the solution

Broad experience from other jurisdictions points to the requirement for a detailed discussion with road users, to outline the principles, objectives and challenges to be addressed through road pricing. Political sustainability for reform models appears to have a close relationship to the level of public debate, consultation and community education that occur, in advance of implementation.

Switzerland provides another useful case study. In that country, the concept of distance based charging for vehicles above 3.5 tonnes gross vehicle mass (GVM) was discussed for a decade and half, before the level of required public support was attained.

In 1984, an annual flat fee for heavy vehicles was applied - from the outset this fee was considered to be a transitional measure, leading to a distance-based charging mechanism. However, a referendum two years later to replace the annual tax with a distance-based equivalent was rejected by 66 per cent of voters[55] (for a major reform to be introduced in Switzerland it must be supported by the majority of the population through voting in a referendum).[56]

The policy was not put to another public referendum till the mid-1990s, and once approved did not commence until 2001. During this time the policy of distance based road user charging for heavy vehicles remained on the public agenda in Switzerland; numerous research reports were written and a consistent campaign of advocacy and public debate occurred, outlining the requirement for reform; and importantly the likely impact on the road and transport network in Switzerland.

The successful second referendum shows the utility and importance of a live process of consideration, research and debate, in advance of implementation.[57]

The Swiss case study shows that in that jurisdiction, political support for reform took some 17 years to mature. Lessons should also be taken from the deep process of sustained interrogation and public socialisation of difficult reform.

Demonstrating the benefits

Experience from jurisdictions that have reformed road user charging shows that public support lifts, post implementation. This suggests that users are more likely to accept change, once the benefits become tangible and are realised by individual road users.[58]

Our analysis of road pricing schemes across other jurisdictions shows a range of approaches to sustaining public support through establishing and clearly demonstrating the benefits of reform.

Demonstration Period

One approach has seen the use of a demonstration period, allowing the public to experience the impact of the reformed pricing model in advance of a binding decision on implementation.

The introduction of the Stockholm congestion charge in 2007 is one example. Preceding the decision to implement a permanent cordon charge in Stockholm, a full scale trial was conducted for the first seven months of 2006. The trial was matched by a dedicated public education campaign by the Stockholm City Council.[59]

In the Stockholm case study, the demonstration period was particularly important in shifting the opinion of residents and road users within central Stockholm. Surveys conducted by the Stockholm Office of Research and Statistics regarding public attitudes towards the cordon charge indicate that a significant portion of Stockholm's population positively changed their mind about the new charge, following the trial period. About a third of those surveyed became more positive, 14 to 17 per cent became more negative, and the remaining half maintained their original view, in surveys conducted after the trial was introduced.[60]

Investing in Public Transport

A common (and legitimate) argument exists that viable public transit options need to be available, if the aim of pricing reform is to affect congestion and therefore, shift non-discretionary (but lower value) journeys onto alternative modes. Moreover, there is substantial evidence to suggest that developing better quality mass transit that is more accessible and journey focussed will also help to attract users, because the relative value of mass transit is increased.

The London and Stockholm case studies provide evidence in this regard. In both cases, large investments were made to improve the quality of the transport networks in the two cities.

In London significant attention was paid to improving the capacity of the bus network – capacity of the central London bus network was increased by 24 per cent at a cost of £30 – 40 million.[61] During the demonstration of congestion charging in Stockholm, almost $170 million was spent on increased public transport services – including 16 new bus lines and 14 new express buses to the city, and 1500 new parking spaces were created near train stations.[62]

The uniting lesson from each case is the large, visible investment in supporting mass transit capacity prior to the implementation of permanent reform. The timing is important as it enables the public to comprehend a tangible positive of the new policy – improved public transport.[63]

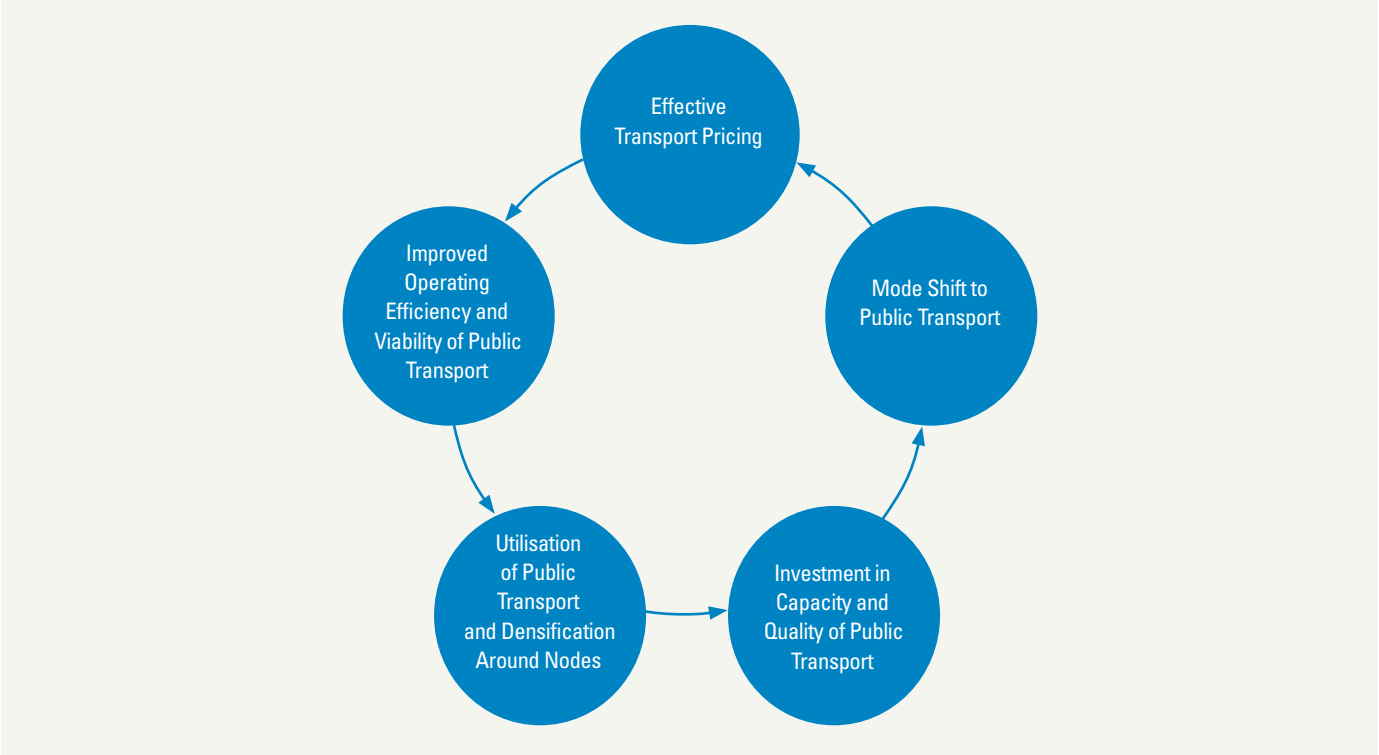
55 Ibid.
56 Balmer, U 2003, 'Practice and Experience with Implementing Transport Pricing Reform in Heavy Goods Transport in Switzerland', available at: http://www.imprint-eu.org/public/Papers/IMPRINT4_balmer.pdf
57 Suter, S & Walter, F 2001, 'Environmental Pricing – Theory and Practice: The Swiss Policy of Heavy Vehicle Taxation', Journal of Transport Economics and Policy, Vol. 35, No. 3, pp. 381-397.
58 Winslott-Hiselius L, Brundell-Freig K, Vaglandm A & Bystrom, C 2009, 'The development of public attitudes towards the Stockholm congestion trial', Transportation Research Part A, Vol. 43, pp. 269-282.
59 Schuitema, G, Steg, L & Forward, S 2010, 'Explaining difference in acceptability before and acceptance after the implementation of a congestion charge in Stockholm', Transport Research Part A, Vol. 44, pp. 99-109.
60 Winslott-Hiselius L, Brundell-Freig K, Vaglandm A & Bystrom, C 2009, 'The development of public attitudes towards the Stockholm congestion trial', Transportation Research Part A, Vol. 43, pp. 269-282.
61 Swanson, J 2009, 'Gaining Public Support for Congestion Charging: Lessons from Europe for U.S. Metropolitan Areas', Policy Brief: Comparative Domestic Policy Program, The German Marshall Fund of the United States. Available at: http://www.scribd.com/doc/38426948/Gaining-Public-Support-for-Congestion-Charging-Lessons-from-Europe-for-U-S-Metropolitan-Areas
62 Schuitema, G, Steg, L & Forward, S 2010, 'Explaining difference in acceptability before and acceptance after the implementation of a congestion charge in Stockholm', Transport Research Part A, Vol. 44, pp. 99-109.
63 Swanson, J 2009, 'Gaining Public Support for Congestion Charging: Lessons from Europe for U.S. Metropolitan Areas', Policy Brief: Comparative Domestic Policy Program, The German Marshall Fund of the United States. Available at: http://www.scribd.com/doc/38426948/Gaining-Public-Support-for-Congestion-Charging-Lessons-from-Europe-for-U-S-Metropolitan-Areas

The benefits of road pricing reform for public transport (funders, providers and users) should also be considered. Where road pricing reform seeks to price congestion, the outcome sought is a more efficient allocation of capacity on both road and public transport networks. Pricing congestion is a mechanism designed to change the relative economics of road use, compared to other modes.

An effective charging system would offer the opportunity to develop a virtuous cycle of demand led public transport investment. Effective transport pricing, which accounts for undesirable externalities such as congestion, would increase demand for alternative modes generating a modal shift to public transport. In turn this would drive increased investment in the capacity and quality of public transport and improve road and road-based public transport journey times. Investments in high quality public transport are likely to lead to greater utilisations and densification around transport nodes and a related improvement in operating efficiency and the viability of public transport. Finally, this would continue to allow more effective transport pricing across all modes, completing a virtuous cycle in the medium to longer-term – see Figure 7.2.

▼ FIGURE 7.2

VIRTUOUS CYCLE OF EFFECTIVE TRANSPORT PRICING



Source: Infrastructure Partnerships Australia, 2013

Hypothecation of revenue

Our analysis of international case studies also finds a fundamental correlation between the treatment of revenues and the political sustainability of pricing reform. Experience shows a much higher level of public support is achieved and sustained, if the revenues from reform are hypothecated to transport network investment. In the case of a road user charge, it would refer to the commitment of funds raised from that charge to investments in dedicated transport infrastructure projects, including public transport, that complements the network that is priced.

However, experience also shows that policymakers must be cautious in how widely those benefits are invested, and to what degree revenues support modes that are distant and of marginal benefit to the source of the charges. A sound example of this tension exists in the implementation of the German Heavy Vehicle Charging scheme.

The German scheme was introduced in 2005, with all freight vehicles with a GVM exceeding 12 tonne paying a distance based charge for access to the German road network. Of the revenue collected, 50 per cent is allocated to roads, 38 per cent to rail and 12 per cent to waterways.

An internet based survey, conducted in 2005 with German road freight operators, indicated that acceptability of the scheme was diminished as a result of revenue being used to cross subsidise other modes of transport. The freight companies supported revenue being spent on a combination of road maintenance and motorway upgrades, but predominately rejected the use of revenue for rail and water transport. 50 per cent of the trucking companies surveyed rejected the revenue from the charge being used to fund other transport; 25 per cent agreed and the remaining 25 per cent were undecided.[64]

In the London case study, net revenues over the first decade of congestion charge must be invested in committed transport priorities in the London Mayor's Transport Strategy. For example in 2009/10, the scheme generated £148 million in net revenue; which was allocated to funding enhancements to the bus network, road safety measures and new cycling and pedestrian facilities.[65]

In the London case, those who pay the congestion charge – motorists travelling inside the cordon during charging periods – can expect to directly or indirectly benefit from these investments; for example, investments in the bus network through service quality, increased capacity or new routes may provide an alternative option for the motorist, or free up road capacity by encouraging other motorists to use a public transport alternative. Support for the London scheme has remained high, indicating that where there is a tangible benefit from hypothecation to those who bear the burden of the cost road pricing schemes can maintain popular backing.

Substantial evidence exists to support the thesis that the investment of revenues is a fundamental consideration in achieving sustained public support. To alleviate this tension, decisions regarding the use of revenue by governments must be effectively communicated to both road users and the general public.

7.3 KEY CONSIDERATIONS FOR AN AUSTRALIAN REFORM PROCESS

Use of revenue

As discussed earlier in this paper, there is a considerable gap between what is charged to road users, and the amount that is invested in the nation's road network, under current arrangements. As discussed above, there is a well-accepted and fundamental linkage between public support for reform, and the investment of revenues.

That means that the reform of road pricing in Australia will necessarily require consideration in the context of a broader national taxation strategy. Further complexity is created, because of an array of inconsistent parallel taxation and distributions structures between states and local governments. The practical complexity of achieving reform across all road users and all tiers of government across the country point to the requirement for a clear, staged and detailed engagement to achieve full hypothecation.

In the near term, the hypothecation of road related charges at a state level may present an achievable first step.[66] Proposed funding and revenue distribution arrangements which may be introduced under the HVCI reforms could be relevant to light vehicle road use reforms in the future which is discussed in the next section.

National reform will also require a decision about the target revenues to be raised by the scheme. Setting the revenue target will naturally have a direct impact on the community's acceptance of reform. At a minimum, a reform model should set a revenue target equal to all existing road related investment. However, under this option, additional revenue beyond the road charging system would need to be sought to fund the major expansions of the network, thus representing a sub optimal outcome.

For road pricing reforms to contribute to the development of additional road and transport infrastructure, it would be preferable that new charges be structured to initially generate revenue equivalent to that of all road-related revenue currently collected by all Australian governments,[67] supported by a staged approach to hypothecation. In addition to generating revenue, hypothecation could also serve to increase transparency in transport related expenditure – better allowing the public to understand the spending requirements for maintenance and augmentation of the transport network and how revenue is directed to pay for those demands. Exposing the true cost could serve to increase the integrity of investments through transparency and visibility of both revenue and expenditure.

64 Link, H 2008, 'Acceptability of the German Charging Scheme for Heavy Goods Vehicles: Empirical Evidence from a Freight Company Survey', Transport Reviews, Vol. 28, No. 2, pp. 141-158.
65 Transport for London 2011, What do you need to know about Congestion Charging. Available at: http://www.tfl.gov.uk/assets/downloads/congestion-charging.pdf
66 This is currently the practice for some jurisdictions (e.g. New South Wales) but for most, registration charges form part of consolidated revenue.
67 Excluding the Goods and Services Tax, Fringe Benefits Tax and privately collected motorway tolls

Revenue in excess of current road expenditure could be directed to other modes of transport e.g. rail freight, public transport, active transport and other transport facilities. Public transport will play a particularly important role in supporting road pricing reforms in urban areas, and provision of better travel alternatives may be seen as a prerequisite by the community. Under an urban time of day based charging system, the higher volumes of passengers wishing to switch mode from private to public transport is likely to provide substantial public support for the necessary investment in improved public transport capacity and capability.

Under a whole-of-network user charging mechanism, when and where revenue is invested in the transport network is a complex issue that will require detailed analysis and consultation. Options are varied and include:

- Centralised distribution of revenue on a best for network basis;
- Revenue remaining in the state jurisdiction from which it was collected, with state governments responsible for allocating capital within that jurisdiction;
- Revenue distributed on the basis of an agreed formula akin to horizontal fiscal equalisation used to allocate GST revenue;
- A single, or series of, infrastructure investment fund(s) with spending decisions taken at arms-length from governments;
- Revenue distributed based on observed traffic volumes on particular corridors or road classes (i.e. National Highway Network, Arterial and Suburban Roads); or
- A combination of above or other mechanism.

Under a universal charging framework a wealth of currently unavailable data on actual road use and demand would be available to policymakers. Access to reliable and detailed data about actual usage patterns could be invaluable to inform the allocation of capital to maintain and augment the network – ensuring that investment decisions are responsive to the needs of users.

Lessons from heavy vehicle reforms

Reforms in heavy vehicle charging arrangements over the past decade, including work recently undertaken as part of the HVCI, can provide important lessons for the future introduction of direct charging for light vehicles. Focusing initial reforms on commercial network users has been appropriate, as this group of users is likely to have a much greater appreciation of the benefits of a more direct, rational user pays system.

Significant improvements to the heavy vehicle charging regime have been incrementally achieved over the last decade. Key steps in the reform process may have some relevance to the pathway that could be followed for light vehicles e.g.:

- Recognition of distortions caused by inconsistent heavy vehicle registration charges and development of a nationally consistent charges;
- Establishment of a national registration scheme with an agreed mechanism for redistributing revenue to states;[68]
- Establishment of road use charges linked to infrastructure use;[69]
- Ongoing refinements to road use charges to minimise cross subsidies between vehicle classes and ensure that charges continue to recover infrastructure costs; and
- A multi-jurisdictional approach to investigation of more advanced direct charging mechanisms.

Work being undertaken by HVCI to investigate the feasibility of mass distance charging for trucks is likely to be particularly relevant to the future reform process for light vehicles. Although this reform process is only dealing with a 'partial market', a number of general lessons are likely to emerge from the process, for example:

- Alternative approaches to setting charges;
- Technology capabilities and limitations; and
- Approaches to revenue distribution and reforms which can ensure that road supply decision making is more responsive to the needs of network users.

The National Transport Commission and other stakeholders involved in HVCI should play a key role in reforms to light vehicle charging arrangements to maximise the value of knowledge gained during that process.

The role of technology

Technology is no barrier to the implementation of the kind of scheme outlined in this paper. Indeed, consideration of the ultimate reform model should lead the selection of technology, rather than selecting a scheme to fit a particular technology. Policymakers should avoid being prescriptive about a particular system (e.g. GPS, telematics, odometer readings), recognising that scheme outcomes may be achievable through a variety or combination of technologies.

The selection of the most appropriate technology solutions will need to balance a range of considerations, including cost for motorists and government, effectiveness, and relative simplicity of use. On-going costs associated with a new system will need to be investigated as lessons from other road pricing schemes show that this can have a considerable impact on revenue. An understanding of the costs of administering the current system of road use charges will be needed to properly evaluate options – at present, this is not well understood.

The procurement of technology should provide an opportunity for service providers to develop innovative, leading edge solutions which satisfactorily deliver the scheme's objectives at the best value for money and reliability.

An example of such an approach is provided by the following case study on New Zealand's 'eRUC' system. Whilst electronic payments for registration are a reality in most Australian states, the development of the eRUC solution provides an example of a non-prescriptive approach to developing a technology solution for road pricing reforms, combining regulatory and commercial services within a common platform. This style of approach can reduce costs and risks

68 The Australian Government established the Federal Interstate Registration Scheme (FIRS) in 1987 to promote uniform charges and operating conditions for heavy vehicles operating interstate. It is an alternative to state or territory registration for heavy vehicles. Approximately 20,000 vehicles are registered under the scheme (representing approximately 3% of all heavy vehicles). Revenue from FIRS is collected by the states and territories and submitted to the Australian Government. The Department redistributes the revenue back to states and territories according to an agreed formula that reflects road damage as a result of FIRS registered heavy vehicles. This distribution process reflects the relative amount of heavy vehicle travel within each Australian state.

69 The PAYGO charging cost base is based on the recovery of road expenditures (construction and maintenance) by all levels of government (Commonwealth, State and Territory) that is attributable to heavy vehicles.

for government, whilst at the same time encouraging innovative solutions from the private sector and providing network users with a commercial incentive to use a system that can also provide regulatory benefits.

A market based approach to the supporting technology for a road user charging scheme is best placed to deliver efficient and innovative solutions that meet customer demands. Subject to the objectives a road user charging framework seeks to achieve, it is likely that the scheme's outcomes could be supported by a variety of technology solutions – allowing the market to determine the most viable technology solution(s), and recognising that different users are likely to be better serviced by different technology solutions.

The US state of Oregon provides another contemporary example of a technology-agnostic approach, through its 2012 Oregon Road User Charge Pilot Program.[70]

Earlier evolutions of the pilot programme required a government mandated GPS tracking solution to support the charging mechanism. Under the 2012 Oregon pilot programme motorists will be able to choose between a number of service provider technology options; ranging from their own GPS device to odometer based readings, or even pre-pay mileage block options for motorists concerned about privacy or 'bill-shock'.[71]

The philosophy underpinning this approach is sound, in that the market will be able to determine the validity of technologies, with customer choice leading decisions. Obviously, the ultimate model and scheme adopted in an Australian context would dictate the broader suite of options that would be practical. This kind of approach has benefits, because it would limit the degree of direct exposure to technology risks.

Encouraging technology innovation in road pricing reforms – the New Zealand experience

New Zealand has had variable mass-distance based charging regime in place since 1978. The Road User Charges (RUC) scheme applies to all vehicles over 3.5 tonnes GVM and all light vehicles powered by diesel or other fuels which are not taxed when sold. Under the system, road users purchase a licence to use the network in 1000 km increments.

All vehicles under the scheme must be fitted with distance recorders to provide reliable records of distance travelled. Paper based licences are required to be displayed on the inside of the vehicle windscreens.

A review of the RUC was undertaken by the New Zealand Government in 2008 and made a number of recommendations including the need for improvements to the approach to collecting revenue. Compliance costs under the scheme were found to have a high impact on users because of the need to purchase paper licences. Evasion and tampering with odometers and hubodometers (used on trailers) were also issues.

Coinciding with the review, a private company, EROAD, approached the New Zealand Government with a proposal to develop an electronic road user charging (eRUC) system. The system, approved for implementation in 2009, is a cellular-based vehicle tracking and fleet management system which also enables users to purchase RUC licenses via a web application.

Users pay a fee of $80 per month, plus an additional $5 transaction fee for licence payments. Whilst the vehicle tracking and fleet management system provides the main source of revenue for the vendor, the electronic payment mechanism has provided an internet-based payment channel for government, which has reduced the number of paper based transactions for licences.

New Zealand Transport Agency officials estimate that during fiscal year 2011 up to 15 per cent of the heavy vehicle fleet used the eRUC system, an increase from less than 1 per cent in September 2009.[72] Under the certification model adopted for the reform, other technology vendors are not precluded from acting as agents for eRUC payments. It is understood that other vendors are now developing competing systems.

Such GPS or cellular based systems could potentially serve as a platform for further reforms in charging and funding arrangements (e.g. allocation of payments to road owners, differential rates for particular road types or targeting a particular corridor or area congestion issue).

70 Oregon Road User Charge Pilot Program, http://cms.oregon.egov.com/ODOT/HWY/RUFPP/pages/rucpp.aspx
71 Ibid.
72 United States Government Accountability Office, Report to the Subcommittee on Transportation, Housing, and Urban Development, and Related Agencies, Committee on Appropriations, House of Representatives GAO-13-77, December 2012 and EROAD (2009), EROAD (2011) NZ Electronic Truck Tolling, presentation to CRRP Board, 5 July 2011

Other practical considerations

A series of other practical considerations need to be recognised and addressed during the defining stages of any future reforms to the road user changing framework. Issues for consideration may include:

- that charges are logical, transparent and can be easily understood by road users;[73]
- if applicable, the issue of how to include occasional and 'out-of-region' users is carefully addressed;
- Concessions and special users are considered and adequately addressed;
- a clear understanding of community service obligations (CSO) associated with the road network (for example, the maintenance of road connectivity to remote communities);
- strategies to manage revenue, operating costs and risks are in place; and
- it has sufficient lead-time, including for real-world testing and transitional arrangements, to work through all the issues so the scheme can commence and operate effectively.

Each of the issues raised would require careful consideration and may require individual analysis and modelling to better understand its effect on the overall effectiveness of the scheme.

7.4 RESEARCH PRIORITIES

There remain a large number of 'unknowns' within the road charging reform debate. In the short-term, further research is needed to address a number of key issues.

Strengthening the 'evidence base' on transport network performance

There is a need for consistent, time series information on network travel speeds, congestion and its impacts on productivity. The Bureau of Transport and Regional Economics' *Estimating Urban Traffic Congestion Cost Trends for Australian Cities* is a useful and widely referenced information source, but is based on an aggregated modelling approach.[74]

More detailed studies of traffic congestion within specific urban areas will be important for future decision making, as will detailed information on how the broader road network is actually used. Information on congestion and road network performance should be published on a regular basis and data should be made freely available to the travelling public.

Reform to road pricing will also require a more detailed understanding of public transport availability and demand in anticipation of a contingent modal shift away from private vehicle use. Further consideration of whether public transport capacity will be sufficient to accommodate changing demand will be required.

Analysis of revenue that may be raised under different schemes

Future analysis should focus on potential revenue that may be generated by different charging models. For universal distance based charging schemes, this will require consideration of revenue shortfalls in particular regions (e.g. rural areas) and the potential need for community service obligation CSO payments to ensure that non-commercial parts of the network can be maintained.

Investigation of urban schemes should consider the amount of revenue that can be raised and the level of investment needed in other transport alternatives to manage the impacts of higher road use charges during selected periods. Analysis should also include scenario analysis and sensitivity testing on the risk to revenue flows from any proposed charging regime reforms.

Further analysis of likely winners and losers under different road charging reform options

Using findings from this work, further analysis should consider the impacts of direct road user charges on different types of motorists, households and geographic regions. Work should also consider the potential for new charges to have a negative impact on some socio-economic groups. This may require further information on travel patterns of particular network users. For instance whilst comprehensive travel models have been developed for many urban areas, there is a comparative lack of data available on travel in regional areas.

Assessing the costs and benefits of reforms

Reforms to light vehicle charges should be subject to thorough economic evaluation of costs and benefits. Further work to assess the likely national productivity benefits associated with road charging reforms (e.g. especially models applied in urban areas) will be important.

Analysis should also consider the city shaping implications of a rational approach to road pricing, recognising that schemes may have impacts on areas such as consumer demand for density close to urban centres or in close proximity to transport hubs – this is particularly pertinent in regard to schemes which include a congestion management component.

There is also a need to test road user responsiveness to different pricing levels and explore the magnitude of changes needed to change behaviour. A number of innovative research projects have been undertaken looking at how road users respond to different price signals which could be used to test the effects of different road charging models.[75]

73 This issue was recognised in a recent review of road user charges in New Zealand, which concluded that "while a degree of precision is desirable when determining the allocation of costs and setting of charges, absolute precision is not possible or practicable" (Road User Charges Groups (2009) An Independent Review of the New Zealand Road User Charging System).

74 The Bureau of Transport and Regional Economics 2007, Estimating Urban Traffic Congestion Cost Trends for Australian Cities, Working Paper 71.

75 For example see Greaves and Fifer (2011), *Analysis of a financial incentive to encourage safer driving practices*, Institute of Transport Studies Working Paper 11-18

Key points

- To provide a foundation for longer term reforms, immediate efforts could focus on addressing distortions within the current charging system including inconsistencies and inefficiencies in road access taxes and fuel consumption charges. Options involving the use of pricing as an instrument to manage demand could be introduced as a medium to longer term reform.
- For road pricing reforms to contribute to the development of additional road and transport infrastructure, new charges could initially be structured to generate revenue equivalent to all road-related revenue currently collected by all governments. This should be supported by a staged approach to hypothecation.
- Work being undertaken by the HVCI to investigate the feasibility of mass distance charging for trucks is likely to be relevant to the future reform process for light vehicles.
- Experience from international jurisdictions has shown public support for road pricing reforms relies on policy makers and political leaders being able to demonstrate the problem to solve, articulate road pricing as the solution to that problem and demonstrate the benefits of reform.
- The technology used to underpin a new charging system will need to balance a range of considerations, including cost for motorists and government, effectiveness, and relative simplicity of use. A market based approach to the procurement of technology should provide opportunities for service providers to develop innovative solutions.
- In the short-term, further research is needed to address a number of key issues including:
  - Strengthening the 'evidence base' on transport network performance;
  - Analysis of revenue that may be raised under different schemes;
  - Further analysis of likely winners and losers under different road charging reform options;
  - Assessing the costs and benefits of reforms; and
  - Understanding the implications of more direct charging as an urban planning or city shaping tool.

8 Conclusion

This paper seeks to progress the discussion about the positive options that are available to materially restore the efficiency of the nation's transport network.

As the major stakeholders across the national road network, including the owners, providers, regulators and most particularly, road users, we are seeking to begin a genuine, honest and collaborative policy reform process for road user charging and funding.

It is increasingly apparent that the current approach is diminishing in its funding capacity, and of limited use in balancing the signals for efficient expansion, maintenance and usage of the broader transport network.

This is not a niche area of government policy, or an abstract application of economic theory; rather it is a fundamental challenge that is entrenched into the price of the goods and services that we consume and produce.

Failure to reform will risk increasing urban and freight congestion, and a sustained erosion of the abilities of Australia's cities and regions to compete in global markets.

By presenting a range of identifiable and relatable, but hypothetical, real-world users, we have sought to demystify the discussion about reform – showing road users, taxpayers and policymakers alike that reform offers substantial opportunities to make life better.

We accept that the scale of reform considered in this paper offers substantial political complexity. We further accept that broad taxation reform in Australia has historically required a sustained period of public debate and consideration, to achieve the level of consensus that makes reform politically achievable and electorally sustainable.

The potential to reform road user charging has been considered several times in Australia, but to date, theoretical concepts have not matured into any meaningful process.

What is missing in this debate is a formal process to interrogate the options, consider the pathways and provide a forum for ongoing consideration, ventilation and socialisation of the concept of reformed road user pricing.

That process could begin immediately, through a formal referral to the Productivity Commission, as outlined as the principal recommendation of this paper; and a concurrent process to drive consistent approaches and common regulation across Australia's federation.

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