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The Role of Road Pricing in the Australian Policy Context

Anthony Ockwell[1], Phil Bullock[2]

[1]Saha International, Canberra; [2]Saha International, Sydney

Email for correspondence: aockwell@sahainternational.com

Abstract

This paper presents a series of options for the implementation of a national road pricing scheme. The impetus for the paper was to contribute to the debate on the current taxation system as part of the Henry Tax Review.

The objectives of the paper were to:

- Review the current system of taxes and charges paid by road users
- Review road pricing systems in place overseas and assess their effectiveness in meeting policy objectives
- Review current policy initiatives in transport and other sectors relevant to a broader debate on resource pricing
- Develop a set of options for a national road pricing system and consider their alignment with Australian government policy as set down by the Australian Transport Council
- Analyse the possible impact of two options on likely total charges paid by road users

In our paper we have argued the merits of shifting the focus of charges away from high fixed taxes (such as registration) to a system based on variable charges according to distance travelled, location and time of day. The underlying objective of this approach is to shift user behaviour to focus more on the actual cost of undertaking a given trip (including the cost of externalities).

We have proposed national road pricing scheme comprising three tiers: non-metropolitan (base charge); metropolitan (base charge plus additional charge for externalities for use of urban networks); and metropolitan peak charge (metropolitan charge plus time of day charge for use of congested networks).

1 Introduction

Like many countries, Australia faces major challenges in maintaining its existing stock of transport infrastructure, and expanding transport system capacity to meet the future needs of the forecast growth in population. The concept of 'pricing' has been discussed for many years, and is often advocated as a way of managing road and other transport assets. Among other things, setting appropriate 'price signals' on road infrastructure has the potential to:

- Help better match the demands of road users with the available capacity or 'supply' of road space
- Provide a basis for replacing outdated and inappropriate taxes and fees, and provide a fairer set of charges which match charges and payments to actual road use and the impact this has on society
- Provide a more sustainable and transparent funding mechanism for maintaining and improving the transport system.

While there appears to be a general consensus about the theoretical benefits of road pricing, in policy terms the concept has often been put in the 'too hard basket'. Despite this, the potential benefits of road pricing are being discussed again in Australia. Why is the concept now receiving increased attention, and why should it be taken any more seriously this time around?

Continuing advances in technology, and the benefits demonstrated by schemes in other countries have helped break down some of the barriers which have previously prevented the introduction of more efficient road use charging arrangements. However beyond these factors, there are far more pressing reasons to re-think the concept in Australia.

Australia's transport task is growing rapidly. Transport infrastructure developments in recent decades have helped maintain economic productivity and ensured that communities and regions stay connected, but developing new infrastructure is becoming increasingly difficult and costly. With increasing attention being paid to climate change together with the effects that the global financial crisis has had on a number of major transport infrastructure projects, now is the time to consider a range of options for better managing, funding and using our transport system.

The review of Australia's taxation system has provided an opportunity to consider opportunities for reforming taxes and other charges paid by the travelling public. Further, the transport regulatory reform agenda and the current appetite across governments for a national approach to transport is another reason why the role of road pricing needs to be debated. Related to this push for greater reform has been the growing realisation of the substantial indirect cost that transport imposes on society.

This discussion paper presents a conceptual approach to road pricing in Australia, and considers issues that will need to be included within the public debate on transport reforms. The paper looks at examples of pricing schemes in other countries and where the idea fits within the current national transport reform agenda. Specifically, the paper then considers the extent to which a road pricing system can meet the transport policy objectives which have recently been agreed by the Australian Transport Council (ATC). The final section of the paper considers options which could achieve a more efficient and coordinated approach to infrastructure funding. A range of important practical issues are discussed, such as the potential scope of a charging scheme, equity considerations, and how current fees and taxes could be changed as part of a move towards a new system. The paper concludes with some suggestions on how the public debate on pricing should be advanced, and steps that could be taken to deal with key inefficiencies and inequities which currently characterise our transport system.

It is recognised at the outset that the approach proposed may warrant some re-thinking of Australia's existing taxation arrangements for transport with implications for Commonwealth-State fiscal balance. The purpose of this paper is to contribute to the debate on the current road transport reform agenda before COAG and ATC, and to facilitate discussion on road pricing following the release of the Henry taxation review.

2 Setting the scene: Why do we need road pricing?

Australia's population growth over the past 20 years has accelerated the demand for infrastructure and services, particularly in our capital cities. This growth is expected to continue over the coming 25 years as the freight and passenger tasks double in line with increases in population and income.

Population projections suggest that Australia's population could reach around 35.5 million in 2056[1]. This growth has outstripped the capacity of governments to supply infrastructure which is needed to sustain service levels and productivity in many sectors of the economy. The sectors that appear to be most affected by this imbalance between the supply of and demand for infrastructure and services are transport, health, education and water.

While regulatory reform has helped manage supply and demand for resources in certain sectors (such as energy), the management of our transport infrastructure has, for the most part, been characterised by a 'hands off' approach, based on the assumption that the market will sort things out. This approach appears to be founded on the idea that people will change the way they behave and use transport resources according to trade-offs between the way they value time, and levels of service offered by the transport system. In other words, people who place a high value on their time (e.g. work commuters) will be less flexible in their use of the transport system compared to other people (e.g. leisure travellers) who may be prepared to wait and use the transport network at less busy times of the day. This is also based on the assumption that people have access to good information on which to base their decisions which in the case of road use is not usually the situation.

However in reality, the 'hands off' approach taken by transport policy makers has done little to manage the impact of unrestrained growth in travel demand and its effects on infrastructure use, as well as the secondary, longer term negative effects this has on our society. When funds permit, some expenditure is made on alleviating points of major congestion. Generally, these solutions are civil engineering based (such as widening) and often too little, too late.

While road users bear the direct cost of their transport activities, their decisions to consume transport resources may not be based on the correct 'signals' or information. In economic efficiency terms, there are three key shortcomings or sources of 'failure' in transport markets, notably:

- **Inappropriate taxing arrangements for road transport users**, which means the amounts they pay to use the road system do not accurately reflect when and how often they use the system. As a result this creates inequity across road users since many transport system users are charged more than they should really pay, whilst others are charged much less
- **Non-pricing of externalities**. While transport users who decide to travel during peak hour may incur some delay themselves, they do not pay for the indirect effect they have on other users of the system, or for the additional pollution they cause by choosing to use the network at a busy time
- **A lack of a direct relationship between infrastructure use and provision**. There are a range of different taxes and charges collected by governments from transport users, but it is unclear how funds are allocated back into the transport system for the benefit of those users.

2.1 Key issues and challenges

Road users are subjected to a range of government taxes and charges for access to and use of infrastructure, and these are imposed by all levels of government to varying degrees. These taxes and charges take the form of:

- Australian Government: fuel excise, Goods and Services Tax (GST), Fringe Benefits Tax (FBT), Luxury Car Tax (LCT), import duties, sales taxes on new vehicles
- State/Territory Government: registration charges for light and heavy vehicles, stamp duties, licence fees, permit fees (for heavy vehicles), insurance levies for Compulsory Third Party (CTP) and revenues from infringements/penalties

[1] ABS (2009)

- Local Government: parking charges and penalties.

In 2000-07 together these taxes and charges (excluding GST) amounted to around $22.80 billion (including GST or around $18 billion excluding GST) comprising $15.6 billion to the Australian Government, $6.1 billion to State and Territory governments and $1.1 billion through tolled motorways. In contrast, total funding of road-related expenditure by all levels of government in that year was $12.1 billion including capital and maintenance. The array of taxes, charges and expenditures for the road transport sector raises the question of whether these revenue and expenditure streams could be handled more efficiently through a national approach.

For the most part, taxes and charges imposed on the transport sector do not encourage efficient use of infrastructure. In particular:

- The rate of FBT falls with distance travelled, thereby encouraging more travel
- Registration charges are fixed costs to the road user, and hence increased vehicle use has the effect of reducing the average fixed costs associated with vehicle registration. This also applies to other fixed costs of vehicle ownership, such as stamp duty. There are also very few examples of registration charges reflecting vehicle fuel use efficiency to encourage shift toward more energy efficient vehicles
- While fuel excise varies with vehicle usage, it is non-discretionary and ignores location or time of travel (although vehicle operating costs, including fuel consumption, increase with higher levels of congestion). In their consideration of road pricing, the Dutch Government dismissed the concept of increasing fuel taxes on the basis that such increases would have no effect on the times and places people drive, and hence it would not have a significant effect on reducing congestion (Netherlands Ministry of Transport 2009).

A lack of investment in infrastructure contributing to increasing levels of congestion in Australia's capital cities is likely to erode Australia's competitiveness and undermine productivity growth (Gruen 2010). Further, congestion is having an increasingly negative impact on the cost of business and the liveability of our cities. Of the 2005 congestion cost of $9.4 billion estimated by the BITRE (BITRE 2007), around $1.1 billion (or 11.7%) comprised additional air pollution damages. This does not include the additional cost of noise pollution or the decline in urban amenity from transport emissions.

Infrastructure Australia (IA 2009) recently identified around 40 infrastructure projects that need to be considered in order to achieve an efficient and sustainable transport system in the longer term. Together, these projects total almost $60 billion of capital investment. The range of projects in the IA priority list covers roads, terminals, ports, airport facilities and public transport. For the roads sector alone, some 12 high priority projects have been identified totalling around $15.5 billion worth of capital investment.

It is important to recognise that this investment plan does not take account of the high cost of maintaining existing infrastructure in the face of the forecast growth in demand. The funding challenge is compounded when consideration is given to the ageing of our transport infrastructure, particularly in the rail sector.

2.2 Time for a new approach?

The concept of road use pricing has existed for many years and is often advocated as a way of managing transport demand and raising funds for improvements to transport networks and systems (Chin 2002, Transport for London 2007). In a theoretical sense, if we consider road space as a commodity in a market where there is a demand for travel, then just like in other commodity markets (such as tickets to a football or cricket final) we would use price as a way of 'rationing'

demand. However, in the roads sector, apart from toll roads, there is no direct pricing system used to ration demand for road space. In simple terms, as long as we are prepared to meet vehicle running costs, we can travel as much as we wish between any origin and destination without directly paying for our use of the road commodity.

The same argument applies to time of day or location use of the network. If we choose to travel in an urban area during peak times, our travel decisions would have a greater impact on other road users and society overall than travelling rural roads.

As a general concept, road pricing can help tackle some of the current shortcomings of our transport system, and help deal with some of the future challenges we are facing. Pricing has the potential to change behaviour by making road users think more carefully about when they use the network, which can result in demand being better matched to supply; that is, using the network more efficiently and getting more out of existing transport assets. Pricing can also facilitate the reform of outdated and inappropriate taxes and charges which do not vary according to how people use the network, and provide a more stable link between road use and investment in the transport system. In other words, only charging road users according to what they use, and ensuring these charges go back into the system for their benefit.

Whilst there are currently few if any "pure" forms of road pricing that balance demand for transport with the supply or capacity of transport infrastructure, various schemes have been introduced around the world that use pricing instruments to manage certain aspects of transport systems. An overview of different pricing systems is shown below.

Key concepts in road pricing

Congestion pricing
Under this approach, urban road networks are priced to ration road space to account for the cost of externalities. Congestion pricing may take the form of charging to use specific roads, broader network wide pricing or cordon pricing (i.e. a specific area or zone). Prices are set to reflect the cost of supply of infrastructure and the demand for use of that infrastructure. The main limitation of this approach is that it focuses primarily on urban road networks of capital cities to better manage congestion. While this is a worthwhile objective in its own right, congestion pricing may not necessarily address the broader question of infrastructure funding and provision across the whole network (urban and non-urban).

Cordon pricing
Cordon pricing is a subset of congestion pricing. The term refers to a charge for providing access to a defined part of an urban network, usually associated with a central business district. The primary purpose of such an approach is to ration demand within an area which is characterised by a highly concentrated level of activity. The basic principle underlying cordon pricing is to charge road users in a particular area, as a proxy for the externalities they generate and thereby reduce congestion (see Geroliminis et al 2009). Cordon pricing can involve charges which are fixed across all times of the day, or be levied as a combined congestion based charge (examples: Central London Congestion Charging scheme, Trondheim, Oslo, Stockholm, Singapore).

Tolling
Tolling is principally a financing mechanism to fund infrastructure provision and has been used extensively in Australia to develop urban tollway networks in Brisbane, Sydney and Melbourne. Without time of day pricing adjustments, tolling is a very ineffective tool in managing congestion. With the exception of the Sydney Harbour Crossings, tolling is generally not used as a price rationing mechanism. In return for funding the road project, the private sector manages and charges motorists for the use of that asset over an agreed concession period.

Heavy vehicle charges
The National Transport Commission (NTC) first introduced heavy vehicles charges for the road freight industry in July 1995 for vehicles greater than 4.5 tonnes gross vehicle mass (GVM). The PAYGO approach was adopted to recover expenditures on road construction and maintenance attributable to heavy vehicle use of the road network, comprising registration fees and a net fuel charge. The registration charge is set at a uniform rate for each vehicle class to reflect the mass of the vehicle and its road damage impact. Heavy vehicle charges are determined by the Australian Transport Council (ATC) on advice from the National Transport Commission (NTC 2008).

Network based road pricing
Network wide road pricing is a more comprehensive approach to charging for road use and could potentially encompass elements of all of the above schemes. This could involve setting prices for road use which could vary constantly within a given price band and/or time period according to traffic volume or demand for road space. Prices could be set across the network as a general approach to charge all vehicles (both heavy and light) for use of the road network. A network wide pricing system could be levied on both urban and non-urban based traffic according to location and distance travelled and in the case of heavy vehicles, mass. In addition, for urban networks, a third tier should include the cost of externalities (noise and emissions) based on time of travel to reflect traffic volume or demand for road space in the urban context.

See: Eliasson and Lundberg 2002; BITRE 2008; NTC 2008.

3 Current Examples of Road Pricing Schemes

3.1 The rise of demand side responses

With current technology, it is now possible to vary prices for road use and public transport use within a given price band and/or time period according to traffic volume or demand for services. However, number of practical issues need to be considered in developing a broad based road pricing scheme, namely:

- What key objectives should pricing instruments fulfil in the context of transport?
- In which locations and regions should they be introduced?
- What types of vehicles and transport modes should they be applied to, and what current road user charges should they replace?
- Can a system be designed that is efficient from an economic perspective, but is also understandable to members of the general public?
- What are the equity implications across different socio-economic groups and regions from introducing a national road pricing scheme?

These are not easy questions to answer, especially given the complicated regulatory and political environment that characterises our transport systems. Before considering these questions in more detail, it is important to consider road pricing schemes which have already been introduced in other parts of the world, and the objectives they were designed to meet.

A study of a number of the world's leading cities by the Commission for Integrated Transport (CfIT) in London has found the only way to reduce car use is to include a measure of demand management that complements public transport investment (CfIT 2009). This finding is becoming more commonly accepted, and is resulting in a change of thinking among transport planners - rather than merely adding to the stock of road infrastructure to increase road capacity and meet

demand, planners in many cities are now openly considering charging for road access as a means of dealing with increasing congestion.

As cities become physically constrained in terms of the potential for increasing their road network, authorities are progressively looking to more 'demand-side' management initiatives to deal with increasing congestion problems. Three such cities that have implemented road access charges in various forms are Singapore, London and Trondheim. Aspects of these access pricing schemes are summarised in Table 1.

Table 1: Summary of some typical international experience with road pricing

	Singapore	London	Trondheim
Type of scheme	Congestion pricing	Congestion pricing	Toll pricing
Date of Implementation	• First road pricing scheme, known as the Area Licensing Scheme (ALS), was introduced in the Restricted Zone (RZ) in 1975 • Scheme was subsequently extended to major expressways with the Road Pricing Scheme (RPS) • In September 1998, the ERP system replaced the manual system for the RZ and expressways • In September 1999, ERP was extended to some key arterial roads beyond the RZ[(1)]	February 2003	• Cordon based scheme implemented in 1991 • Changed to zonal system in 1998[(2)] • Pricing system scrapped at end of 2005[(5)]
Motivation for Scheme	Regulate traffic in order to increase accessibility (through maintaining target speed).	Reduce traffic, finance transport investments	Finance new, transport-related infrastructure
Charging Area	CBD and expressways	21 Km^2 area of CBD	Formerly city centre based scheme, now a zone-based system with differentiated prices depending on the time of day.[(2)]
System Technology	RFID based tolling technology - smart card inserted into in-vehicle unit; scanned by on-site gantries around charging area using short range radio	Video camera system (ANPR*) with character recognition software	Tolling technology known as AutoPASS. It is intended that the system will provide a platform for additional functionality in the future (e.g. electronic payment, access control, traffic monitoring, and exchange of information between vehicles and roadside). AutoPASS is now the Norwegian standard for EFC-systems.[(2)]
Infrastructure	At least 60 overhead gantries on roads heading into charging area	700 camera in 230 positions, mobile units, data centre, pay machines and internet kiosks	20 unmanned and 2 manned toll booths with cameras for detection of cars without an AutoPass account[(5)]
Reduction in Congestion	10-15%	Vehicles by 20%, congestion by 30% (reductions greater than expected; resulted in reduced revenue)	Less than 5% (congestion reduction to aim of scheme)[(3)]
Annual Operating Costs	S$16 M[(6)] (2006$A13.6 M)	£64 M GBP[(7)] (2006$A159 M)	N/A
Annual Revenue	S$80 M[(6)] (2006$A 68 M)	£160 M GBP[(7)] (2006$A398.4 M)	150 M NKr[(5)] (2006$A32.4 M)
Other	• Fees revised every 3 months • Fees variable according to	• Revenues were 30 million GBP less than expected due to a	• Introduced 2nd generation zonal system in 1998

	Singapore	London	Trondheim
	congestion levels; displayed on billboards at each gate • Revenue goes into a national account; not distinguished from other state revenues	greater reduction in vehicle usage then envisaged	• Charges vary according to time of day (hourly) • Pricing scheme initially implemented to finance infrastructure; following a change in local government, the scheme scrapped from 2005 although there has been some push to reinstate for congestion purposes • Norway uses same card system among a number of cities which have different pricing regimes
Outcomes	• By 1988 there was a 31% reduction in traffic relative to pre-1975 levels despite a 77% increase in the vehicle population.	• Achieved a 21% reduction in traffic entering the charging zone relative to traffic levels in 2002. In 2006, congestion reduction was broadly in line with the 30% reduction realised in the first year of operation. • The scheme has also had a positive impact on reducing emissions and improving road safety • Average travel speeds have increased by 37%	• Little overall reduction in the total volume of traffic in the region where road tolling was introduced. • Improved accessibility for public transport vehicles within the tolled area. • Local government conservative party voted to not extend the scheme beyond 2005

(1) Singapore Land Transit Authority 2009
(2) PRoGRESS Project 2004
(3) Waersted 2005, p. 5
(4) Christainsen 2006, p. 81
(5) CfIT 2006a
(6) CfIT 2006b
(7) Litman, 2006, p .5
*ANPR-Automatic Number Plate Recognition

Plans existed in the Netherlands to introduce a distance based road user charge in 2004 with the aim of transferring the cost of owning a car to the cost of actually using it (Lundberg 2002, p. 15). It was intended that this kilometre-based charge would replace part of the Netherlands' existing vehicle excise charge. It was also planned that charges would be differentiated according to time of day and place of travel. Two years before the scheme was due to be implemented, a change of political majority resulted in a major revision of Government policy. It was decided that a road charging system would not be developed until an adequate road network and public transport system was in place, and hence the proposed system was discarded. Despite renewed interest in introducing road pricing in the Netherlands and agreement to introduce a scheme to the National Parliament in 2010, on 11 March the Dutch Government declared the proposed scheme as "controversial" and decided to discontinue preparations for the intended roll-out of the scheme.

3.2 Public perceptions of road charging

Past experience shows a common trend in public perception over road charging initiatives. Evidence from other countries suggests that, in the pre-implementation phase of some road pricing schemes, the majority of road users and those affected by the charge were firmly against it.

However, in the case of overseas schemes this opposition has tended to dissipate fairly soon after implementation as system benefits become more apparent (Eliasson and Lundberg 2002).

An example of this is the London congestion charge. Before the charge was implemented, the plan was widely criticised with the opposing candidate for the Mayor of London promising to remove the charge if elected. However, within a month of implementation, residents in other areas of London began requesting the charge be employed in their areas and the Mayoral candidate backed down on his promise (Litman 2006, p. 7). In terms of political implications of the charging system, the Mayor who implemented the system, Ken Livingston, was re-elected largely on the success of the scheme.

Experience suggests that the general public will be more receptive to road pricing schemes if the use of revenue from the scheme is transparent, and allocated towards transport system improvements (Chin 2002, Eliasson and Lundberg 2002). In the case of London, some 90 million pounds per annum ($AUD160 million) have been invested in public transport, walking and cycling infrastructure following the introduction of the scheme to ensure that transport users has sufficient alternatives to travelling by car. This has also been seen as important to ensuring equity of access to transport users by providing a feasible alternative to private vehicle use.

3.3 Key lessons from the review of international pricing schemes

Road pricing schemes in other countries appear to suggest a number of key lessons. First, schemes implemented to date have largely been restricted to individual cities or regions. There are likely to be significant political and socio-economic challenges for developing an all encompassing, network-wide road pricing scheme in other countries. A larger scale scheme would need to recognise the varying transport needs of different cities and regions, and would need to contend with complications arising from different political jurisdictions and current vehicle charging regimes.

Second, existing schemes have generally focused on specific transport problems and/or raising revenue for transport system improvements, rather than broader network management issues (e.g., more transparent and efficient allocation of revenue/expenditure, more equitable charging schemes). The extent to which the general public would support more holistic forms of road pricing is unclear.

Third, technology no longer appears to be a barrier to the introduction of road pricing. Tolling and location based technology have advanced significantly in recent years. With this technology comes the added potential of implementing road pricing schemes across wider geographic areas, which can vary according to different periods of the day or levels of service on the road network. Because of the rapid changes in image processing technology, the costs associated with the use of this technology are likely to fall dramatically in the future.

However it is important to note that costs of implementation and administration of such schemes can vary significantly by system. The London scheme for instance, is extremely expensive to operate.

The London and Singapore schemes highlight the key policy issues which have generated interest in road pricing. The demand for road space has exceeded the capacity available and the availability of funds, and in some cases, public support to continue to “build our way out of the problem”. Past experience based on this approach has clearly demonstrated that this is not a long term solution. Broader societal concerns associated with the liveability and social amenity of our cities, and increasing concerns arising from climate change, have combined to focus increasing attention on price as a way to better manage transport demand. Paralleling these developments, rapid

advances in technology have indicated that mass-distance-location tolling is emerging as a real and potentially low cost possibility to take forward the policy debate on road pricing.

The significant benefits generated by pricing schemes in other countries suggest that the concept is certainly worthy of consideration in the Australian context. However, the key lesson from past practice in Australia is the need for systems to be compatible across jurisdictions and to adapt the international experience from other countries which are now tending toward systems that incorporate electronic number plate recognition with global positioning system (GPS).

4 Evolution of technology

To develop abroad, wholly electronic, network-wide pricing regime an alternate system to a gantry based system will be required. Locational based systems and GPS technology (or Global Navigation Satellite Systems – GNSS) are relevant to the development of future network-wide road pricing schemes. GPS technology holds some advantages over traditional electronic tolling regimes. It removes the need for physical infrastructure in the network, it provides a high degree of flexibility and accuracy, it allows for distance-time-location based tolling and it also comes with the potential of providing value-added services for the road user (Persad et al 2007, p. 16). Furthermore, given the increasing frequency with which cars today come standard with in-built GPS systems, the cost and ease of implementing this system in the longer term will most likely be significantly less than that of a traditional gantry system.

Recent trials in the UK have explored GPS technology to monitor people's travel movements for potential application in the UK Department for Transport (UK DfT) National Travel Survey The key conclusion from the feasibility undertaken by the DfT was that further consideration should be given to exploiting the opportunities that GPS technology presents. However, on the basis of the experience of this feasibility study and the hardware used, the ability of GPS technology to deliver the necessary data within the context of the seven-day NTS was unproven (Anderson and Abeywardana 2009).

A number of cities have investigated the use of GPS tolling systems. Both Singapore and London have flagged the technology for future use in the next ten years. Pilot studies in a number of cities in the United States have also considered its potential use. Furthermore, GPS systems are commonly used at the moment in both the taxi and trucking industries. For example, the German trucking industry has used GPS technology since 2005 in a distance based pricing regime for all trucks using the German road network. A similar system is used in Switzerland (Samuel 2003). GPS also provides the basis for the Intelligent Access Program (IAP) in Australia. However, GPS based systems alone may not provide the best solution for addressing broader network management objectives.

5 The policy context

5.1 COAG Transport Reform Agenda

At its meeting in February 2006, COAG (COAG 2006) agreed to a series of major reforms of the transport sector including:

- development of proposals for efficient pricing of road and rail freight infrastructure, to be undertaken by the Productivity Commission;
- development of strategies to reduce current and projected urban transport congestion.

In response to the COAG decision, the Productivity Commission (PC) completed a review of road and rail infrastructure pricing (PC 2006) and concluded that:

- Efficiency losses are associated with current road charging arrangements through averaging of costs and charges, and the disconnection between road revenue and spending decisions. It was concluded that these provide poor price signals to the transport market, and distort the incentives needed for efficient road use and provision;
- Developments in road pricing technology create the opportunity for use of pricing instruments which offer the potential for substantial efficiency gains.

The implications of the PC Review for future road pricing policy are:

- Focus of the charging debate to achieve improved equity and efficiency within the road transport industry;
- Recognition of the direct link between use of the road network and charging for that use;
- Recognition of the role that Intelligent Transport Systems could play in delivering a more efficient pricing regime across the road network and across road users by better balancing the demand for and supply of road infrastructure.

5.2 COAG Urban Congestion Review

The COAG review of urban congestion (COAG 2006) concluded that, from overseas experience, price-based measures have the potential to moderate demand for road infrastructure when used with other measures such as improved public transport systems. In response to this finding COAG agreed that it would:

- Develop principles and analyse options for variable tolling regimes as a potential congestion management measure (e.g. varying tolls by level of road usage, time of day and/or class of vehicle);
- Consider the costs, benefits and any other feasibility issues for developing congestion pricing mechanisms applicable to a specific corridor or network, and suitable for Australian conditions;
- Investigate the impact of relevant financial and taxation measures on urban congestion (eg, FBT, stamp duty, payroll tax and fuel excise) (COAG 2007).

At their meeting in May 2008, the Australian Transport Council (ATC) agreed to undertake a comprehensive study to improve its understanding of pricing schemes which could be used to manage congestion.

5.3 Transport Reform Agenda – Heavy vehicle charges

At their meeting in May 2007, in response to the Productivity Commission's report (Productivity Commission 2006) on road and rail pricing, the Australian Transport Council (ATC) agreed that the National Transport Commission (NTC) should develop a new heavy vehicle charging regime for implementation in 2009. ATC directed that the new charges determination should ensure that the allocation of road infrastructure costs to heavy vehicles should be met in aggregate and that cross-subsidisation across heavy vehicle classes should be removed (ATC 2007). ATC is currently considering the feasibility of a mass-distance-location charging scheme to more accurately reflect use of the road network by heavy vehicles (ATC 2008).

5.4 Intelligent Access Program (IAP)

The Intelligent Access Program (IAP) is based on technologies surrounding Intelligent Transport Systems including telematics and vehicle tracking systems. The underlying principle for this

technology is the ability to send and receive information from Global Navigational Satellite Systems (GNSS), or the Global Positioning System (GPS) to record a vehicle's location. In 2005, ATC approved 'IAP Model Legislation' which led to the establishment of Transport Certification Australia (TCA) and the full implementation of IAP. A summary of IAP and its relevance to the development of a national road pricing scheme are discussed below.

Case Study 1: IAP - Lessons learned for the development of a road pricing system

The Australian Intelligent Access Program (IAP) is a national program which uses vehicle telematics (GPS) to monitor truck operator compliance with access conditions set by road authorities in different jurisdictions. Membership of the program is a pre-condition for access to Higher Mass Limit (HML) schemes in some Australian states, and use of non-prescriptive vehicle designs approved under the Performance Based Standards (PBS) program in all states. The scheme is administered by a statutory body called Transport Certification Australia (TCS) (see http://www.iap.gov.au/ for further information).

Whilst the system has been designed for ensuring heavy vehicle compliance, it could provide useful lessons for the development of a road pricing system. Many of the challenges that were tackled in the establishment of IAP are likely to be relevant in the context of a charging scheme i.e. developing:

- common standards for the technology, data communication channels etc
- data storage protocol and privacy considerations
- system governance arrangements, protocols for dealing with state based road authorities.

Australia was the first country to use locational based technology to ensure route compliance and facilitate the uptake of higher productivity vehicles. The lessons learned from this experience, and indeed the system itself, is likely to be very useful in helping authorities transition to a national road pricing system.

5.5 Carbon Pollution Reduction Scheme

The Australian Government outlined the basic principles of a proposed Carbon Pollution Reduction Scheme (CPRS) in its White Paper of December 2008 (Australian Government 2008). The White Paper has stated that the increase in fuel price resulting from the Scheme should encourage the development of new vehicle and fuel technologies, and encourage road users to reduce their demand for fuel. It is expected that this would be achieved by changes in driver behaviour, using alternative modes of transport, changing places of residence, sharing vehicles, and improved vehicle efficiency.

In April 2010, the Australian Government announced that it had decided to delay the introduction of the CPRS until after the current term of the Kyoto agreement which ends in 2012. Even then, any decision would depend on the extent of international action on climate change by the major economies, including the USA, China and India (Australian Government 2010).

5.6 Taxation Review

In their background paper for the Henry Taxation Review, Clarke and Prentice (2009) concluded that fuel taxes are an imperfect tool for reducing transport externalities including local pollution. However, they argued that from an administrative point of view, fuel excise represents an efficient

way of raising revenue and could be increased by around 10 cents a litre with other taxes being used as an off-set.

At the same time, Clarke and Prentice argued that, in some cases, taxes applied to the transport sector appear inappropriate and based on weak grounds. For example, the Luxury Car Tax (LCT) which contributed around $464 million to revenue in 2006-07, is difficult to justify in terms of market failure (i.e., there is little apparent need for government intervention in this area). From a road safety perspective for instance, the LCT may be seen as counter-productive to the early introduction of more advanced technologies into the vehicle fleet.

Clarke and Prentice (2009) concluded that:

- Consideration should be given to demand oriented user charges
- Current road user charges are geared toward cost recovery and do not help manage travel demand
- To be successful, road pricing requires an effective public transport system to provide road users with an alternative to private car use in urban areas
- Electronic road pricing could represent a cost effective approach
- For cities with high traffic density, cordon pricing may provide an effective intermediate step to full implementation of a road pricing scheme
- Fuel excise could represent a proxy for pricing vehicle emissions, i.e. more fuel efficient vehicles will pay less excise.

In its final report of December 2009, the taxation review suggested that while measures now used to "price" the demand for transport through the taxation system may represent an efficient mechanism to raise revenue, they may not be an effective mechanism to balance the demand for and supply of transport infrastructure nor promote an efficient transport sector. The review has placed more emphasis on direct rather than indirect pricing options by focusing on the implementation of a congestion tax:

Governments should analyse the potential network-wide benefits and costs of introducing variable congestion pricing on existing tolled roads (or lanes), and consider extending existing technology across heavily congested parts of the road network. Beyond that, new technologies may further enable wider application of road pricing if proven cost-effective. In general, congestion charges should apply to all registered vehicles using congested roads. The use of revenues should be transparent to the community and subject to further institutional reform. (Australian Treasury 2009).

In May 2010, the Australian Government announced its response to the review of Australia's taxation system (the Henry taxation review). In its response, the Australian Government focused on only a subset of the recommendations for implementation - these did not include the recommendation on the introduction of congestion pricing.

6 An assessment of road pricing options

Previous sections have considered examples of road pricing schemes in other countries and the relevance of pricing to the state and federal policy environment. Bearing this background information in mind, this section seeks to answer the following questions:

- What are the main benefits offered by different approaches to pricing road transport in Australia?
- What are some of the potential downsides of these schemes?

This section considers, in qualitative terms, a number of road user charging/pricing options, and the extent to which they could help progress ATC transport policy objectives. Six specific options are considered in relation to the ATC objectives (see Table 4).

Road user charges and pricing options

1. **Registration charges** – mechanism to regulate general access to road networks, with registration charges varying by vehicle class
2. **Fuel excise** – tax imposed on fuel use on a per litre basis which contributes to general government revenue
3. **Cordon pricing** – a localised, fixed charge for managing travel into a specific urban area. Cordon pricing is usually levied on all types of vehicles, and is essentially a flat charge or tax on travel/congestion
4. **Congestion pricing** – a fee which is varied according to traffic volumes or time of day, and applied to a specific area or road, or across a group of roads in an urban area. Congestion pricing can be used to manage transport demand across an urban network and is usually applied to all vehicle types.
5. **Heavy vehicle charging** – a distance or mass-distance based charge imposed on freight vehicles only, for use of urban and rural road networks. The main purpose of a heavy vehicle charging scheme is to better align heavy vehicle use of the road network with the cost of providing and maintaining the network. Advances in ITS and GNSS are allowing the extension of mass-distance charging to include location.
6. **National road pricing** - A network wide road pricing system (encompassing both urban and rural roads), involving a combination of fixed and variable distance based access charges. A national road user charging scheme represents an extension of cordon pricing to encompass whole networks. It would represent a direct user pays approach to the use of infrastructure to cover capital and maintenance costs, as well as the cost of externalities (i.e., noise and emissions).

6.1 Registration charges

Registration charges are imposed by State and Territory governments as an access charge to road users. In 2006-07, total vehicle taxes and charges collected by these governments amounted to $5.76 billion (ABS 2008) with an estimated breakdown comprising:

- Vehicle registration fees: $3.72 billion
- Stamp duty vehicle registration: $2.042 billion.

In the same year, funding of road related expenditure by State and Territory governments was $6.11 billion (BITRE 2009). In aggregate, revenues raised by State/Territory governments from road users almost balance expenditures by those governments on the roads sector.

While registration charges are administratively efficient in collecting revenue for road use, the main issue with registration fees relates to the fixed amount charged by vehicle class. While registration charges do vary within vehicle classes in some states (see Table 2), there is only limited recognition of distance travelled. For example, under the historic vehicle category, registration charges are reduced significantly to reflect the low kilometres travelled by these vehicles annually. However, for the general category of light vehicle registration, the lack of recognition of distance

travelled for registration charges means that low kilometre travellers cross-subsidise high kilometre travellers. Hence, it may be argued that registration charges have no real impact in curbing travel behaviour.

Table 2: Registration charges by state and passenger light vehicle type in 2008-09

Car type	Qld	NSW	Vic	WA	SA	Tas	NT	ACT	Average
Small	$263.00	$245.20	$178.00	$201.35	$125.00	$181.85	$162.40	$245.20	$200.25
Medium	$380.35	$275.40	$178.00	$265.35	$223.00	$204.85	$231.40	$275.40	$254.22
Large	$514.80	$392.20	$178.00	$313.35	$310.00	$246.85	$298.40	$393.20	$330.85
Method	Cylinders	Weight	Flat fee	Weight	Cylinders	Cylinders	Engine Cap.	Weight	-

Notes:

- Small car is defined as a 4 cylinder 2 litre car weighing approximately 1,100kg.
- (Medium) family car is defined as a 6 cylinder 3.5 litre car weighing approximately 1,500kg.
- Large car is defined as a 8 cylinder 5 litre car weighing 1,800kg.
- The definitions allow comparison of state registration systems due to the differing criteria and fees used to calculate total charges.
- This analysis includes all registration and related fees and excludes transfer charges and Compulsory Third Party insurance.
- All costs are annual, although some states allow quarterly or 6 monthly time periods for billing.
- These are the 2008/09 full prices for private use, not including concessions available to some motorists.

Source: RACQ Fact Sheet, *Motor Vehicle Registration fees in Queensland*.

6.2 Fuel Excise

Fuel excise has a long history in Australia, being introduced soon after Federation to fund the development of Australia's road network. The direct relationship between excise and road funding continued until 1959 when hypothecation of revenues from fuel taxation was abolished. At that point, fuel excise became a general source of taxation revenue. In 1982, a surcharge of 1c/litre on fuel excise was introduced to fund the Bicentennial Roads Program. This arrangement remained in place until the Fuel Tax Inquiry of 2001which re-instated the earlier position of no hypothecation of fuel excise to road funding (Australian Treasury 2001). The current rate of fuel excise is 38.143c/litre, and in 2008/09 fuel excise contributed $15.8 billion to revenue. There are two main issues with using fuel excise to price road use. First, it is non-discriminatory, i.e. it does not vary according to location of or time of day of road network use. Second, under current arrangements, there is no link between fuel excise revenue derived from road use and road expenditure.

6.3 Cordon pricing

Cordon pricing is principally a congestion pricing scheme applied to a defined area. Once the infrastructure is in place, the main benefit is that it is relatively easy to collect revenue. Depending on the use of revenues collected from users, it may be seen as a tax or a charge. If the monies raised contribute to the general revenue base of government, then it may be regarded as a direct tax on road users. If, on the other hand, the monies collected from cordon pricing are hypothecated to transport, then it may be regarded as a charge.

The impact of cordon pricing on governments' policy objectives varies with the type of cordon pricing scheme implemented. It may lead to improved use of infrastructure, providing users have

the option to change their travel behaviour, in which case it could have a positive impact on environmental objectives An example of such an approach is the hypothecation of revenues collected under the London congestion charge to public transport.

On the other hand, a cordon price could reduce accessibility by people from lower socio-economic backgrounds and may act as a barrier for people moving between different areas. In this case it is likely to be more regressive compared to fuel tax because it is only levied on certain transport users.

A cordon price does represent a transparent form of revenue raising, in that users know they are being charged for their decisions to use road infrastructure by location and time of day (e.g., Trondheim). At the same time, the use of funds so collected may or may not be transparent. In the case of Trondheim, the use of funds has been transparent in terms of improving transport infrastructure.

Cordon pricing schemes are likely to be neutral in their impact on transport system integration and hence are unlikely to result in an increase in overall transport efficiency.

6.4 Congestion pricing

In terms of the ATC objectives, by reducing congestion the Singapore and London schemes appear to have had a positive impact on promoting more efficient movement of people and goods. Congestion pricing could also generate environmental benefits through one or a number of factors including improved travel times, reduced vkt and mode shift to more environmentally sustainable forms of transport. The recently established variable tolling arrangements on the Sydney Harbour Crossing provide an example of a congestion pricing instrument (but should not be confused with a scheme like the London Congestion Charge, which is a cordon based fee covering a wide area).

Case Study 2: Variable tolling on Sydney Harbour Crossing

The introduction of variable tolling on the Sydney Harbour crossings (Bridge and Tunnel) appears to have met the objectives set by the NSW Government through the RTA, that is, to ease congestion and to change motorists' behaviour to travel outside peak time. From preliminary data (see table below) on traffic counts, the RTA concluded that '[m]otorists have adapted well to the changes and traffic volumes reflect a marked increase in people travelling before the peak period, with numbers falling again during the peak period between 6.30am and 9.30am on all crossings, including the Ryde and Gladesville bridges, when compared to the same time last year' (RTA 2009).

Impact of variable tolling on Sydney Harbour and Ryde-Gladesville Crossings

Charges and traffic volumes	Crossings (Tuesday)				
	05:30-06:30[(1)]	06:30-07:30[(2)]	07:30-08:30[(2)]	08:30-09:30[(3)]	09:30-10:30[(4)]

Toll ($)	2.50	4.00	4.00	4.00	3.00
Sydney Harbour Crossings - Traffic count:					
- 29/01/2008	4050	10237	11667	10361	7415
- 27/01/2009	4287	9097	10646	9468	8043
Percentage change	+6%	-11%	-9%	-9%	+8%
Ryde & Gladesville Bridges - Traffic count:					
- 29/01/2008	2754	6289	6942	5759	4864
- 27/01/2009	2808	5928	6290	5707	5282
Percentage change	+2%	-6%	-9%	-1%	+9%

(1) Average increase in traffic of 4% on all crossings.
(2) Average decrease in traffic of 9% on all crossings.
(3) Average decrease in traffic of 6% on all crossings.
(4) Average increase in traffic of 9% on all crossings.

Source: Roads and Traffic Authority of NSW

For all time periods on the day to day comparison, the total traffic count for the Sydney Harbour Crossings was 5.0% lower in 2009 compared with 2008, and for the Ryde/Gladesville crossings traffic count was 2.2% lower in 2009 than 2008. Part of this change in traffic volume could be attributed to the economic downturn which is consistent with the increase in public transport patronage. However, part of the greater decline in traffic levels for the Sydney Harbour Crossings would appear to support the RTA's argument that the introduction of variable tolling contributed to some change in people's travel behaviour. The NSW Government has committed to using the revenues collected from the variable tolling system of the Sydney Harbour Crossings on public transport improvements.

The longer term issue for managing demand for the SHC is whether the short term response of road users will be sustained, or whether demand will return to "normal" or trend. The question for road network operators is then the extent to which prices need to be increased to manage demand or relating price to quality of service.

The wide-spread use of toll roads in Australian cities, and high uptake of tolling tags amongst motorists means much of the infrastructure is already in place and variable charges could be imposed to better manage demand for that infrastructure. However, this would require re-negotiation of existing commercial agreements with private operators and consideration of broader network management for traffic diverting away from toll roads.

Congestion pricing is strong on dealing with highly specific transport problems in urban areas, but can be considered weaker on broader objectives, such as social inclusion (unless revenue is spent on transport for communities outside urban areas), integration (it can influence travel decision

making, but only in relation to specific routes and areas), and transparency (charges only apply to a section of the network, and are not specifically related to cost recovery).

Unless congestion pricing is applied to the whole urban network, given the extent of urban sprawl of Australia's capital cities and the growing significance of cross urban trips, it could be argued that location-specific congestion pricing would have only limited effect in meeting the ATC's broader objectives of improving transport efficiency and reducing transport's negative impact on the environment.

For instance, the Melbourne East-West Link Needs Assessment concluded that '[o]ver the coming decades, strong growth is expected to continue in Melbourne's outer suburbs….These patterns of growth will create increasing demand for cross-town commuting and freight movements, placing greater strain on Melbourne's cross-city links' (Victorian Government 2007).

In summary, it appears that the main impacts of congestion pricing on governments' transport objectives could be to:

- Contribute a slight improvement in economic efficiency but this would be highly localised to specific parts of the urban network but may result in negative broader network impacts
- Contribute to a reduction in road trauma through some change in users' travel behaviour to public transport
- Contribute to a reduction in transport impact on the environment in terms of less air pollution, lower noise emissions, and less toxic run-off to dams and water courses
- Improve transparency in directly charging for road use, but depending on the use of revenues collected this may or may not improve transparency in funding improvements to transport infrastructure/services
- Provide no impact on remote communities but it may have a negative impact on accessibility by lower socio-economic groups who do not have a transport alternative
- Provide no significant impact on integration unless the congestion pricing scheme is tailored in such a way that it facilitates access by heavy vehicles to ports, terminals and key distribution centres
- Improved social amenity and liveability of communities and urban areas.

6.5 Heavy vehicle charging

If developed, a mass-distance-location based heavy vehicle charge is likely to satisfy a number of important transport policy objectives such as efficiency, transparency, safety and environment. This would be achieved by developing a clear set of pricing arrangements which reflect the relative impact that the demand by different vehicle classes have on infrastructure use. A variable heavy vehicle charging system is also likely to have a positive impact on road safety. Safety benefits could be achieved by leveraging off an IAP style compliance system. This type of system could also generate environmental benefits by facilitating greater uptake of higher productivity freight vehicles. Heavy vehicle charging could also promote social inclusion and integration benefits by providing new revenue streams for local councils, as well as the use of higher productivity vehicles in remote areas (and hence reduce transport costs).

Whilst variable heavy vehicle charging offers a wide range of potential benefits, there are practical issues which still need to be overcome. There are technical challenges associated with measuring vehicle mass which require more specialised on-board vehicle technology compared to vehicle tracking applications like IAP. Further, given the average age of Australia's vehicle fleet at 10.3 years in 2004 (ABS 2004), the prospect of retro fitting is likely to be expensive and a barrier to widespread acceptability and adoption.

In their study on the acceptability of road pricing for heavy vehicles in Europe, Stewart-Ladewig and Link (2005) concluded that industry acceptance of a new charging system would be improved if the following were adopted:

- using a transparent method of defining the charge
- introducing the distance related charge to all vehicle classes including private vehicles
- offering some form of compensation for increased commercial transport costs and
- ensuring interoperability between technical charging systems
- earmarking revenues raised through road charges back to the road network.

Their study also emphasised the importance of implementing a nationally based scheme rather than a jurisdictionally based scheme. These issues have been addressed through the course of this discussion paper.

6.6 National road user charging

By varying the road user charges for all vehicles according to mass-distance-location and time variables, a national road pricing scheme could be used to better manage the demand for infrastructure. Revenues generated from road pricing could be used to fund a range of transport-related requirements in terms of both infrastructure and non-infrastructure measures to improve transport efficiency, including public transport.

A national scheme could comprise a two tiered approach – improved cost recovery for the provision and maintenance of roads infrastructure, and a component applied to travel within urban areas as a means of incorporating the cost of externalities (noise and emissions) in the travel decisions of road users. From this perspective, such a scheme has the potential to satisfy all key objectives, and could facilitate the attainment of broader transport objectives such as social integration through improved access to public transport.

The main difficulties of this approach relate to implementation. While there could be potential to leverage off tolling technology in urban areas, the main problem arises in extending the scheme to a fully national system which would require location based technology. This raises similar issues to those discussed above for heavy vehicle charging. A national system would also be politically complex given current taxation arrangements. These and other issues relevant to implementation of a national road pricing scheme are discussed in the next section of the paper.

Summary

The likely impact of the different approaches to road pricing on Governments' objectives for transport are summarised in Table 4. The basis for Table 4 is to provide a comparative assessment by assigning a qualitative assessment of the direction of impact of those measures. For example, a flat registration charge across all light vehicles types without consideration of engine efficiency is seen as having a negative impact on the environment objective. From a comparison of the various approaches, a national road pricing scheme would appear to make the greatest contribution to meeting policy objectives relative to other options. However, the extent to which a national scheme actually advanced attainment of those objectives may depend on:

- The basis for determining the charge for road use
- The trade-off or balance between fixed and variable charges. With more weight being given to the variable component, it could be argued that users would become more conscious of their travel decisions rather than undertaking journeys because of the high annual sunk costs of operating a vehicle (ie., if the car sits there, owners think that it should be used to "recover" the sunk costs of registration and insurance)

- The determination/estimation of externalities and the pricing of those externalities, bearing in mind the Government's decision to introduce a Carbon Pollution Reduction Scheme
- The relationship between road pricing as a source of revenue and other taxes (e.g., stamp duty, luxury car tax, FBT, sales tax, fuel excise)
- The relationship between revenues from road pricing and expenditure on transport infrastructure and services, including:
  - Location of road use as the revenue source and location of expenditure – mismatches between the two may be
  - The extent of redistribution of revenues to support objectives of improved accessibility and social inclusion of remote unacceptable to the general public communities
  - Use of revenues for expenditure on broader transport requirements, such as public transport, rail freight, etc
  - Road pricing as a general infrastructure funding mechanism including funding non-transport infrastructure requirements such as for health and education
  - Road pricing as a source of taxation revenue with no direct hypothecation to transport
- The private and public costs of implementing a national road pricing scheme
- Potential differential impact of road pricing on equity across road user groups and mechanisms by which this may be addressed
- The administrative efficiency of the scheme to minimise leakage of revenues
- The implementation path to a national road pricing scheme including Governments' reform agenda (including taxation), use of technology and acceptability by both public and private sectors.

In the absence of detailed quantitative analysis of the economic impacts of a national road pricing scheme, to illustrate the likely direction of impacts, a national scheme is compared with the current arrangements based on registration charges and fuel excise. Neither of these offers any effective means of promoting the attainment of social inclusion or integration of transport activities or transport and land use planning/management. In some jurisdictions, registration revenues are used to directly fund road infrastructure whereas in other jurisdictions such revenues contribute to State Treasuries for general expenditure. Fuel excise may have some impact on curbing emissions in that it increases the price of fuel and hence adds to the variable component of vehicle operating costs. In contrast, a national road pricing scheme, if properly implemented, could contribute directly to enhancing economic efficiency, longer term positive impacts on the environment, and transparency in charging and funding, with the latter dependent on governments' decision on the use of funds so collected.

Table 4: Impact of Measures on ATC Objectives

ATC Objectives	Registration charges	Fuel excise	Cordon pricing	Congestion pricing	Heavy vehicle charging	National road user charging
Economic	-	+/-	+	+	+	++
Safety	0	0	+/0	+	+	+
Social inclusion						
• Remote communities	0	-	0	0	+	+
• Accessibility	0	-	-	-	0	0
Environmental						
• Emissions	-	+	+	+	+	+
• Energy use	-	+	+	+	+	+
Integration						
• Within transport	0	0	0	0	+	+
• Transport and land use	0	0	0	0	0	0
Transparency						
• Charging	+	-	+	+	+	+
• Funding	+/-	-	+/-	+/-	0	+

Key:

- (+) : positive impact
- (o) : no significant impact
- (-) : negative impact
- (-/+) : positive or negative impact depending on scheme implementation and management/use of funds

7 Considerations for a national road pricing scheme

Given that the primary purpose of this paper is to examine options to achieving a more efficient and coordinated approach to infrastructure use and funding, the implementation framework presented here is targeted toward that outcome. However, through the implementation of a national road pricing scheme, an overarching objective should be the development of a more efficient approach to network management.

7.1 Coverage of the scheme: national or state?

Australia has had a long history of fragmented and inconsistent transport regulations, which clearly creates a challenge for the development of a national road pricing scheme. Since recognising the need for a national set of transport regulations in 1991, it is important that COAG and ATC continue to push on with the reform process. Further, the disjointed nature of current road user charges for light vehicles is a key issue and again demonstrates the need for a single set of charges that gives consistent signals to road users. In addition, there is the potential to realise further efficiency gains through the development of a nationally based approach to vehicle registration, in contrast to the current situation of different state based schemes characterised by duplication and lack of mutual recognition in the ownership and use of vehicles.

Fortunately reforms are currently underway which are moving us (slowly) towards a single national transport market place (ATC 2009). National road freight reforms are well progressed – registration charges have been harmonised, Australia is now moving towards a national network of routes for higher productivity vehicles (with a nationally consistent monitoring scheme in IAP), and ATC is currently considering a move to a single licensing authority for heavy vehicles (NTC 2009). A challenging issue in the reform agenda is the agreement by ATC to proceed with the introduction of a mass-distance-location charging regime for heavy vehicles which could pave the way for a national road pricing scheme for all vehicles.

7.2 Fuel excise and other road user charges

One of the problems with the current set of charges is that they present users with an array of charges which for the most part are not directly related to use.

Fuel excise is a very efficient form of revenue raising and a “winner” for Treasury - increasing demand for transport generates increased revenue streams; however a key problem is that fuel excise is not related to location or time of day use. There is no relationship between fuel excise paid by users and infrastructure spending. Another emerging issue for Treasury is the impact that more fuel efficient vehicles and alternative fuels (including hybrid, electric, and fuel cells) will have on revenue for excise

Registration charges provide access to the road network – although we now have a national approach to heavy vehicle charges, registration charges for light vehicles (< 4.5 tonnes GVM) vary across jurisdictions. A flat fee based approach to registration does not provide the user with any incentive to reduce travel or move to more fuel efficient vehicles; the highest component of the registration charge in NSW is the motor vehicle tax which can account for around 85% of the cost of registration.

Other current charges are also problematic. Stamp duty on vehicle transfers vary across jurisdictions which could hamper cross-jurisdictional transfers. FBT payable on vehicle use can have the effect of encouraging vehicle use to lower the FBT rate. In addition, road users pay GST on fuel excise. Case Study 3 provides an overview of taxes and charges as a proportion of total vehicle operating costs.

Case Study 3: A sample of vehicle charges and operating costs

With fuel at $1.20/litre, total taxes payable to the Australian Government amount to 49.05/litre (40.8%) comprising 38.143c/litre in excise and 10.91c/litre in GST. For a typical urban journey in Sydney, total taxes and charges (excluding GST) represent between 17-21% of total trip costs, depending on the vehicle type as shown in the Table below. The estimates exclude the capital cost of vehicle, opportunity cost and depreciation, and are based on an annual average distance travelled of 15,000 Kms (NRMA 2008). A similar result holds for Melbourne where taxes and charges range between 12-15% of total trip costs.

COSTS	*Scenario 1: Campbelltown to Sydney (57.7 Km)*		*Scenario 2: Burwood to Melbourne (14.1 Km)*	
	Holden Commodore	**Toyota Corolla**	**Holden Commodore**	**Toyota Corolla**
Stamp duty	$1.51	$0.90	$0.31	$0.18
Total fuel costs	$9.36	$6.53	$2.29	$1.60
Proportion: Fuel	$7.03	$4.91	$1.72	$1.20
Proportion: Excise	$2.33	$1.63	$0.57	$0.40
Tyres	$0.84	$0.69	$0.21	$0.17
Servicing	$1.08	$0.69	$0.26	$0.17
Rego	$1.52	$1.07	$0.58	$0.58
Insurance-CTP or equivalent	$1.60	$1.60		
Premium	$1.17	$1.17	$0.37	$0.37
MCIS levy	$0.43	$0.43	$0.04	$0.04
Insurance-comprehensive	$2.86	$2.59	$0.84	$0.74
Tolls	$8.80	$8.80	$5.56	$5.56
Total trip cost	**$27.59**	**$22.89**	**$10.46**	**$9.41**
Taxes and charges (ex GST and tolls)	**$5.36**	**$3.60**	**$1.50**	**$1.20**
Percentage taxes and charges (excl GST)	**20.9%**	**17.6%**	**14.3%**	**12.8%**
Cost of existing taxes and charges	**9c/km**	**6c/km**	**11c/km**	**9c/km**

Options for reform

If fuel excise were phased out in favour of a road pricing scheme, then for the three years to 2006/07 an average revenue deficit of around $11.3 billion would need to be recovered from other sources of taxation. This is based on the assumption that an average level of Australian Government funding on road related expenditure would be maintained in real terms at around $3.0 billion per annum.

To illustrate, for 2006/07, GST revenue amounted to $41.2 billion. In order to recover the shortfall in revenue from the phasing out of fuel excise and to achieve no net change in taxation revenue to the Australian Government, GST revenue would need to be increased by around 30% to $52.5 billion. On this basis, the rate of GST would need to be increased by about 30% or as a crude measure from 10% to 13% which is still low by UK (15%) and European standards (e.g., France is 19.6% for most goods).

In some respects this could be a more equitable approach to taxation in that it would be shifting the tax burden from road users to the general community – that is, at the moment it could be argued that road users are cross subsidising the rest of society through fuel excise. Of course, other revenue sources could be considered in a similar way.

At the State level, consideration could be given to phasing out stamp duty and incorporating the revenue stream into road pricing or capturing it within the GST. At the same time, a variable registration charge based on distance travelled and engine efficiency would provide a clearer price signal to road users on the true cost of vehicle use.

In short, the long term components of a road pricing scheme must be clearly identified in order to implement the appropriate levers required to achieve governments' objectives. Further, these components need to be consistent across the board in order to remove conflicting signals to road users in their daily travel decisions.

Case Study 4: What could a variable distance based charge look like?

The price per kilometre that motorists might be charged under a road pricing scheme is difficult to determine without modelling specific options, but some basic figures can be derived by looking at selected transport statistics and current levels of road revenue and expenditure.

The table below provides a broad indication of what costs might look like under four hypothetical scenarios. The first scenario considers what costs might be charged if the objective of the system was to provide full recovery of taxes and charges (excl FBT) currently collected from road transport, i.e. if the system was designed to be revenue neutral. The second half of the table shows what costs might look like under a scheme designed only to collect current levels of road expenditure, i.e. assuming that revenue shortfalls (e.g. loss of fuel excise) are foregone or recovered by some other means outside the transport system (e.g. GST). The two variations of these scenarios include an estimate of the cost of externalities that may be attributable to light vehicle use in Australia's capital cities (derived from BITRE 2007) which could be recovered through a road use charge.

Full recovery of taxes and charges (excl FBT) currently collected from road transport	
Average taxes and charges (excl FBT) currently collected from road transport	$16.185 bn
Revenues attributable to passenger cars, LCV and motor bikes (1)	$14.379 bn
Average annual total vkt by pass cars, LCV's and motor bikes (2)	202.76 bn
Average road user charge	**7.1c/km**

Full recovery of taxes and charges (excl FBT) and cost of externalities attributable to light vehicles

Estimate of externality costs attributable to road use by light vehicles – rural (ATC 2006, Vol 3, Appendix C)	0.5c/km
Recovery of taxes and changes and externalities attributable to vehicles for rural road use (pc, LCV's, mb)	**7.6c/km**
Estimate of externality costs attributable to urban road use by light vehicle (ATC 2006, Vol 3, Appendix C)	4.3c/km
Recovery of taxes and changes and externalities attributable to vehicles for non-congested urban road use	**11.9c/km**
Estimate of externality costs attributable to urban road use by light vehicle during peak congestion (BITRE 2007)	0.9c/km
Recovery of taxes and changes and externalities attributable to vehicles during peak congestion	**12.8c/km**
Recovery of current road expenditure only	
Total road expenditures (2006-07)	$11.371 bn
Road expenditures attributable to passenger cars, LCV's and motor bikes (1)	$9.565 bn
Recovery of road expenditures attributable to light vehicles (pc, LCV's, mb): base charge	**4.6c/km**
Recovery of current road expenditures and cost of externalities	
Estimate of externality costs attributable to road use by light vehicles – rural (ATC 2006, Vol 3, Appendix C)	0.5c/km
Recovery of road expenditures and externalities attributable to vehicles for rural road use (pc, LCV's, mb)	**5.1c/km**
Estimate of externality costs attributable to urban road use by light vehicle (ATC 2006, Vol 3, Appendix C)	4.3c/km
Recovery of road expenditures and externalities attributable to vehicles for non-congested urban road use	**9.4c/km**
Estimate of externality costs attributable to urban road use by light vehicle during peak congestion (BITRE 2007)	0.9c/km
Recovery of road expenditures and externalities attributable to vehicles during peak congestion	**10.3c/km**

These scenarios provide estimates in the range of 5.1 –12.8 c/km. This provides an indication of the magnitude of charges that road users might pay under a pricing regime. However it is essential to recognise that charges are likely to be most effective if they incorporate a number of different elements e.g. a per km base charge paid by all road users, supplemented with an additional charge for certain roads within urban areas to manage transport externalities. This means that prices paid by road users could be quite low in certain circumstances (e.g. for travel on rural roads), and higher in others (for travel on certain urban roads during peak hour), depending on location and time of day. This approach is likely to be more preferable from a transport efficiency perspective, but needs to be balanced against the need to keep the design of the system as simple as possible. Road users will not respond to pricing signals unless they are easy to understand.

(1) Road cost recovery from heavy vehicles under PAY-GO approach averaged around 20% of total road expenditures (Second Determination), based on average taxes and charges (excl FBT) collected from road transport between the above years, this equates to $1.806 bn
(2) Based on 14,000 km which was the annual distance travelled by passenger cars from 2003/2004 - 2005/2006

(3) Assuming average annual total vkt by pass cars, LCV's and motor bikes of 202.76 bn kvt (from 2003/2004 - 2005/2006)
(4) Assuming light vehicles contribute 90% of pollution costs in capital cities.

7.3 Financial outcomes

In reforming current taxes and charges applied to the road transport sector, their replacement with a road pricing system needs to be at least a zero-sum result for all jurisdictions. That is, in order to achieve a national approach to road pricing, a consistent set of charges should be developed and applied across all States/Territories. Different schemes with different price settings would be a huge backward step and counter to the objective of a more efficient transport system. At the same time, as the technology evolves there should be the capacity to refine an early broad brush approach to better align price with quality of service (i.e., differential pricing according to road surface, performance standards, service levels etc).

A national approach to road pricing would suggest the need for a common clearing house preferably based on centralised administration for the dissemination of revenues based on network use. The question that then arises is whether or not this should be the basis of infrastructure expenditure.

Several models are relevant to addressing this question based on two components:

- Fixed charge centralised registration system with a registration fee based on location, distance travelled and vehicle efficiency with revenues distributed to states on the basis of place of residence or business
  - Encompass stamp duty in registration fee based on centralised system above – this would result in an increase in registration of around 50% to achieve a zero-sum result for states; however, this would mean that one-off charges would be annualised across all vehicle owners
  - Incorporate stamp duty in GST in line with the original basis of GST and the abolition of state stamp duty with redistribution to states in accordance with Commonwealth/State fiscal arrangements
- Variable price for road use based on location, vehicle mass and distance travelled which would replace fuel excise with redistribution of revenues based on either:
  - Source of road use
  - Infrastructure priorities.

The centralisation of administration of road pricing and infrastructure investment based on source of road use raises two issues:

- Efficiency of expenditure on marginal projects *vis-a-vis* projects with a higher benefit cost ratio (i.e., the "over-funding" risk, whereby the scheme could generate funds for projects which would not normally be considered worthwhile)
- Equity of access for people in regional and remote areas – the CSO issue (i.e., the "under-funding" risk whereby revenue might not support minimum road maintenance activities).

On the other hand, infrastructure funding could be centralised through an Infrastructure Fund (such as Building Australia Fund) which could determine the redistribution of revenues through an objective determination of investment priorities. In this case, a board comprising the

Australian and state governments should determine the allocation based on the economic evidence.

The other issue that arises in the consideration of investment priorities is the overall question of whether Australia's infrastructure is funded at a level commensurate with its short and long term needs. If a case exists, as the evidence would suggest, that we are in a state of under-capacity relative to the efficient delivery of services, then there would appear to be an argument to increase the funding of infrastructure. On this basis, while a revenue neutral approach to road pricing would be desirable, prices could be set at a level that increases the revenue take to expand infrastructure capacity. For transport, such funds should not be restricted to re-investment in the roads sector but should also include other transport activities that contribute to a more efficient and sustainable transport system overall, including public transport. In the urban context, this is important in providing road users with a viable option for mode shift and in improving equity of access across different socio-economic groups.

Further, if an efficient allocation of investment funding is pursued, then the road pricing approach could be expanded to fund infrastructure development in other sectors such as health and education. However, the counter argument to this would be the proposed absorption of any revenue deficit through the abolition of fuel excise into broader based taxes to fund such activities on the basis of taxation efficiency and equity. There would appear to be more merit in this approach unless the efficient use of road funds is achieved within the transport sector.

7.4 Coverage: urban versus rural

The possible introduction of a heavy vehicle charging regime based on mass-distance-location would likely provide coverage across both the urban and non-urban networks, depending on the type of technology adopted for implementation.

Initially, a road pricing scheme for light vehicles could be capital city based and expanded to major urban centres as the technology and adoption process is phased in following the implementation of a heavy vehicle scheme. However, this should not imply the introduction of a single distance based charge for light vehicles as road pricing is rolled out across the broader network. In effect, a two tiered approach could be taken to manage demand and fund infrastructure:

- First, a flat charge (including externalities) across the network should be applied to manage demand and to fund transport infrastructure including capital and maintenance expenditure – this would be the base price. Rural road users (light vehicle) would pay a minimum charge to reflect access and the marginal costs associated with rural road use.
- Second, a premium should be applied in capital cities and major urban centres to improve the efficiency of use of infrastructure by providing a mechanism to internalise the external costs of transport (i.e., congestion and emissions).

The current network of tollways in Melbourne, Sydney and Brisbane could provide a framework for improved network management through a variable tolling regime (as per the newly introduced variable tolling arrangement for the Sydney Harbour Crossings). However, there are two main issues here:

- The need to re-negotiate current commercial agreements with private toll road operators;
- Partial coverage of the network by toll roads and the potential negative impacts of road users diverting to unpriced roads depending on their individual time cost and road price

trade-offs under a variable pricing regime where there is a premium charged for peak demand.

7.5 Equity issues

The introduction of a national road pricing and vehicle registration scheme is likely to generate a range of equity implications. While these have been raised in studies on road pricing the extent and incidence on different socio-economic groups is not easy to determine (BITRE 2008, UK House of Commons Transport Committee 2009). The reform of taxes and charges imposed on the road transport sector could help to address the current inequity borne by road users as a group in that the revenues so raised contribute to the broader welfare of society. Only a minor component of the taxes and charges collected by governments is allocated to fund road transport infrastructure. The introduction of a direct link between revenues from road pricing and transport infrastructure funding has the potential to contribute to transparency and equity objectives of governments. Funding of public transport to address access issues for people without public transport options should promote the attainment of a fairer and more sustainable approach to transport in the longer term.

7.6 Other considerations

While urban based schemes could leverage off existing tolling technology to introduce road pricing to currently non-tolled parts of the network such as urban arterials, this would not provide a sensible long term solution given the infrastructure costs involved. Current developments in technology suggest that there are no real technical constraints to introducing a national road pricing scheme for Australia in the medium term.

In the interim, one approach might involve the use of odometer readings for general access charges, with use of tagging and ANPR technology in urban areas. For example, odometer readings could be provided at the time of re-registration of vehicles. Developments in heavy vehicle charging suggest that road freight could provide the springboard for a comprehensive locational based approach to road pricing.

The key issue with technology is that the road pricing scheme framework and objectives should dictate the type of system used, and not the other way around. The system ultimately chosen will need to balance the usual constraints involved with large scale reform involving technology e.g. cost for industry/motorists, costs for government, effectiveness, relative simplicity. Hence, the procurement process should be outcomes focused so that industry can competitively bid on the ability of the technology to satisfactorily deliver the outcomes in a cost effective and reliable way.

A problem with road pricing in urban areas is that unless it covers the whole network it could lead to evasive action by motorists (i.e., rat running). This raises issues for local government and their role in managing those parts of the network for which they have responsibility. This could include non-price regulatory measures (such as zoning – lower speeds, restricted access, and enforcement) or infrastructure measures (one-ways, speed humps etc).

There appears to be few options for dealing with this issue other than developing detailed plans for specific areas and roads as part of a general approach to network management. In some ways, the process is no different from what happens with current major road developments and

so it is not insurmountable. The recent trial of Automatic Number Plate Recognition (ANPR) system in Brisbane to manage heavy vehicle movements demonstrates the potential for integrated network management using ITS technologies. The trial was designed to restrict heavy vehicle movements along the Brisbane Urban Corridor and was successful in encouraging trucks to use alternative routes such as the Logan Motorway.

7.7 Committing to transport system improvements

A key consideration from a transport user's perspective is what road pricing revenue is spent on. Large sections of the public will view road pricing as just another tax. Hypothecation of revenue will be essential and was a factor in making the London scheme palatable to the general public. The London experience also demonstrates the importance of investing in transport system improvements before schemes are rolled out, as well as after. A price premium for urban areas will (indeed should) trigger major changes in behaviour and mode shift – the public transport system needs to have the capacity to absorb changes in travel behaviour otherwise governments' (transport) policy objectives will not be met. This was a key lesson from the recent hike in fuel prices and the increase in patronage witnessed on public transport. However, while the potential extent of the change remained unknown because of capacity constraints with public transport, the key issue is whether such shifts are permanent or temporary. Hence, this can also help improve public perception because transport users can see improvements being made from an early stage.

7.8 Making sense of road pricing

From an economic view, the ideal urban road pricing system would vary according to traffic volumes, i.e. fully dynamic rather than based on somewhat arbitrarily pre-determined time periods. However the more dynamic a system is, the more complicated it becomes from a user point of view. Road pricing is a relatively complicated concept as it is, and a scheme which is difficult to understand is likely to fail. For other commodities or services, the consumer usually knows beforehand what the price is likely to be before the point of transaction. Road users will want to have some understanding of how much they would actually pay to make a journey at any given time before embarking on the journey. Hence, effective public education in advance of rolling out a system will therefore be vital to the acceptance and success of such a scheme.

It will be essential for these issues to be considered within the public debate on a road pricing system for Australia. An initial step in this direction could be facilitated by the seed funding of projects to trial road pricing on some key routes. While this may be useful in gauging public reaction, it may not provide an accurate measure for two reasons:

- A feasible public transport option would need to be in place so that road users have an alternative to private car use
- Road users may take short term measures to "avoid" the road price on the basis that it is "just a trial".

8 Conclusion and Recommendations

The purpose of this paper is to facilitate debate on whether Australia should proceed to develop and implement a national road pricing scheme. The debate is timely given the review of taxation currently underway and the broader reform agenda for transport, including the funding and

provision of transport infrastructure. Now is the time for policy makers and the general public to seriously consider the role of road pricing among options to better manage the forecast growth in the demand for transport.

8.1 Key issues for the debate

The introduction of a national road pricing scheme can achieve more efficient use of transport infrastructure and generate funds for investment in transport infrastructure. In moving towards a pricing scheme, the following issues need to be considered within the public debate:

1. **What effect should a scheme have on current road user charges and government revenue?** To be acceptable to all jurisdictions, a national scheme as a minimum should not have a negative impact on budget. An issue which needs to be debated is whether or not revenues should be increased to expand infrastructure capacity and if so, by how much

2. **Should a scheme be developed on a national basis with uniform charges, or on a state by state basis using a common framework?** The net benefit of moving toward a national scheme needs to be weighed against proceeding with a state based scheme and whether a national scheme should be extended to include a centralised registration system encompassing a common clearing house for collection and distribution of revenues. The key issues here are the relative merits of different approaches in terms of administrative and operational efficiency for road agencies and road users. Either way, the development and implementation of a national scheme would appear to depend heavily upon leadership by the Australian Government.

3. **How should current road user charges be changed?** The impact of replacing the current system of fixed registration charges with distance based registration charging needs to be assessed in terms of its likely effect on changing user behaviour. The current review of commonwealth taxes also needs to take into account:
   - Trade-off between road price and excise to fully recover road expenditures
   - Abolition of the FBT
   - Possible taxation offset in other areas (such as the GST) to offset revenue deficit caused by removal of excise and the FBT as a more equitable basis for taxation

4. **What framework could be adopted for a road pricing system?** Variable mass-distance-location road user charges can encourage greater awareness of travel choice decisions to improve the efficiency and provide a better infrastructure funding mechanism. A system could be founded on a number of different components, e.g. a base charge for road use paid by all road users, and a premium for the generation of noise and air emissions in urban areas to address externalities generated by the transport system. The latter pricing regime could include time of day pricing on key road corridors

5. **How should revenue be spent?** International experience suggests that the acceptance of road pricing is enhanced when the revenues collected are hypothecated to an Infrastructure Fund which could be used to improve the transport system including public transport in order to address equity concerns that may arise.

6. **What other practical issues need to be considered?** The potential benefits of a road pricing scheme are clear, but other important practical issues need to be considered as part of the debate. Among others, these include:
   - *Making the system comprehensible*: the Singapore road pricing scheme is based on service delivery measured by travel speed and appears to be well understood by road users. A road pricing scheme based on service may be more acceptable to road users than a simple fixed price time based scheme that does not address service requirements such as expected travel time. There are important time-cost trade-0ffs here for road users that may need to be tested under a trial arrangement.
   - *Technology options*: It is important to remember that the road pricing scheme framework and objectives should dictate the type of system used, and not the other way around. The system ultimately chosen will need to balance a range of constraints e.g. cost for industry/motorists, costs for government, effectiveness, relative simplicity
   - *Cost of administration*: related to the above a potential issue in moving toward a national road pricing scheme could be the costs of administration. A scheme would need to contribute both to transport efficiency and administrative efficiency. An important lesson from the international experience is the need to avoid the high administration costs that have characterised the Central London Congestion Charging scheme which account for around 50% of total revenues

8.2 When could a scheme be implemented?

If road pricing is seen to have a role in progressing a more sustainable and efficient transport system, then consideration needs to be given to a possible implementation path that needs to take account of a range of issues including the reform of current taxes and charges paid by road users. Timing will need to allow further refinements in network wide pricing technology to be cost effective.

The most appropriate way forward could be a phased approach across the network by road category to allow development of public transport infrastructure to provide road users with choice in their travel decisions: National Network, State Highways and Arterials, urban network, major non-urban local roads. Developments within urban networks will need to avoid negative impacts such as rat running. At the same time, jurisdictions could consider the phased introduction of variable registration charges to help focus road users' decisions on the actual cost of their choice of travel.
The transition period would need to parallel reform of current taxing regimes by State and Federal Governments in order to move toward a consistent set of price signals for road use.

8.3 A way forward

As an immediate plan, there would appear that there are five main points to progress the concept of a network wide road pricing scheme:

1. **Continue the harmonisation of state transport regulations through the COAG reform agenda** – the lack of consistency and uniformity across jurisdictions in their approaches to transport regulations has increased the cost of doing business in Australia. In addition, the duplication of activity has imposed a significant administrative cost on society. The COAG reform agenda requires full support from all players if these burdens are to be removed from

society and the development of a platform to embark on other reforms to achieve a national transport market.

2. **Extend the harmonisation of tolling schemes to include variable tolling as a first step towards a demand management solution** – the COAG Urban Congestion Review suggested that consideration should be given to the implementation of variable tolling regimes as a step toward the introduction of road pricing. This would extend the concept of tolling as a financing mechanism to also managing demands for road space. The introduction of variable tolling on the Sydney Harbour Crossings represents a step in this direction. It is recognised that current agreements with toll operators would need to be reviewed and that consideration would need to be given to revenue streams in terms of the infrastructure financing requirement. However, there would appear to be scope to assess this as an option as part of a broader approach to network management.

3. **Implement heavy vehicle reforms and establish a national heavy vehicle charging scheme based on mass-distance-location** – the current review of heavy vehicle charges could provide the mechanism for a national approach to a road pricing scheme for all vehicles

4. **Reform state based road user charges to provide better price signals to road users** – current registration charges are inequitable in their impact in that they disadvantage low kilometre users relative to high users. A better approach would be to base registration charges on distance travelled and engine efficiency. A variable registration charge based on odometer readings at time of vehicle registration/inspection could be a first step. Initially this could be based on broad bands of vkt increments (e.g., < 10,000kms; 10,000 to 30,000 kms; > 30,000kms).

5. **Consider ways in which commonwealth taxes can be reformed to achieve a more efficient taxation regime and one that provides consistent and clear signals to transport users** – the array of Commonwealth taxes on road users sends conflicting signals to road users. The rate of the FBT reduces with distance travelled; fuel excise is an efficient form of tax collection but is not related to location or time of infrastructure use; and the LCT is an inefficient form of taxation in terms of government objectives. The range of taxes imposes an administrative burden on users and government which contributes to the overall cost of transport. The use of a single price would improve administrative efficiency and, if hypothecated to an infrastructure fund, would provide a clear link between infrastructure use and provision.

Not all of these reforms are short term. However, the key point is the setting of a clear agenda and path for all governments to achieve an efficient national pricing and infrastructure investment framework transport over the next five or so years. In proceeding down the path of a national road pricing scheme, a phased approach should be considered which includes:

- Development and conduct of trials in capital cities to test:
  - Technology options
  - Changes in travel behaviour, including “credits” for not travelling during periods of peak demand
  - Trade off between fixed charges and variable charges based on vehicle use rather than vehicle ownership
  - Options available to employers to allow adjustment of work patterns for commuters to avoid peak demand for road use

- Implementation of heavy vehicle mass-distance-location charging across urban and non-urban network
- Investment in public transport and "transport system deficiencies" to provide road users with a viable alternative to private vehicle use
- Phased implementation across light vehicles over a five year time-frame to enable equipment roll-out and transition by road agencies to distance and emissions based charging for registration
- Implementation of tax reforms in the direction of a user-pays approach to road use based on revenue neutrality.

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