International Transport Forum

A Corporatised Delivery Model for the Australian Road Network

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Working Group Report

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Foreword

Transport infrastructure is a major enabler of economic development. In the drive to refurbish or build, governments worldwide have turned to the private capital market for financing. The primary narrative behind this push is the huge stocks of private capital that are available, while public financing capabilities are said to be limited and insufficient.

The almost exclusive vehicle of private investment in transport infrastructure, including social infrastructure, is Public-Private Partnerships (PPPs). In the context of PPPs, two important aspects have received little attention.

First, sufficient attention has not been given to the role of suppliers. The focus of governments and Intergovernmental Organisations has been on resolving the challenges to private investment from the viewpoint of investors: reducing the uncertainty they face and enabling them to price risk more efficiently by establishing infrastructure as an asset class.

However, looking only at investors gives an incomplete view of the total cost of the risk transferred from the public to the private sphere. In PPPs, investors transfer some of the major risks they are not comfortable bearing to design, construction, maintenance, and operations contractors.

Suppliers, too, face uncertainties and are unable to efficiently evaluate price risk. In such cases, the base cost of the initial investment – and of subsequent services – may be much higher than they might have been, and not just the cost of their financing.

Uncertainty arises from the difficulties to accurately estimate the cost of construction, maintenance, operations, and financing. But it also stems from "unknown unknowns" (the so-called Knightian uncertainty). For instance, changes in weather patterns or paradigmatic technological shifts, the timing and impact of which are unclear, will influence what infrastructure is needed and where.

So what can policy makers do to reduce the cost of inefficient risk pricing of suppliers? Where does this put PPPs? How can public decision makers reconcile long-term uncertainty with private investment in infrastructure? Who should bear long-term uncertainty in projects: the public or the private sector?

These were some of the guiding questions for a Working Group of 33 international experts convened by the International Transport Forum (ITF) in September 2016. The group, which assembled renowned practitioners and academics from areas including private infrastructure finance, incentive regulation, civil engineering, project management and transport policy, examined how to address the problem of uncertainty in contracts with a view to mobilise more private investment in transport infrastructure. As uncertainty matters for all contracts, not only those in the context of private investment in transport infrastructure, the Working Group's findings are relevant for public procurement in general.

The synthesis report of the Working Group was published in June 2018. The report is complemented by a series of 19 topical papers that provide a more in-depth analysis of the issues. A full list of the Working Group's research questions and outputs is available in Appendix 4.

Acknowledgements

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Executive summary

What we did

Funding of the land transport sector presents a significant challenge for governments around the world. Governments have pursued public-private partnerships (PPPs) as a temporary bypass to public debt or deficit constraints, postponing potential fiscal implications of these decisions to future governments. While considered highly successful in some instances, experience with PPPs includes examples with poorer outcomes. Inadequate project development, inappropriate risk allocation (especially the assignment of demand risks) and limited competition for the contract – among other issues – have all contributed to these outcomes.

Experience in other infrastructure sectors demonstrates that a well-designed and well-managed regulatory structure can provide an effective mechanism to manage demand and delivery risks, and, in turn, facilitate private investment in infrastructure networks. However, these regulatory structures rely on a stable funding structure, whether from user charges and/or from government.

This paper argues for a shift towards a corporatised approach to road governance in Australia and gradually to the use of a regulated asset base (RAB). In a corporatised approach public road agencies are transformed to state owned road corporations, which implies a change in the governance and other dimensions. The paper also assesses the prospects for such a change.

What we found

Australia's 874 000-km road network is one of the largest in the world. New motorways have been developed within and between the capital cities. Increasingly, in urban areas, roads are being built in tunnels at significant cost. There are 16 PPP projects with a total network length of 241 km.

The Australian road network had an estimated depreciated replacement cost of AUD 470 billion in June 2015. Spending by governments on roads in 2014-15 totalled AUD 23.5 billion or about 1.44% of Gross Domestic Product (GDP). Government spending on roads has risen to above the OECD average. Road-related revenues – principally fuel excise, vehicle registration fees and driver licence fees – totalled AUD 28.7 billion in 2014-15. As in several other countries, fuel excise receipts are declining.

Yet, at the same time, road usage has been increasing. Although per capita usage has stabilised over the last decade at around 10 500 vehicle kilometres travelled per person per year, rapid population growth is causing an increase in total road usage. This population growth, and therefore traffic growth, is projected to continue (in percentage terms, Australia is one of the fastest-growing member countries in the OECD in terms of population). Relevantly, most population growth is occurring in the cities, i.e. those areas where expensive road forms such as tunnels need to be built.

Road freight is also growing in line with population and economic growth. The road freight sector's share of total bulk freight has remained around 75% (measured in tonne km) for the last 30 years.

The current system of road governance has several weaknesses, including the relative absence of clear objectives and standards for the road network, growing financial pressures on government budgets, and weaknesses in project planning, selection and procurement.

Various efforts to reform road governance and funding have been attempted over some decades. Australia has been at the forefront of introducing user-funded PPPs for roads. While these were initially successful, a number of projects collapsed financially in the mid-2000s, principally because projected demand was not realised. As a result, the private sector has become more risk averse. More recent PPPs have involved government financial support.

Governance and funding reform in the heavy vehicle sector has been slow in coming. It is not much further advanced now than 10 years ago. Nevertheless, there are some recent, encouraging signs, including the development of a "forward-looking cost base" that could be used to improve heavy vehicle charging arrangements, and investigation of independent price regulation of heavy vehicle charges.

Charging for light vehicle usage remains politically contentious, as it is in other countries. Although a public inquiry into issues associated with light vehicle charging has been proposed, any move to light vehicle charging is at least 10 years away (and probably more likely 15 to 20 years).

Industry and community acceptance of the need to change is at an early stage. While industry associations and road user organisations have made supportive comments about the need to explore options for governance and funding reform, that support is not assured.

Given the significant growth pressures and prospective funding challenges, and given the political sensitivity around light vehicle charging, it is critical that a staged approach to road reform be pursued.

The early establishment of a regulated asset base for the higher order road networks would be an important "no regrets" step towards a broader set of reforms. Even if funding reform and full economic regulation were never to occur, the development of a "shadow RAB" and changes to provide additional independence to road agencies would improve the effectiveness, efficiency, and transparency of spending in the road sector. For example, the process of developing an RAB could address the material data and asset management weaknesses in many parts of the Australian road sector.

These early steps can be built upon. An RAB will be important in any form of heavy vehicle charging, as it will be, over time, in light vehicle charging. The potential productivity improvements associated with this reform are significant. Similar reforms in other Australian infrastructure sectors in the 1990s led to increases in GDP of around 1%.

What we recommend

Start the journey – there is no time to lose

The history of road reform in Australia shows that any material change takes time. However, the demands on existing road networks are growing, as are funding pressures as vehicles become more fuel-efficient and other demands on constrained government budgets increase.

Corporatisation of infrastructure management is beneficial regardless of the geography

Numerous countries to date have already adopted this model and roads and other network industries, such as electricity generation. The shift involves the imposition of similar commercial and regulatory obligations to those faced by private businesses in competitive markets. It also involves the establishment of independent mechanisms for handling complaints when regulatory requirements have

been breached. Furthermore these corporations are accompanied by the creation of independent authorities to set, administer or oversee prices for monopoly services.

Establishing an RAB for a publicly owned corporation is a good first step

Even before a transition to a corporatised model is decided, establishing a regulatory asset base for the road network is useful. It provides the basis for predictable expenditure on maintaining asset quality. And it is a necessary first step in any broader reform.

Invest up front in developing an overall architecture and "working the problem"

Given the range of complex inter-governmental, funding and institutional issues involved, it is vital that the government spends the time and resources to understand how the pieces of the puzzle fit together.

Engage early and often with the public and across the political spectrum

Without a concentrated effort to keep the public on-side (over many years), and to maintain a consensus at a political level, the prospects for success will be greatly diminished.

Do not let "pursuit of the perfect" get in the way of sensible "no regrets" reform

Given the political difficulties in pursuing broader road reform, focusing on staged, "no regrets" steps towards the longer-term goal is still worthwhile.

Introduction

This paper has been prepared as a contribution to the International Transport Forum's (ITF) Working Group on Private Investment in Transport Infrastructure. The paper argues the case for a shift towards a corporatised approach to road governance in Australia (including use of a regulated asset base or RAB), and assesses the prospects for such a change. A corporatised model could facilitate greater private investment in the nation's roads, especially if it is linked to reform of road charging arrangements. This could address, at least partially, looming funding pressures facing the road sector. Even without funding reforms, elements of a corporatised model – for example using the disciplines of a RAB – could yield important efficiency gains.

Australia has a large road network, spanning approximately 874 000 kilometres. A number of countries have larger road networks, when measured simply in kilometres of road. However, when assessed against the size of the economy, as measured by per capita Gross Domestic Product (GDP), Australia's road network is very large, ranking second only to Sweden among the larger economies (see Figure 1).

The road network is a part of the foundation of Australia's economy. It is important, therefore, that Australia's governments and private road owners manage the road network as effectively as possible. Current governance and decision-making processes are not necessarily delivering on this aspiration. While Australia is relatively rich, maintaining and developing a road network that meets the needs of road users and others remains a challenge. Road funding, and making better use of existing roads, are particular challenges.

Faced with budgetary constraints, several Australian governments have attempted to attract private investment in the transport network. Public-private partnerships (PPPs) have been a feature of the Australian transport environment since the late 1980s. However, while a small number of early road transport PPPs were wholly funded by the users (and proved a financial success), more recent PPPs have often involved relatively little user funding and instead relied significantly on various forms of government funding support, for example availability payments. This shift was a response to several factors; including the financial failure of several PPPs in the first decade of the new century.

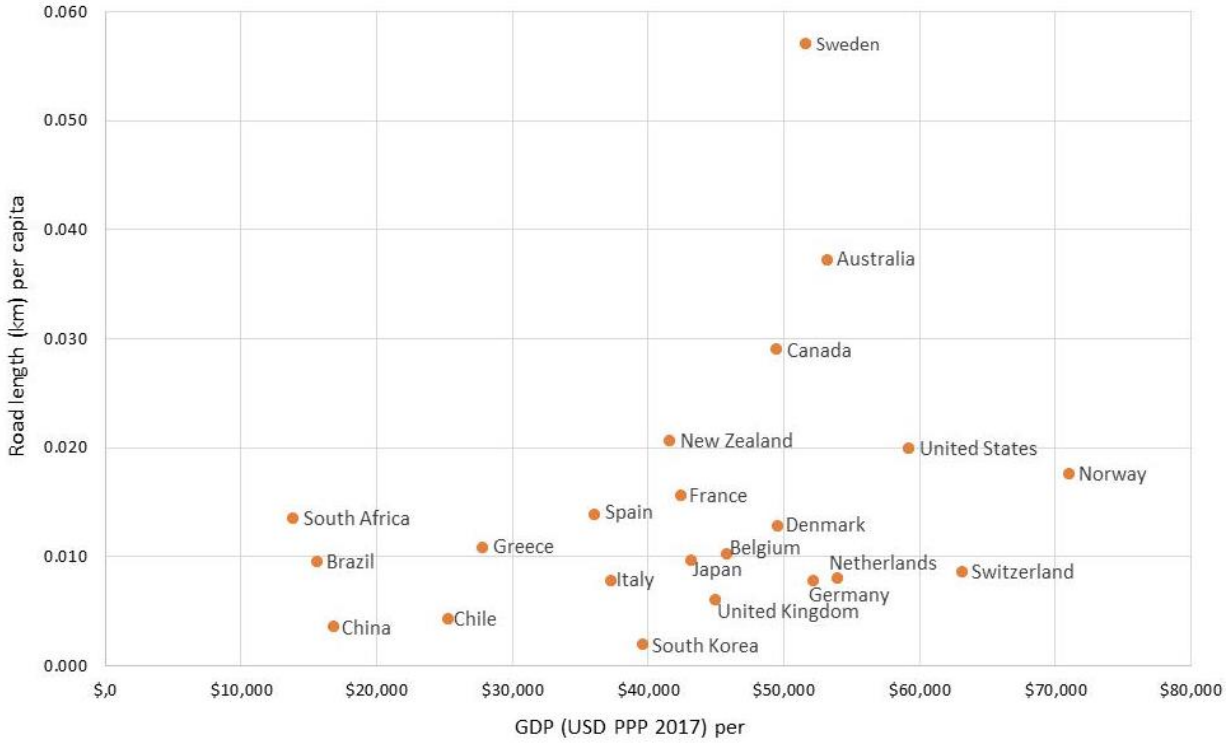
At the same time, other road funding mechanisms put in place some time ago, such as charging heavy vehicle users, remain in need of reform.

These wider and project-specific challenges are situated in a broader economic context. Over the last 30 years, Australian public policy has been aimed at fostering economic growth and improving productivity. Growth rates have been solid, due to economic reforms in the 1980s and 1990s, population growth and on-going demand for Australia's natural resources. However, the results of policies aimed at raising productivity have been slow in coming – multi-factor productivity growth rates have remained static or fallen.[1] Australia's experience is similar to that in many other developed economies.

Ultimately, the quality and rigour of infrastructure decision making bears on a nation's productivity. As Égert, Koźluk and Sutherland (2009) have shown, aggregate spending on infrastructure is not necessarily correlated with better economic outcomes. Spending on poorly conceived infrastructure may provide a

short-term stimulus, but it does not guarantee enduring economic benefits. In short, it is the nature of the spending – specifically, spending on well-conceived, economically robust infrastructure – that supports broader efforts to raise productivity.

Figure 1. Road length and GDP per capita for various countries



Note: Based primarily on 2015 or 2016 data. GDP is measured on a Purchasing Power Parity basis.

Source: Author analysis of data from Central Intelligence Agency (2019).

Productivity in the transport sector is an indicator of these broader challenges. Multifactor productivity (MFP) in the Australian transport sector grew by an average of 1% per year between 1989-90 and 2015-16, yet fell by 0.8% per year between 2007-08 and 2015-16. Transport's recent poor performance has been a drag on productivity growth in the broader economy, which grew by only 0.3% per year between 2007-08 and 2015-16 (Productivity Commission, 2017).

Further evidence can be seen in trends in road freight rates. After falling appreciably between the early 1970s and the mid-1980s, Australian road freight rates have remained static (in real terms) for the last three decades (BITRE, 2017b). This is due to several factors, although it seems likely that productivity in the development, maintenance and operation of the road network itself is part of the equation. Likely explanations include urban congestion, constraints on the use of larger, more productive vehicles, load restrictions and the opportunity cost of funding projects known or likely to have a low economic return.

Infrastructure Australia and the Productivity Commission, among others, have commented on the role that improvements in infrastructure planning, project selection, and road governance could play in raising transport sector productivity (Infrastructure Australia, 2016; Productivity Commission, 2014).

Both organisations, and a number of other policy reviews, have recommended that governments pursue a more commercial approach to the development and operation of Australia's roads.

Reforming existing governance arrangements will be critical to this endeavour, both as a means of fostering more disciplined decision making that improves the economic returns on Australia's investment in its road network, and, in the medium to longer-term, as a means of addressing prospective funding challenges.

Terminology and data

The terms "corporatised model" and "commercial model" are used at different points in the paper. The terms are essentially interchangeable. Managing and funding the road network on a commercial basis – with clearly attributable costs and revenues associated with the provision of a service – is necessary whether road organisations are established as publicly-owned corporations, or, possibly in the long term, as privately-operated concessions. A corporatised model refers to a structure where the overarching management of the road network(s) is the responsibility of a government-owned corporation. In either case (i.e. public or private ownership), the road organisations would operate under a regulatory structure (ideally, but not necessarily, involving an economic regulator) aimed at protecting user interests and ensuring that the organisations are able to fund and finance their operations as on-going concerns.

The term "territorial government" is used at various points throughout this paper. Unless the context suggests otherwise, this term is used to refer collectively to the six state and two territory governments that exist in Australia.

For the sake of consistency, and for comparative purposes, in most cases the analysis in this paper concentrates on data for 2014-15. In some cases, but not all, more recent data is available. When relevant to the discussion, this data is also cited in the text or in the endnotes. This approach is aimed at minimising confusion for the reader.

Where possible, data is presented for the Australian capital cities and rural/regional areas outside of the capitals (referred to as "rest of state/territory"). This acknowledges that, while there are common issues across these locations, it is also true that the urban and rural road networks present some quite different challenges.

Unless stated otherwise, all monetary amounts are expressed in Australian dollars (AUD).

Background

This section provides contextual information on the scale of the Australian road network, road ownership, road usage, and spending on roads and road-related revenues.

Size of the road network

In 2015, the latest year for which statistics are available, there were an estimated 873 561 kilometres of roads across Australia. These are broadly divided as follows:

- Urban roads – 145 916 km (16.7%)
- Non-urban roads – 727 645 km (83.3%).

Table 1 shows the distribution of road length by location and road type. Highways and arterial roads represented 233 227 kilometres or 26.7% of the total road length. There are 16 toll roads in Australia, with a total length of 241 kilometres or slightly under 0.03% of the overall network length.[2]

While the road network has continued to expand over time, the rate of growth has been slowing. The national road network grew by 48 688 kilometres, or 5.90%, between 1985 and 2015. The growth rate was faster in the first decade of this period than in the subsequent decades. Measured in lane kilometres, the network grew faster than the overall road length, increasing by 111 181 lane kilometres, or 6.69%, between 1985 and 2015. This reflects the development of new motorways and arterial roads in the capital cities, as well as progress in completing divided highways between several of the capital cities. Again, the rate of growth has slowed over this period.[3]

Table 1. Length of Australian road network (km) in 2015 by location and road type [4]

	Highway	Arterial	Local	Busway	Total
Urban	6 275.9	15 988.6	123 540.2	111.6	145 916.3
Non-Urban	45 264.0	165 698.9	516 675.9	5.8	727 644.6
Total	51 539.9	181 687.5	640 216.1	117.4	873 560.9

Source: Author analysis of data in BITRE (2017a).

The metrics cited above are simple measures of the length of the road network. What is more striking is the change in the form of the road network over the last half century. This change in form reflects: a policy intent to improve road quality over that period; a recent increase in spending on roads; and the comparatively higher cost of new urban roads (in particular).

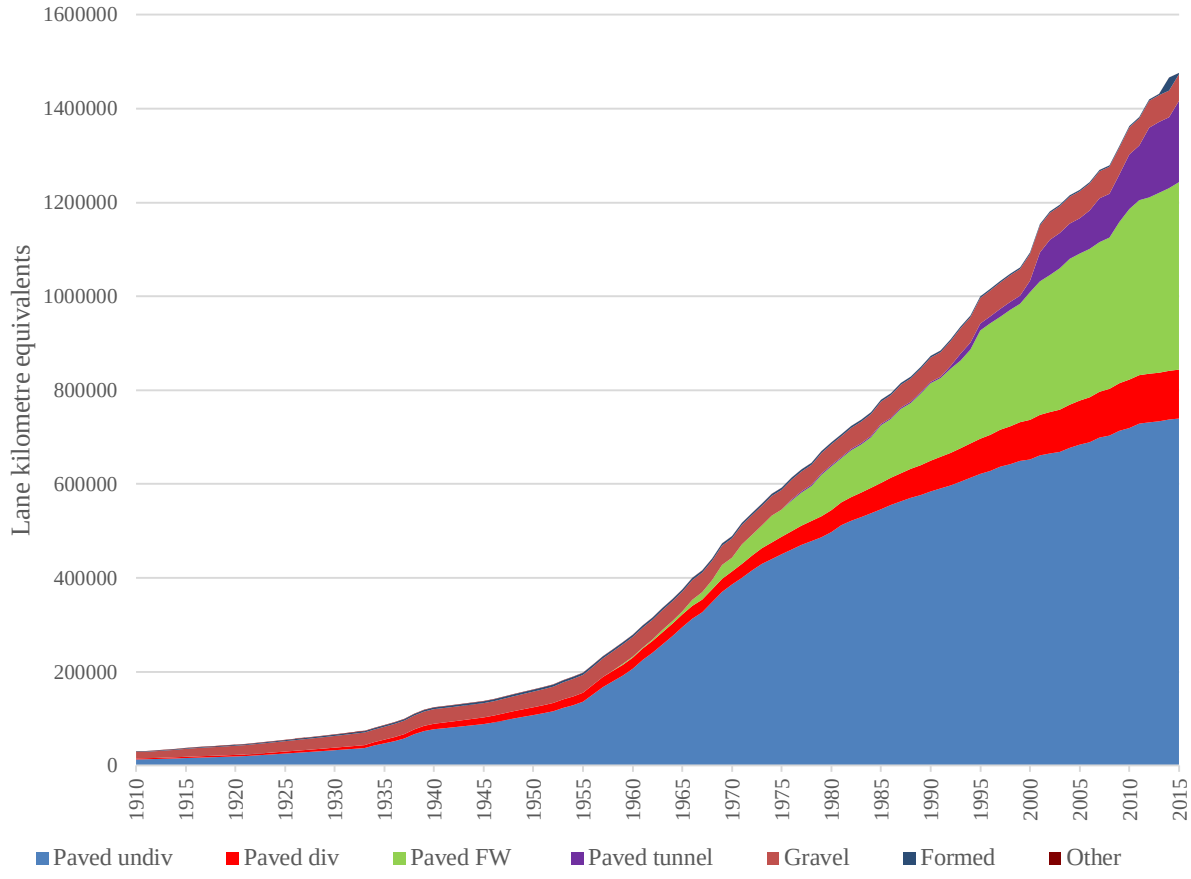
This change in form can be illustrated using a measure of "value equivalent lane kilometres" (VELK), which endeavours to account for differences in the cost (value) of constructing different road types, for example dirt or gravel roads versus urban freeways and tunnels. Figure 2 shows the change in the form of the road network over time. The unit cost estimates per lane kilometre used in the analysis range from: AUD 15 000 for gravel roads to AUD 600 000 for metropolitan paved divided roadways, and from AUD 7 million for metropolitan freeways to AUD 120 million for metropolitan tunnels.

The VELK measure is not a substitute for more detailed asset valuations. However, it provides a useful means of assessing changes in the nature of the road network over time. Most of the increase in road forms with a high VELK has occurred in Australia's metropolitan areas. What stands out from Figure 2 is:

- The growth in the extent of paved roads, of all forms, since the mid-1950s. Paved roads grew from 151 181 VELK (78.3% of the road network in 1955) to 1 416 503 VELK (96.0% of the network) in 2015. Note though that, in terms of road length (as opposed to VELK), some 493 408 kilometres of road, or 56.4% of the total road network, were still unpaved in 2015, i.e. the road is gravel, formed only, or of some other unpaved construction.

- The truly dramatic growth in divided roads and freeways since the mid-1960s. Divided roads increased almost four-fold over the last half-century, rising from 27 005 VELK in 1965 to 56 090 VELK in 1985 and 104 221 VELK in 2015. Freeways increased even faster, rising more than sixty-fold from 6 515 VELK in 1965 to 123 013 VELK in 1985 and 399 555 VELK in 2015.
- A substantial increase in the length of road tunnels since the 1980s and, in particular, since 2000. Tunnels also grew more than sixty-fold, but over a shorter period, from 2 880 VELK in 1985 to 24 328 VELK in 2000 and 173 189 in 2015.

Figure 2. Australian road network – measured in Value Equivalent Lane Kilometres (VELK), 1910 to 2015



Source: BITRE (2017).

These changes in the form of the road network have underpinned improvements in the level of service provided to road users, and contributed to other outcomes, notably a reduction in the rate of road trauma. On the other hand, this change in road form also points to two challenges. Firstly, Australia faces a potentially growing road maintenance obligation. Over 47% of the total value of Australian roads (measured in VELK) has been developed since 1985.[5] The higher quality but more expensive roads built over this period will require major periodic (capital) maintenance and replacement over the next few decades, if service levels are to be maintained. Secondly, there is likely to be continuing demand for these higher quality, higher cost assets, both as a result of population and economic growth and as a result of (possibly rising) expectations about the level of service offered by Australia's road network.

Certainly, the transport plans of the territorial governments include a range of new or upgraded road projects to be developed over the coming 20 years or more.

Road ownership

Under the Australian Constitution, roads are a state/territory (and local) government responsibility. However, the Australian Government provides a significant amount of funding to sub-national governments, both as general-revenue sharing grants and for specific purposes including roads.

This is reflective of a broader pattern of vertical fiscal imbalance (VFI) in the Australian system of government. By international standards, Australia has a comparatively high level of VFI. In 2012-13, around 45% of the revenues of sub-national governments in Australia were in the form of grants from the Australian Government (Australian Department of Prime Minister and Cabinet,2015). The Australian Government raised 81.5% of tax revenues in Australia; the eight state and territory governments raised 15.1%; and local governments raised the balance (3.3%). By comparison, the Australian Government's "own purpose" expenditure accounted for approximately 56% of all government outlays, principally on social security and welfare, health and defence.

Estimated value of the road network

While it is useful for some purposes, a measure such as VELK is an insufficient basis for the development and application of a corporatised delivery model for Australia's road network. The inputs to the VELK numbers necessarily reflect average values for different road types. Some of the inputs are perhaps open to debate, for example the unit cost estimate for unpaved roads.

Ultimately, a more conventional, commercially accepted means of preparing balance sheets and operating statements will be required to underpin a corporatised delivery model for roads.

A review of the 2014-15 annual reports for the eight state and territory road agencies suggests that Australia's principal road networks, i.e. the roads under the control of those agencies (approximately 147 000 kilometres at June 2015), had a depreciated replacement cost of approximately AUD 247 billion at June 2015.[6] It is more difficult to obtain an equivalent figure for local roads, as consistent data is patchy. Using Australian Bureau of Statistics' estimates of the value of all councils' land and fixed assets at June 2015 (AUD 383.8 billion) (Australian Bureau of Statistics, 2017c: Table 339), and other data suggesting the share of road assets in that figure, an indicative figure of AUD 200 billion is probably in the right order. There is an arguable case that the figure could be slightly higher.[7]

Adding these two figures together, and including a modest allowance for the value of tollways, suggests that Australia's road network had a depreciated replacement cost of the order of AUD 470 billion at June 2015.

Spending on roads

The great bulk of spending on roads in Australia is by governments. Most of this spending is undertaken by the general government sector, though a (generally) small percentage of spending is by public non-financial corporations. The general government sector spent AUD 23.46 billion (2014-15 prices) on the road network in 2014-15, or approximately 1.44% of Gross Domestic Product (GDP).[8] As a percentage of

GDP, the outlays in 2014-15 are in line with, perhaps slightly above, the long-term average. Spending on roads in Australia represents a higher proportion of GDP than the average for OECD-member countries.[9]

Table 2. Government road expenditure in Australia (AUD billions), 1999-2000 to 2015-16 (2015-16 prices)

Financial year	Australian Govt.	State and Territory Govts.	Local Govts.	Total (all Govts.)	Australian Government as % of Total	State/Terr Govts. as % of Total	Local Govts. as % of Total
1999-2000	2 612.57	7 770.32	5 221.18	15 604.06	16.7	49.8	33.5
2004-05	2 783.28	8 022.32	4 341.60	15 147.20	18.4	53.0	28.7
2009-10	5 901.25	11 221.63	5 062.00	22 184.87	26.6	50.6	22.8
2014-15	4 826.63	12 678.99	5 391.87	22 897.48	21.1	55.4	23.5
2015-16	5 166.99	12 209.15	5 399.98	22 776.12	22.7	53.6	23.7

Note: Total public sector expenditure on roads includes spending by public non-financial corporations (PNFC). Spending on roads by PNFCs averaged less than 2% of total public sector spending between 1999-2000 and 2014-15.

Source: Author analysis of data in BITRE (2017a).

Over the period 1999-00 to 2014-15, the average shares of general government spending on roads were: Australian Government (21.1%); state/territory governments (52.2%) and local government (26.0%). These averages mask some important shifts, shown in Table 2, in the split between the different levels of government. The Australian Government's share of government road-expenditure has been steadily rising over time, from 16.74% of road-related outlays in 1999-00 to 21.08% in 2014-15. It rose further, to 22.69%, in 2015-16. The share spent by the territorial governments has also increased, while local government's share of spending has fallen quite significantly.

Maintenance spending by governments on arterial roads and bridges (included in the Australian and State/Territory government figures above) averaged AUD 2.43 billion (2014-15 prices) per year between 2010-11 and 2015-16 (BITRE, 2016: Table T1.5). This suggests that annual maintenance expenditure on those roads is less than 1% of the approximately AUD 250 billion depreciated replacement cost of the networks under the control of the state/territory road agencies. With various road assets having design lives of 40–60 years, it may be that, in aggregate, more will need to be spent in the future on maintenance and asset renewal to sustain the network in a reasonable and sustainable condition.

Private sector construction and maintenance spending on roads in 2014-15 totalled AUD 1.05 billion (4.17% of the total). Private sector spending on roads averaged 3.31% of overall spending on roads between 1998-99 and 2014-15.

Road-related revenues and vehicle charges

What constitutes road-related revenue is a matter of some debate. On a broad (and contested) definition, road-related revenues totalled AUD 28.68 billion in 2014-15 (2014-15 prices), approximately AUD 3.4 billion more than government road-related expenditure in that year. Of this amount, AUD 17.72 billion (61.8%) was collected by the Australian Government. Fuel excise, collected by the Australian Government, was the largest source of revenue, accounting for AUD 11.03 billion or 38.5% of all road-related revenues in 2014-15.[10]

Revenues collected by the territorial governments accounted for AUD 8.70 billion (30.3%) of the total. Vehicle registration (AUD 5.65 billion) was the largest share, while driver licence fees accounted for AUD 0.52 billion.[11] Tolls accounted for the balance (AUD 2.27 billion).

As noted above, there are different views as to what reasonably represents road-related revenue. General forms of taxation – for example, Australian Government goods and services taxation on fuel purchases (AUD 3.93 billion or 13.7% of the total revenue cited above), Australian Government fringe benefits tax (AUD 1.43 billion or 5.0%), and state/territory government stamp duty (AUD 2.53 billion or 8.8%) – are significant sources of what the Bureau of Infrastructure, Transport and Regional Economics (BITRE) has reported as road-related revenue. Arguably, they are not road-specific taxes and charges; rather they are general forms of taxation applicable to a broad range of goods, services and activities.

However, as noted above, those general taxes and charges are reported as road-related revenues in statistical publications released by the Australian Government. Relevantly, in their lobbying efforts, motoring and industry organisations include these revenues as part of overall "road taxation". There will be debate as to whether such revenues should be hypothecated into any road fund established under some form of corporatised road delivery. For the purposes of this paper, though, they have been included as road-related revenues.

It is important to note that, in general, with the exception of tolls, road-related revenues are not hypothecated to expenditure on the road network. However, other road-related revenues are generally included in so-called "consolidated revenue". They are then available for any form of government spending, not just on roads. Where road-related revenues have exceeded road-related expenditure, governments have used the "surplus" funds to support other public services.

An analysis of road-related revenues over time shows the following changes:

- A substantial increase in the share of revenue from road tolls. Tolls increased from 0.98% of all road-related revenues in 1997-98 (AUD 220.0 million in 2014-15 prices) and 2.39% in 1999-2000 (AUD 554.8 million in 2014-15 prices) to 7.90% or AUD 2 265.3 billion in 2014-15. Toll revenues increased further to 8.83% of all road-related revenue in 2015-16 (AUD 2 673.9 million in 2015-16 prices). This increase is striking, particularly when compared against the small proportion of the road network (less than 0.03% of the network's length) that has been developed as a tollway.
- The Australian Government's share of revenues has been declining over the last fifteen years, from 70.38% of all road-related revenues in 1999-00 (AUD 16.4 billion in 2014-15 prices) to 61.78% (AUD 17.4 billion) in 2014-15. Conversely, the share from state and territory government revenue sources has been growing slowly but steadily, from 27.2% of all road-related revenues in 1999-00 (AUD 6.3 billion in 2014-15 prices) to 30.32% (AUD 8.70 billion) in 2014-15.
- The impact of improvements in vehicle fuel efficiency is evident. Fuel excise receipts decreased by 19.32% over the last fifteen years, from AUD 13.67 billion (in 2014-15 prices) in 1999-00 to AUD 11.03 billion in 2014-15, even though vehicle usage across the country increased 24.1% over the same 15-year period from 198.7 billion vehicle kilometres travelled (VKT) to 246.6 billion VKT.[12]

Light vehicles

With a few exceptions (mainly tollways), light vehicle users do not pay directly to use Australia's roads. As noted above, drivers of cars and other light vehicles contribute indirectly for road use, mainly through a fuel excise imposed by the Australian Government and vehicle registration charges imposed by state and territory governments. Vehicle registration and driver licensing charges vary between the territorial governments.

Heavy vehicles

Australia currently uses a pay-as-you-go (PAYGO) model to determine annual registration and fuel-based road user charges for heavy vehicles (defined as vehicles over 4.5 gross tonnes). PAYGO was introduced in 1992 with the aim of:

- ensuring heavy vehicles pay their share of road spending
- recovering the marginal or attributable costs of road wear and tear for each heavy vehicle type, in order to address differences associated with different vehicle mass and axle configurations
- recovering a share of common road costs that benefit all road users, such as street lighting, rest bays and signage.

To calculate heavy vehicle charges, the National Transport Commission (NTC) uses the latest heavy vehicle and trailer population data as well as seven-year moving averages for both past road expenditure and vehicle usage. This data averaging is aimed at ensuring that charges do not change significantly in response to short-term changes in expenditure or vehicle use.

The share of national road expenditure attributed to heavy vehicles averaged 22.9% between 2005-06 and 2014-15, ranging between 21.7% and 24.7%.[13] Around 40% of costs attributed to heavy vehicles are recovered as state and territory registration fees, with the balance paid through a fuel-based road user charge collected by the Australian Government.[14]

While the heavy vehicle charges are recommended by the NTC in accordance with principles previously agreed by governments, the charges are ultimately determined by transport ministers through political negotiation. In recent years, charges have not increased. A 2016 review by the NTC found a number of weaknesses in the current PAYGO system, including:

- volatility in the cost base and heavy vehicle charges and, concurrently, persistent mismatches between actual revenue and the cost base
- revenue uncertainty for governments and the absence of a direct link between expenditure and revenue
- lack of predictability and stability
- the charge setting process itself
- lack of independent verification of data, user input or an appeal mechanism.

In summary, Australia has a complex road-funding framework, characterised by significant inter-governmental financial transfers.

Road usage

With growth in population and economic activity, and mode shifts in certain markets, aggregate VKT has grown by 80% over the last thirty years, from 137.0 billion VKT in 1984-85 to 246.6 billion VKT in 2014-15. In 2015-16, road usage rose further to 251.2 billion VKT.[15]

After rising steadily for several decades, per capita use of Australia's roads has flattened out in the last decade. Road usage grew from 6 015 VKT per person in 1970-71 to a peak of 10 938 VKT per person in 2003-04. Since then, vehicle usage has fallen slightly to 10 412 VKT per capita in 2015-16.

Table 3. Growth in vehicle kilometres travelled on the Australian road network (billions of vehicle kilometres), 1970-71 to 2014-15

Financial Year	Passenger cars	Motorcycles	Buses	Light commercial vehicles	Rigid trucks	Articulated trucks	Total
1970-71	60.73	1.01	0.66	9.84	4.70	1.66	78.61
1984-85	103.07	2.28	1.14	20.52	6.34	3.59	136.95
1989-90	124.00	1.80	1.56	23.90	6.84	4.13	162.23
1994-95	139.38	1.57	1.59	27.27	6.32	4.82	180.95
1999-00	151.17	1.42	1.76	31.33	7.29	5.70	198.67
2004-05	166.02	1.72	1.91	35.38	8.10	6.32	219.45
2009-10	166.15	2.63	2.20	41.85	8.99	6.95	228.77
2014-15	174.70	2.98	2.46	48.36	10.06	8.07	246.62
2014-15 as multiple of 1984-85	1.69	1.31	2.16	2.36	1.59	2.25	1.80

Note: Data for 1970-71, the earliest in the BITRE's data series, has been included to provide a long-term point of reference.

Source: Author analysis of data in BITRE (2016).

As shown in Table 3, road usage by freight vehicles, especially light commercial vehicles and articulated trucks, has grown faster than passenger vehicles. As a percentage of total VKT, heavy vehicle usage has remained largely unchanged (at around 7.3% of total VKT). However, the use of light commercial vehicles has grown substantially. It accounted for 19.6% of total VKT in 2014-15, up from 15.0% in 1984-85.

Private travel

As shown in Appendix 1, there are important differences between road use in the eight state/territory capital cities and outside of the capital cities. Although there has been a small shift towards public transport (including road-based forms such as buses) over the past 30 years, private transport in the eight capital cities remains heavily reliant on the road network:

- Total car-based passenger kilometres travelled (PKT) grew by almost 1.8% per year between 1984-85 and 2014-15. The rate of increase in car use slowed somewhat (approximately 1.1% per year in the second half of this period compared to 2.5% in the first half). This reflects a

substantial (9.8%) fall in per capita car-based PKT in the last ten years. However, per capita car usage is still above what it was in 1984-85.

- Private use of commercial vehicles, for example delivery vans, has increased faster than car use, with PKT in commercial vehicles growing at 2.7% per year over the period 1984-85 to 2014-15.
- Use of public transport grew in absolute terms and grew faster in the second half of the period. This reflects an increase in per capita PKT on public transport over the period, notably on rail, which grew faster than for car use. Nevertheless, public transport's share of overall PKT remains modest, growing from 9.5% of capital city passenger kilometres travelled in 1984-85 to 10.3% in 2014-15.

Unsurprisingly, outside of the capital cities, the road network is even more important for private travel:

- Over the last 30 years, per capita PKT by car outside the capital cities has typically been 40-50% higher than in the capital cities. Between 1984-85 and 2014-15, total PKT by car grew by 2.5% per year, more than twice the rate in the capital cities, notwithstanding the population of areas outside the capital cities grew at a slower rate than that of the capital cities. The faster growth rate in total PKT probably reflects increasingly dispersed settlement patterns, including the growing popularity of large lot subdivisions outside of rural towns. It may also reflect the growing importance of larger towns compared to smaller towns; economic activity appears to be consolidating into a smaller number of larger towns, while government services may also be consolidating into larger towns.
- As in the cities, "other vehicles" (comprised mainly of commercial vehicles) have become an increasingly popular choice for private travel, with total PKT growing by almost 2.2% per year.
- Public transport's share of overall PKT fell from around 11.4% in 1984-85 to less than 10.7% in 2014-15. This is due to a fall in per capita kilometres travelled by rail, which has more than offset a small increase in the per capita usage of buses.

Freight

Table 4 shows that total road freight, measured in billion tonne kilometres, has grown threefold over the last 30 years. For both bulk and non-bulk freight, the road mode share has remained relatively stable over that period.

Table 4. Domestic freight by road – bulk and non-bulk, billion tonne kilometres (BTK)

Financial Year	Bulk		Non-Bulk		Total	
	Road BTK	Road as % of bulk BTK (all modes)	Road BTK	Road as % of non-bulk BTK (all modes)	Road BTK	Road as % of total BTK (all modes)
1984-85	20.9	11.7	47.0	75.1	67.9	28.7
1994-95	32.3	13.9	69.1	73.6	101.4	32.0
2004-05	55.2	17.4	107.1	74.4	162.4	35.3
2014-15	79.3	14.1	131.5	77.0	208.3	29.1

Source: Author analysis of data in BITRE (2017a).

Prospective demand

The demands on Australia's road network are increasing, primarily due to:

- a growing population
- a strong preference for travel in private vehicles compared to public transport, itself reflecting patterns of suburban development (especially since the second world war), and the preponderance of government investment in road infrastructure compared to public transport
- a heavy reliance on roads for the transport of many forms of freight, especially for non-bulk freight.

While Australia has a modest population (23.9 million at June 2015), its population growth rate is one of the fastest among OECD member countries. In the 10 years to June 2015, Australia's population grew by 18.2%.[16] On the latest medium-level projections, Australia's population will grow to 28.1 million in 2025, 32.0 million in 2035 and 35.8 million in 2045 (Australian Bureau of Statistics, 2013).

The majority of this growth is occurring, and this is projected to continue, in the larger cities. The population of the capital cities grew by 21.2% between 2005 and 2015, compared to 12.2% outside the capital cities. At June 2015, 66.8% of Australia's population lived in the country's eight state and territory capital cities. The medium-level projections referred to above suggest that the capital cities will continue to increase their share of the nation's population, growing to 69.8% of the nation's population by 2035 and 71.3% by 2045 (Infrastructure Australia, 2015). As noted earlier, the cities are the locations that have experienced a dramatic growth in road assets with a high VELK.

There is, as yet, no consensus on how innovations in automated vehicles, ridesharing and supply chains may influence transport demand. That said, in the absence of a significant uptake of those technologies and services, Australia's growing population is likely to result in road transport demand growing somewhat faster than growth in the road network itself (especially in the cities). Depending on the extent of ridesharing and the expected uptake of automated vehicles, car traffic could conceivably increase by 25-50% over the next thirty years, i.e. five to ten times the potential growth in the road network suggested by experience over the last 30 years. Indeed, for a variety of reasons, the road network may not grow as fast as in the past.[17]

On the other hand, significant uptake of those technologies and services could be transformative, and dramatically reduce the number of vehicles on the road. For example, the ITF's scenario modelling of transport patterns in Lisbon, Portugal found that ridesharing could dramatically reduce the number of vehicles on the road (ITF, 2016). Such a scenario raises different (but equally material) questions about capital spending on roads, maintenance of existing assets, and utilisation of urban land used for roads.

Freight volumes, which have grown broadly in line with growth in the economy, will add to passenger demand on the road network. Continuing growth in on-line shopping could add to freight demand, in urban areas especially. On the other hand, prospective technological changes, e.g. wider use of 3D printing, could moderate the demand for some types of freight.

As noted earlier, most non-bulk-freight in Australia is transported by road. In the absence of a dramatic change in those relationships, it is reasonable to conclude road freight will also grow substantially over the next 30 years.

Road transport will remain the dominant form of land transport in Australia well into the future. Government investment in public transport in the cities, and perhaps some shift to moving freight on rail

(driven by scale economies and/or climate mitigation policies), are unlikely to shift fundamentally Australians' reliance on the road network.

The case for change

This section outlines a case for change in road governance, focusing on: weaknesses in setting objectives and performance targets; fiscal constraints on government, including the decline in fuel-based revenues; weaknesses in planning and project decision-making; and lessons from reform in other infrastructure sectors in Australia and from overseas.

Limited specification of objectives for the road network

The starting point for assessing whether the current system of road funding, governance and management needs to be changed is to understand whether there are agreed aspirations and objectives for the Australian road network. These can provide standards against which the efficacy of current governance and funding arrangements can be assessed.

Governments and organisations representing various groups of road users broadly agree on higher-level aspirations for the road network. All have published documents expressing support for roads (and broader transport systems) that are safe, efficient and sustainable. However, in the main, those documents refer to broad aspirations, rather than a set of deeply considered objectives and metrics that can be operationalised, used as the basis for funding and spending decisions and used for reporting performance to road users and taxpayers. Safety is perhaps an exception. In May 2011, Australian governments agreed a National Road Safety Strategy 2011–2020, which sets a target of reducing Australia's annual number of road deaths and serious injuries by at least 30% by 2020.

Australian road agencies and their peak organisation, Austroads, have developed a range of performance frameworks and indicators. These provide a foundation for improving road management in the future. Nevertheless, much can be done to build on that foundation:

- In most cases, the indicators are not complemented by clear targets or key performance indicators against which performance can be assessed.
- The relative importance and process for weighting of the indicators is often unclear.
- The indicators often vary across jurisdictions.
- The connection between the indicators and road user satisfaction, expectations or requirements is unclear.
- Reporting against progress is limited (in those cases where targets are specified).
- Connections between the indicators, funding arrangements and spending decisions are unclear.

The available evidence suggests the road network is struggling to meet Australians' aspirations and objectives. For example, congestion in the capital cities is projected to increase substantially over the

next 15 years and beyond. The 2015, *Australian Infrastructure Audit* found that, in the absence of increased investment in public transport and road capacity, and policy reform focused on demand management, the cost of congestion in Australian cities is projected to increase from AUD 13.7 billion in 2011 (approximately 1% of GDP) to AUD 53.3 billion in 2031 (approximately 2% of GDP; both measured in 2011 prices).

A recent report shows that progress towards a number of trauma targets in the national road safety strategy is less than might have been hoped. Finally, transport-related greenhouse emissions (of which road-related emissions are the dominant contributor) are growing.

Moreover, reports across various jurisdictions point to existing and future road maintenance challenges. For example, the West Australian Auditor General recently reported, "The backlog of overdue maintenance on the state road network remains at similar levels to 2009, with an estimated total cost of AUD 845 million in 2016. The average age and the proportion of the road network past its design life has increased, with 46% of the network now over 40 years old compared with 32% in our 2009 report." (Western Australian Auditor General, 2016)

The absence of realistic, measurable performance targets – and transparent reporting against those targets – is a key constraint on effective management of the road network. Governments, taxpayers and road users are left ill-equipped to know whether they are receiving "value for money", and are prevented from assessing trade-offs in investment.

The Australian Infrastructure Audit (ibid.) found that inadequate attention is being given to the level of service Australians need and expect from their infrastructure, how much different service levels costs, and how they will be paid for. In some sectors, there is insufficient public data and information to support informed public discussion about these questions. There is a gap between expectations about infrastructure quality, and the willingness or ability to pay. There is a need for serious public discussion about service levels and funding.

The absence of targets also limits the ability of road network managers to:

- specify and structure performance-based contracts to those higher order performance outputs and outcomes
- compare performance across contract bundles (particularly comparator regions in other jurisdictions).

Growing pressure on government budgets

The factors mentioned above highlight the need to reform governance arrangements in the road sector, and to manage Australia's road network more transparently in the interests of users and taxpayers. The aspirations and objectives for the road network need to be refined and updated. When set against the prospective funding challenges facing all governments, and, in turn the road sector, the case for changes in road governance and funding becomes even stronger.

Spending on roads has been growing over recent years, and is now approaching road-related revenues (broadly defined, as noted earlier). As a result, past "surpluses" between road-related revenue and expenditure, which were available for spending on other purposes, are now shrinking. However, proceeds from the largest component of those revenues (fuel excise) will decline over the medium term, as vehicles become more fuel-efficient and as electric vehicles become a larger part of the vehicle fleet.

Modelling undertaken for the National Transport Commission in 2015 found that fuel excise revenue could fall by 45% by 2050 in a base case scenario (Graham and Reedman, 2015).

Other road-related revenues, notably vehicle registration and driver licence fees, could also fall over time. A range of factors is causing a shift towards a future where mobility is viewed as a service, affecting the need to own and drive motor vehicles. These include the growing popularity of ridesharing and technological changes such as the potential introduction of automated vehicles. In addition, shifts in housing preferences and policies are likely to have an impact. There is a growing willingness to live in higher density locations served by public transport. Land use planning policies are progressively shifting to encourage more housing around public transport nodes.

Attitudes towards driving may be shifting. For example, there is evidence that the rate of licence holding has stabilised (at about 0.7 driver licences per capita), and that the proportion of younger people holding a driver's licence was falling (albeit slightly), even before the widespread availability of ridesharing services (BITRE, 2017c; Charting Transport, 2015).

Government budgets are under significant structural pressure. Long-term projections of the Australian Government budget indicate that, without new revenue measures and/or cuts in expenditure, the deficit in the budget cash balance will increase from 2.5% of GDP in 2014-15 to 6.0% of GDP in 2054-55. Equivalent analysis by the New South Wales Government suggests that the state governments are in a similar position.[18]

It is unclear how Australians' attitudes, and the policy positions of the main political parties, will evolve in response to these pressures. Public expectations for improved transport are high, although they are also high in other sectors such as health and education.

The Australian Parliament's Parliamentary Budget Office (2017) projects that Australian Government transport outlays (excluding equity injections for a small number of very large projects, such as a new airport in western Sydney) are projected to fall by 0.2% of GDP between 2017-18 and 2027-28.

These fiscal pressures are reflected in inter-governmental arguments about the respective shares that governments contribute towards spending on transport infrastructure. For example, the state and territory governments periodically argue that Australian Government funding for maintenance of the defined national land transport network (NLTN) – a network of almost 26 000 kilometres of roads and some inter-state rail lines - is inadequate. A map of the NLTN is shown in Appendix 2.

The picture is similar at the local government level. Several state governments have conducted inquiries over the last decade into the ongoing financial durability of local governments. These local fiscal challenges have implications for the road sector. For example, a recent study in the state of New South Wales found that addressing the local road-funding gap in 2014 would require a 41% (AUD 447 million) increase in funding above then current expenditure levels. Council amalgamations have been proposed (and in some cases pursued) with the aim of improving service levels and improving the councils' fiscal viability. However, the potential scale economies from amalgamations are unlikely to yield an increase in funding for roads of this order.

Project planning selection and procurement

The funding constraints described above highlight the need for governments and their road agencies to allocate scarce capital efficiently. Yet there is clear evidence of inefficiency in the planning and delivery

of new projects, Both Infrastructure Australia and the Productivity Commission have highlighted shortcomings in this area, including:

- poorly targeted capital investment (e.g. location, timing, scoping)
- limited options assessment, especially a reluctance to consider seriously options aimed at making greater or better use of existing roads
- poor delivery (for example time and cost overruns).

Frequently, political commitments are made to proceed with projects prior to rigorous assessment of options and business case evaluation. More rigorous and transparent assessment of proposed capital spending offers the potential to increase the economic return from spending on roads.

There is also some evidence of inefficiency in the maintenance of existing roads. Issues include maintenance budgets shifting from year to year, and the risk that unplanned increases in the cost of capital projects affects the amount of funding available for maintenance.

Lessons from other sectors and overseas

Australian experience in other infrastructure sectors shows that governance and pricing reform can deliver significant economic benefits. In 1995, Australian governments adopted what became known as the National Competition Policy. This involved wide-ranging reforms across many sectors, including:

- the adoption of corporatised governance structures for significant government enterprises such as electricity generation; the imposition of similar commercial and regulatory obligations to those faced by competing private businesses; and the establishment of independent mechanisms for handling complaints that these requirements have been breached
- the creation of independent authorities to set, administer or oversee prices for monopoly service providers.

Research by the Productivity Commission in 2005 found that these and related reforms during the early 1990s had added 0.67% to GDP in the case of the electricity sector; 0.35% to GDP in the case of the water sector; and 0.1% in the case of the gas sector. Although there are some exceptions, charging for electricity network and water services is now based on a RAB model with oversight by economic regulators.

Australia has also had experience in using a RAB model for the funding of rail network infrastructure since the 1990s. However, the rail sector is quite different from the road network. Whereas roads have millions of users, rail has only a handful.

The ITF Working Group explored different approaches to the treatment of uncertainty. The RAB model offers some benefits. It can support improved capital spending decisions and prioritisation of maintenance. However, the application of a RAB is not without its own issues. For example, the economic regulation of the electricity sector in Australia has been criticised in the past on the grounds that:

- it allowed companies to spend capital above the amount allowed within a regulatory period and then have that amount included in their asset base, without scrutiny as to whether the expenditure was justified
- governments insisted on reliability standards that could not stand up to economic scrutiny

- it was relatively unresponsive to changing market conditions during a five-yearly regulatory cycle, including falls in demand (and need for capital investment) and the cost of finance (Wood, 2012).

Overall observations

Australia's road networks are not meeting users' needs effectively, and government budgets are constrained. Efficiency needs to be improved. However, the absence of clear objectives presents a challenge. As suggested above, the inter-jurisdictional balance of revenues and spending is likely to be a consideration as governments debate options to reform road governance and charging. There is a case for change, both to:

- improve spending decisions and asset management, and
- address the prospective decline in road-related revenues and pressure on general government budgets.

Past efforts at road reform: Lessons for further reform

Australian governments have pursued various reforms to the governance and management of Australia's roads. These have centred on: firstly, improved management (for example, planning, procurement reform, and intergovernmental coordination) and, secondly, financing and funding. While these efforts have had some success, the fact is the most significant opportunities for reform, such as the corporatised delivery of roads and road-user charging, have not yet been realised and/or are slow in coming.

Management reforms

Heavy vehicle national law

In 2009, the Council of Australian Governments (COAG)[19], the peak forum for inter-governmental policy development in Australia, agreed to establish a single national system of laws for heavy vehicles, and establish an independent national regulator (the National Heavy Vehicle Regulator) to administer the laws. Two governments (Western Australia and the Northern Territory) are not participating in the heavy vehicle national law. In addition, the Queensland Government has a number of derogations from the national law, for example in relation to the mass and loading of heavy vehicles.

Agreement on key freight routes

Transport ministers agreed in late 2014 on a network of key freight routes (KFRs) across Australia. These routes – both road and rail – cover more than the legislated national land transport network (NLTN).

They are aimed at informing decisions by governments and industry on commercial, regulatory and policy initiatives relevant to the freight sector. Agreement on the KFR network was reached comparatively quickly, although this may have been because the KFRs did not involve any commitments from the Australian Government regarding funding.

Planning and procurement reforms

Several jurisdictions have pursued process reforms (often described as "gateway processes") aimed at improving infrastructure planning, project business cases, decision making and delivery.

Many local councils have established "regional road groups" to coordinate investment in upgrades to and maintenance of local and regional roads.

In New South Wales (NSW), maintenance of the state's arterial road network is now managed by the private sector under contract to the government. This has apparently reduced maintenance costs by 5-7%.

Road financing and funding reforms

Several attempts at funding reform have been made over the last 20-30 years. All of these have been partial in nature, rather than systemic. The reforms (or attempted reforms) have been in the following areas:

- use of public-private partnerships to develop new roads
- changes in fuel levies
- reforms to heavy vehicle charging.

Public-private partnerships (PPPs)

Australia was at the forefront of introducing toll funded PPPs in the modern era. The number of Australian road PPPs has remained steady over the last 15 years, averaging slightly less than one transaction per year. However, that steady flow of projects masks a material change in the nature of the most recent PPPs. Four projects initiated in the mid-2000s have collapsed financially, leading to a fundamental shift in the private sector's risk appetite, especially for patronage risk. The reasons include:

- A failure by project proponents (both in the public and private sectors) to acknowledge adequately various differences between early PPP projects and subsequent projects. These differences lay principally in two (related) areas:
    - The later projects had to be developed as tunnels whereas the earlier projects were built largely as comparatively lower cost surface roads
    - The underlying or latent demand for travel in the corridor served by the project. It was probably the case that the most substantial "missing links" in the existing networks were addressed by the earlier projects. As a result, latent demand in the corridors served by the early PPP projects was high.

  The combination of comparatively high traffic demand and comparatively lower costs provided the foundation for commercially successful projects. Subsequent projects are likely to have had

lower latent demand. The lower demand, especially when combined with higher tolls necessary to cover higher capital costs, created financial stresses on the projects.

- Optimism bias and opportunistic behaviour among bidders, especially as potential bidders in later projects saw the success of the earlier projects.
- (Some) governments seeking to extract fees from projects. These fees had to be recovered through higher tolls.
- The impact of the global financial crisis on proponents' ability to secure debt on commercially viable terms.

As a result, the private sector has become more risk-averse, especially in relation to demand risk. In the period since those projects failed, the commercial challenges associated with new road PPP projects have been resolved in a number of ways:

- Governments have made significant contributions to the capital cost of the projects, which has had the effect of moderating the tolls, which the private parties would otherwise have had to charge more for. Examples include the Legacy Way project in Brisbane and the NorthConnex project in Sydney.
- Governments have funded some projects largely or entirely through shadow tolls and/or availability charges paid to a private operator of the road in question. For example, the Peninsula Link project in Melbourne is untolled. The focus of the PPP is on maintaining and operating the road.
- Governments have taken on some level of patronage risk. Governments have considered sharing "layers" of patronage risk, for example during consideration of the previous East-West Link proposal in Melbourne.
- Some private road owners appear to have been willing to accept some level of patronage risk, taking into account their ability to generate supplementary income from tolls collected on other roads they own, i.e. from additional traffic on existing links which might be generated by the presence of the new project. The NorthConnex project in Sydney is an example.

Although the assessment of such subsidies within government has probably improved, there is a case for improving the transparency of such assessments. This is especially so in cases where the project involves a renegotiation of an existing PPP contract.

Whatever the form of financial support, governments need to understand their projects (in Australia, PPP projects are typically initiated by governments). Funding support involves opportunity costs. Moreover, there may be limits as to how far these types of arrangements can assist in supporting the funding arrangements and financing of road PPPs. For example, Henscher, Ho and Liu (2016) have used the experience in Sydney to argue that in cities with a large number of tollways, drivers can experience "toll fatigue", i.e. drivers' willingness to pay for additional projects may be somewhat lower than estimated in many current tolling studies.

Australian governments continue to use PPPs as a delivery model. Examples include the WestConnex and (potentially) F6 projects in Sydney and the Westgate project in Melbourne. Recently, a PPP has been agreed in Melbourne, where the private party will upgrade eight arterial roads (untolled) in the west of the city by 2021, and maintain 260 kilometres of arterial roads for a further 20 years. Although user-pay PPPs remain under consideration, governments remain cautious about the introduction of a broader form of charging for road use.[20] In addition, in recent years, governments have elected to fund several

new roads or road upgrades, despite advice that tolling be pursued to cover some of the projects' costs, e.g. widening of the Gateway Motorway North in Brisbane and the Northern Connector in Adelaide.

Fuel levies

Although fuel excises have been declining as a share of government revenue[21], fuel prices and fuel taxation remain potent political issues in Australia, particularly at a time when wages and salaries are growing slowly.

In 2001, the Australian Government decided to discontinue indexation of fuel excise. This decision was taken partly in response to the introduction, in July 2000, of a broader 10% Goods and Services Tax on most goods and services, including fuel. However, there was commentary at the time that the decision to abandon indexation was also influenced by concerns about the political impact of rising fuel prices. Indexation was re-introduced in the 2014-15 budget to provide funding for additional road projects, although there may have also been concerns within government about demands on the budget and the need to increase revenues.

The New South Wales Government's experience in the late 1980s and early 1990s with a hypothecated fuel levy (three cents per litre for three years) to fund road improvements is also relevant, although for other reasons. It appears the original decision enjoyed some measure of public support; road users accepted the notion of a "dedicated tax". However, the increase in excise was maintained after the three years, and the revenues incorporated into the government's general revenue rather than remaining hypothecated to spending on roads. It has been argued that this led to a loss of public confidence. In addition, an impression may have been conveyed that a "3x3" levy would provide a longer-term, structural solution to road funding issues, when in fact it could not provide such a solution, either for funding further capital projects or dealing with underlying maintenance backlogs.

Heavy vehicle charging

Heavy vehicle charging has been the subject of several attempts at reform over the last decade. A 2006 inquiry into road and rail pricing by the Productivity Commission identified a range of limitations with the broader approach to road funding (including PAYGO). The Commission recommended a reform agenda to be overseen by the COAG. This agenda was to comprise:

- phase 1 – regulatory reforms and improved decision-making frameworks that were to be implemented in the short term, as well as several research and feasibility studies to progress pricing reforms
- phase 2 – implementation of a system of incremental pricing, combined with institutional reforms (such as the establishment of road funds) to link road charge revenue with future road spending, supported by improved governance arrangements
- phase 3 – extension of location-based charging and, where feasible, a move to commercial provision of road infrastructure services.

In response to the Productivity Commission's report, COAG established the so-called COAG Road Reform Plan (CRRP) in April 2007 to review heavy vehicle user charges and to investigate the viability of alternative charging models for heavy vehicles. The officials working on CRRP then conducted a feasibility study into other charging and funding arrangements for heavy vehicles. The study found that reform was feasible if charges were linked directly to road funding and investment changes, and recommended that new direct charging arrangements be developed for COAG consideration by 2012.

In July 2012, COAG noted the recommendations of the feasibility study, and agreed to proceed further with the reform project. The CRRP was then renamed the Heavy Vehicle Charging Initiative (HVCI) to reflect a broadened scope. The HVCI Project Board was restructured to oversee the development of a framework to support a package of charging, funding and investment reforms where benefits outweigh costs.

Advice to COAG in 2013 indicated that the potential benefits of transitioning to a market for the provision of heavy vehicle road services were conservatively in the order of AUD 8 to AUD 22 billion (NPV over 20 years), depending on the system (Department of Infrastructure, Transport, Cities and Regional Development, 2016).

In May 2015, the ministerial Transport and Infrastructure Council (TIC) – one of a number of ministerial fora under COAG – agreed a four-step road map to progress heavy vehicle road reform:

- step 1 – improve transparency of investment, expenditure and service delivery
- step 2 – implement a forward-looking cost base and independent price regulation
- step 3 – return charges revenue to road owners based on use
- step 4 – implement more direct user charging where appropriate.

Whether applied to heavy vehicles and/or light vehicles, these four steps remain the key elements of a transitional path to a corporatised delivery model for roads.

Ministers also agreed that jurisdictions would work together to implement four initial "heavy vehicle access and investment measures":

- the development of asset registers and assessments of road conditions according to agreed service level standards by the end of 2015
- improved data for demand forecasting by the end of 2016
- publication of annual heavy vehicle expenditure plans, based on efficient costs and prepared on a consistent basis by the end of 2016
- investigation of practical ways for industry to negotiate and pay for improved access by the end of 2016.

More recent developments in this area are discussed in the next section.

Lessons for the introduction of a corporatised delivery model

Although there have been many attempts at reform in the Australian road sector, progress has been slow and incremental. More than ten years have passed since COAG endorsed a road reform plan. Governments are still considering some of the early stages of reform agreed in 2007. This highlights the political challenges in securing inter-governmental and cross-party support for changing road governance and charging arrangements. Major improvements still require a structural change that has eluded governments to date. In pursuing further reform, the lessons from past efforts can be summarised as follows:

- Staged or incremental approaches are likely to be required. The experience in heavy vehicle charging reform demonstrates that securing inter-governmental agreement to change is difficult.

- Securing reform depends on the drive of key individuals, and good will from all parties.
- Central government agencies will need to play a role in driving reform, particularly to assist in making the fiscal case for change.
- Governments need to be open with stakeholders and users of the road network, and be careful not to lose public trust. The experience with a hypothecated fuel levy in NSW, both in originally communicating the intent of the levy and subsequently maintaining the levy as part of general government revenue is instructive.

Road reform: The state of play

Recent reports have continued to recommend that governments corporatise their road agencies, and move towards a broader system of road user charging. In February 2016, Infrastructure Australia recommended:

- establishing a corporatised delivery model for roads, using a regulated asset base, and hypothecation of existing taxes and charges to support delivery of infrastructure ahead of the introduction of a broader system of user charging
- implementation of heavy vehicle charging within five years and light vehicle charging within 10 years.

The Australian Government's response to Infrastructure Australia's recommendations, released in November 2016:

- Noted the recommendation on a regulated asset base, and observed that it is working with state governments on heavy vehicle road reform. The government's views on application of charging (and pricing) to light vehicles would await the inquiry mentioned below.
- Supported the recommendation on road charging, while noting that the government does not intend pursuing reforms that do not deliver clear benefits for the community. The government indicated it would establish a wide-ranging inquiry to investigate the possible impacts of user charging reform on all users. The responsible minister has indicated that the inquiry will commence in 2018.

In October 2017, the Productivity Commission made similar recommendations to those proposed by Infrastructure Australia, arguing that:

- road users should have an opportunity to contribute to project selection and funding decisions
- various road-related decisions – for example, major road expenditure proposals; measuring the road asset base; proposals for which roads should be priced; the standards that should apply to roads – should all be subject to independent appraisal
- road-related revenues should be hypothecated into state and territory-based road funds, with an initial focus on heavy vehicle revenues

- state and territory governments should consider pilot programmes for broader road user charging.

These recommendations from the two advisory bodies, and the government's response to Infrastructure Australia's Australian Infrastructure Plan, emphasise progressive change, improved management of existing assets, and continuing with agreed reforms. The main streams of work are set out below.

Review of heavy vehicle cost base allocators

This project provides technical support for heavy vehicle road reform by reviewing the heavy vehicle cost base allocators. The allocators determine the share of total expenditure allocated to heavy vehicles and how expenditure is attributed to different types of heavy vehicles. The accuracy of cost allocation is fundamental to heavy vehicle user confidence and the efficiency of road pricing (National Transport Commission, 2017: 8).

Asset management and financial planning among local councils

A growing number of local councils are developing and applying road asset management plans. The Australian Local Government Association (ALGA) found in 2015 that 93% of councils responding to a survey had adopted asset management plans for their local roads. It is unclear to what extent these asset management plans are shaping the councils' long-term financial plans. The ALGA survey found they are, with 91% of councils responding that their asset management plans had been integrated into the council's long-term financial planning. On the other hand, analysis in 2015 by the Institute of Public Works Engineering Australia found that a substantial number of councils in New South Wales were not incorporating the necessary spending allocations from the asset management plans in the council's long-term financial plans.

Adoption of a road data standard

Austroads, the peak organisation for Australasian road transport agencies, has been developing a draft data standard that could be used to harmonise the range of road-related data being collected by road owners. Given the range of existing data holdings and requirements, attention is being focused on a "priority data set". This smaller set of data is aimed at striking a balance between securing additional useful information, while acknowledging the cost and effort required to transition to new sets of data.

Such a data standard is likely to be highly useful, if not essential, in establishing a robust regulated asset base. However, progress appears to have stalled due to resistance from various agencies: partly over questions as to whether the standard is needed to progress reform; and partly in relation to whether the particular jurisdiction's existing data holdings are sufficient or better than the data standard. Local government appears to be supportive, though it is arguing for funding to assist with building up data to the required standard and for development of organisational skills and capability.

Independent price regulation of heavy vehicle charges

The Australian Government released a discussion paper in mid-2017 seeking views on options for future regulation of heavy vehicle charging. Several submissions from the transport industry advocated that the price regulation function be given to the Australian Competition and Consumer Commission (ACCC). This reflects the organisation's reputation for independence, and its existing expertise in the regulation of infrastructure charging, for example in the water and energy sectors.

In November 2017, the Transport and Infrastructure Council (TIC) agreed that governments would work together on a Regulation Impact Statement (RIS) to assess implementation options for independent price regulation of heavy vehicle charges. Relevantly, the communiqué from the ministerial meeting leaves open whether the ACCC is the preferred entity to take on the regulatory function, or whether other models will be considered further. This points to future challenges in securing inter-governmental agreement on the form of independent price regulation.

The RIS will examine the costs and benefits of implementation of independent price regulation and a forward-looking cost base, and better enable jurisdictions to assess the potential financial impacts of these measures, including assessing any impacts on regional communities of changes to road pricing models. This is aimed at enabling the ministerial council to make a decision on implementation options (including a preferred regulator) during 2018-19, some 12 months later than originally proposed by the Australian Government.

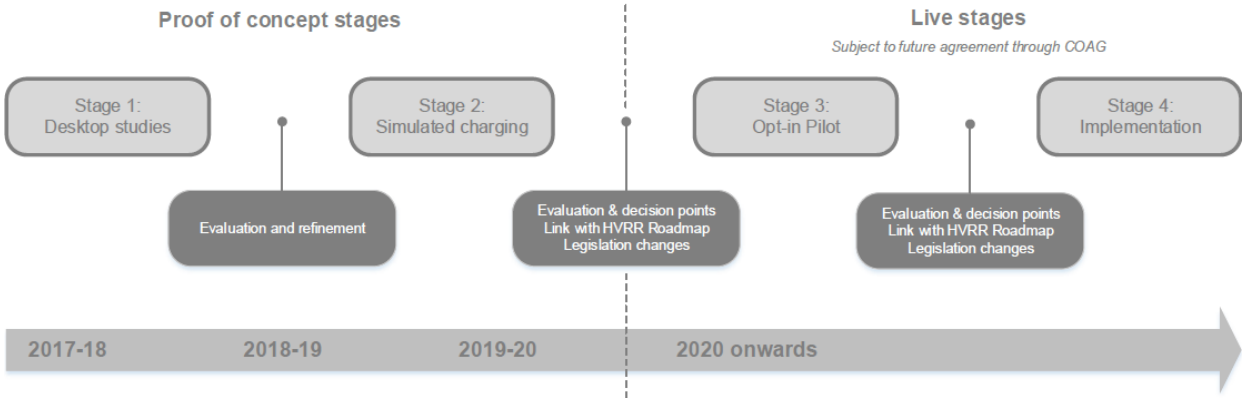
Development of a "forward-looking cost base"

The National Transport Commission (NTC) has developed a prototype of a forward-looking cost base that could be used in setting heavy vehicle charges (as distinct from the approach under PAYGO that recovers past expenditure). The prototype forward-looking cost base uses current asset values and future operating costs to establish a forward-looking revenue requirement (or cost base) for heavy vehicle charging. It is expected that the prototype will be refined during the course of the RIS process.

Heavy vehicle charging pilots

In December 2017, the Australian Government announced that it would commence a trial of a new system of heavy vehicle charging. Selected participants involved in the pilot will test the replacement of registration fees and the fuel-based Road User Charge, with a national direct user charge. In addition, a business case programme for location-specific trials will be undertaken. As shown in Figure 3, the live stages of the pilot are not scheduled to commence until after 2020 (assuming COAG agrees to proceed to the live trials). This suggests that any decision, based on the trials, to proceed to direct heavy vehicle charging is unlikely to occur before the mid-2020s.

Figure 3. Timetable for heavy vehicle charging pilots



Source: Department of Infrastructure, Transport, Cities and Regional Development (2017)

Encouraging private investment in roads for heavy vehicles

In November 2015, the TIC adopted a framework for smaller-scale private investment in public road infrastructure (Austroads, 2015). The framework is aimed at providing industry with certainty about government processes, so that firms can invest in specific projects that would improve the productivity of their operations. It is intended for one-off, smaller-scale, high productivity vehicle access enhancements, including first/last kilometre links, farm gate access and "pinch points" such as bridges. It is unclear whether publication of the framework has led to any private investment proposals. Anecdotal evidence suggests that, although there is some interest in pursuing this opportunity in the agricultural sector (for example to allow large farm equipment to be driven along local roads), there has been comparatively little progress in translating this opportunity into projects on the ground.

Charging for light vehicle usage

For the time being at least, there is little or no political appetite to extend road user charging into the realm of light vehicles.

Recently, though, road user groups have begun to acknowledge the need for reform. For example, the Australian Automobile Association, the national peak body of road user associations, has supported holding "a public inquiry into transport market reform and how we move in the long term to a system that replaces current taxes with a fairer road user pricing mechanism … this inquiry is the critical next step in developing a funding model capable of building the transport system Australia needs for the 21st century."

Transurban, the owner of most road-related PPP projects in Australia, undertook trials in 2015 and 2016 of various alternative approaches to road user charging. These trials, in Melbourne, gauged motorists' understanding of the current road-funding system, and assessed their views of the alternative charging structures.

As noted earlier, the Australian Government indicated in November 2016 that it would institute a public inquiry into a broader system of charging for road use, including light vehicles. The inquiry is scheduled

to start in 2018. The Minister stated in early 2018 that any changes in light vehicle charging would be a 10-15 year process, and require backing from territorial governments.

Overall observations

In summary, the state of play remains one of slow, incremental progress towards new governance arrangements for Australia's roads. Current work aimed at considering some of the building blocks of future reform – for example a forward looking cost base and potential establishment of a heavy vehicle pricing regulator – is encouraging. In addition, there is the possibility of a start on what will surely be a long journey (one with an uncertain destination and duration) towards broader funding and governance reforms.

However, key decisions to implement changes are yet to be taken.

Critically, the central agencies of government are focused increasingly on the need for reform, and in the process are re-considering previously held views on road funding. For example, it appears several treasury departments are now less concerned with hypothecation of road-related revenues; which is an implicit recognition of the prospective gap between road-related revenues and government spending on roads. That said, the treasuries will doubtless play a strong role in further reform, notably through advice to governments concerning on-going fiscal impacts (for example, outlays on roads that are unlikely ever to cover their costs through road charges) as well the broader economic impact of any reforms.

Options for further reform

The previous sections identified a history of slow, incremental change in the governance of Australia's roads, as well as recent initiatives offering cause for optimism that further reform is possible. Given the funding challenges facing the road sector, and given the need for the road sector to play a part in raising economic productivity, the objectives for further reform need to focus on:

- improving the quality of decision making in the road sector (i.e. "no regrets" reforms, including the establishment of a RAB, that can deliver benefits independent of road funding reforms)
- providing an enduring means of funding the development, maintenance and operation of Australia's road network.

With this backdrop, the options for further reform fall into two categories: "more of the same" or "something new". The first three options below fall into the "more of the same" category, while the fourth and fifth options fall (broadly) into the "something new" category.

Governments, industry and the community will need to consider whether action under the first category could contribute, or create a barrier, to more significant reforms in the second category.

Continuing with efforts to improve contracting arrangements

This option presents few barriers to pursuing change in other areas, and offers some potential to reduce construction and maintenance costs. Any reductions will be useful, although they are not going to be sufficient to address the funding challenge.

To varying degrees, governments and road agencies are already working to improve their contracting practices. The option is supportive of reform in other areas, although the duration of any maintenance contracts needs consideration; overly long contracts or contracts without appropriate "break" clauses may constrain governments' ability to establish an optimal commercial model.

More transparent and commercial management

Options in this area also present few barriers to pursuing change in other areas. They include:

- Improved asset management – This option presents few barriers to pursuing change in other areas. It offers moderate potential benefits, although most road owners are likely to be exploring options in this area. The option is supportive of reform in other areas.
- Benchmarking – This option should present limited barriers to pursuing change in other areas. It offers modest potential benefits. Experience shows, though, that one or more jurisdictions could resist publication of any benchmarking results.
- Adoption of a (shadow) regulated asset base – This option involves, in effect, creating the equivalent of the common asset base that would be used in the fifth option below, but without using the information for regulatory purposes. It provides existing road agencies and, importantly, the central agencies within government, with information to assist them in making well-informed spending decisions. The option presents moderate challenges in implementation, but is not a barrier to pursuing change in other areas. There is potential to build on the asset registers and expenditure plans for the key freight routes agreed by transport ministers. This option offers moderate to high benefits, due to its greater transparency and scrutiny of the asset base by any prospective independent regulator.

These approaches offer the prospect of improved decision making, leading to more targeted spending and lower costs. However, like the first option, they do little to address the larger funding challenge.

Greater use of PPPs

As noted earlier, toll roads represent a very small percentage of the overall network. While potentially useful in some cases, individual toll roads will not provide a comprehensive basis for meeting Australians' road needs in the future.

In any event, there are likely to be limited instances where PPPs can be developed on a fully commercial basis. This is because of: increasing uncertainty about traffic forecasts (especially); high capital costs for any projects that involve extensive tunnelling; potential market resistance to tolls; and, arguably, a comparatively small contractor market.

New PPP contracts could complicate the implementation of broader reforms, for example by introducing new long-term concession arrangements that would need renegotiation if a broader, systemic charging

model were to be introduced. Careful assessment of the commercial arrangements and careful drafting of relevant clauses in the concession contracts will be required. After all, the possibility of a move to a broader system of road charging is a possible (and foreseeable) outcome during the 30 or more years covered by most PPP contracts.

In this regard, recent questions about concentration in the market for road PPPs have significant implications, both for the future development of particular road projects as well as broader reform of the road sector. The Australian Competition and Consumer Commission has commenced an inquiry into whether Sydney Transport Partners' (STP) proposed acquisition of a majority interest in the WestConnex project in Sydney would or could have the effect of substantially lessening competition in one or more markets for road-related services.

STP is a consortium involving Transurban, which owns 15 of 19 toll road concessions in Australia and seven of nine concessions in New South Wales (NSW). In a Statement of Issues, the Commission stated:

> The ACCC is concerned that the proposed acquisition may substantially lessen competition for concessions to construct, own and operate toll roads in NSW or nationally. Incumbent toll road operators have significant advantages in bidding for subsequent concessions. Advantages arise due to control of detailed traffic data and the ability to leverage existing concessions when seeking new concessions…. Transurban's… incumbency advantages are evidenced, for example, by the fact that Transurban is the only entity that has been granted a toll road concession in Australia on the basis of unsolicited proposals to state government since 1987. (Australian Competition and Consumer Commission 2018)

The Commission is scheduled to report in mid-July 2018.

Broader road reform will take time, and, during this period, there will still be a need for new roads, and upgrades of others. Provided new projects are supported by a rigorous business case, and suitably structured contracts are established, PPPs will remain a delivery option. What governments do need to consider are the implications for broader reform before PPP contracts are executed, amended or extended.

Establishment of a road fund with hypothecation of existing revenues with (or without) independent regulation (or oversight)

Hypothecation of existing road-related revenues will not address the funding challenge; however, it will assist in making the case for reform, by making it clearer to road users and taxpayers what level of road-related taxation versus general taxation is spent on the road networks.

Hypothecation could be complemented with independent oversight of, and reporting on government road spending. Both capital and maintenance spending would be captured in this model. This approach is broadly the role undertaken by the Office of Rail and Road in the United Kingdom.

Broader reform of road funding

Reforms in this area include:

- Explicit road charging including full economic regulation – as noted above, public and political resistance will need to be overcome if this option is to be pursued. That said, it offers substantial potential benefits, principally in the form of a more durable funding base, and by supporting greater scrutiny of spending decisions. Across the road sector and government, there is an acknowledgment that charging would need to start with heavy vehicles, before any decision is taken to extend charging to light vehicles.
- Increases in fuel levies – this option faces two limitations: firstly, moderate to high public and industry resistance, and, secondly, limited benefits in the medium to long-term, as vehicles become more fuel-efficient and as more vehicles are powered electrically. Considered together, these factors suggest there is little reason to pursue this option. Moreover, if governments pursue this option, there is some risk it could compromise more durable funding reform options.

In summary, contracting reform, changes in asset management and benchmarking will deliver some improvements. However, of themselves, they are only a partial answer to challenges facing the road sector. Neither increases in fuel levies nor localised user charging as part of PPPs can meet the funding needs of the road sector. Conversely, introducing a charging and pricing regime for light vehicles presents too many political difficulties in the short term.

The following reforms associated with the establishment of a corporatised delivery model – introduction of a regulated asset base for roads; heavy vehicle charging reform; the establishment of a heavy vehicle charging regulator; and the creation of one or more road funds operated on a transparent and commercial basis – are consistent with a longer-term reform pathway towards broader road charging.

Pre-conditions for the successful introduction of a corporatised delivery model for roads

Corporatisation of the road sector is a significant and complex undertaking. Without careful attention to a wide range of issues, the exercise may falter. Bureaucratic and other disagreements may cause political will to waiver. In addition, without rigorous assessment, the model may deliver poor or unintended results.

Success will depend on several pre-conditions being satisfied. Those pre-conditions are likely to be:

- broad industry and community acceptance of the need for change, as well as the direction and pace of change
- agreement among governments and other road owners on the direction and pace of change
- agreement on the design of a corporatised delivery model, including:

- which roads would be covered by a corporatised delivery model
- bundling of the networks
- collection of relevant and acceptable data
- staging of a corporatised delivery model.

These pre-conditions are reasonably well understood, and there is some work underway. Even so, they have not yet been satisfied. Indeed, that will take some time. The three following sections explore each of these matters in more detail, before the final section draws out the paper's main conclusions.

Securing industry and community acceptance of the need for change

Industry

The trucking industry appears to be ambivalent about road reform. Statements by the Australian Trucking Association in December 2017 show some organisational support for the creation of road funds and hypothecation of existing road-related revenues. It stated, "There needs to be a clear link between the collection of charges and the reinvestment of these funds back into the road network … Currently there is no link, no guarantee that the charges will actually be spent on roads, and no guarantee they'll be spent on the roads where it is needed."

However, the association also argues the current system overcharges the trucking sector (prospectively by AUD 189.5 million in 2018-19), and that, as a result, charging reform and the creation of an independent road fund would reduce what it sees as overcharging. There may be a mismatch of expectations between the trucking sector, other road users and governments.

In addition, the association's statement suggests considerable caution in its support for road charging reform. It argues, "Distance based charging is not a silver bullet. Any new charging system must be efficient and effective, it must be fair, and it must not impose additional burdens on road users."

The Australian Logistics Council is more supportive of reform, but still has concerns, notably in relation to potential overcharging of freight vehicles and ensuring that payments to achieve service levels associated with broader Community Service Obligations (CSO) are paid for by government rather than from user charges.

It seems clear, therefore, that debates about the costs attributable to heavy vehicles will be central in any move towards a corporatised delivery model for roads.

Industry is also concerned about rising costs and administrative burdens. A corporatised delivery model, including direct charging for road use, may therefore meet resistance on the grounds of the claimed administrative overhead it imposes on drivers and companies. However, modern GPS-based tracking systems should now minimise those costs.

Industry is seeking to use larger vehicles over larger parts of the road network. Participants in the industry can be expected to seek assurances that road reform will allow them access to larger parts of the network on suitable terms. Conversely, some road owners, especially local councils, will remain wary of allowing heavier vehicles on to their roads in the absence of assurance systems for enforcement of vehicle access and load limits and additional road funding.

There are approximately 46 000 businesses in the trucking sector. Small firms dominate the road transport industry. In 2004, approximately 70% of all operators had only one truck in their fleet and approximately 24% had two to four trucks. Less than 0.5% of all operators had fleets with more than 100 trucks. These small businesses are a significant lobby.

While the larger operators would be aware of policy debates about the road sector and its governance, it is quite possible that many smaller operators (especially owner-drivers facing the immediate, day-to-day pressures of running a business) would be only broadly aware of those debates.

Widespread and ongoing engagement with the road transport industry, both about its concerns and the fiscal and economic realities facing Australia, is vital. Industry expects to be actively involved in the road reform process, and not just consulted. For example, the Australian Logistics Council (2017) argued, "… while it is important for industry to have confidence in the development of a road pricing model for heavy vehicles, it is also imperative that industry is involved in the model whilst being developed, and not merely asked for comment at the point a consultation Regulatory Impact Statement (RIS) is put forward."

In summary, industry is providing only qualified support for reform. This will increase the difficulty that governments face in translating current initiatives (discussed in earlier sections) into decisions to change the system of heavy vehicle charging. Current indications from industry of support for reform could break down.

Community

Extending any new governance and funding model for heavy vehicles to light vehicles will require understanding and reasonable support from the Australian community. Without that support, governments are unlikely to take the threshold decision to proceed beyond heavy vehicle reform. Alternatively, any lack of public understanding may lead to pressure to reverse a decision to extend the corporatised model to light vehicles, for example if spending on roads in some areas is lower than had been the case prior to corporatisation or if light vehicle users are surprised by new direct charges. Once started, any decision to halt or reverse reform processes would have significant financial and reputational costs.

Around the world, trust in the ability of governments to manage public policy in the broader interests of the electorate is in question. Australia is no exception. The results from an international survey, published by Edelman in early 2018, found that trust in government in Australia (35%) is lower than the average of 28 larger economies. The Pew Research Center has reported similar results; in recently published research, it found that 48% of respondents trusted the national government to do what is right for Australia, a percentage that is lower than most other western democracies.

Transport is a significant outlay for Australian households. Between 1984-85 and 2009-10, it represented between 15.1 and 16.9% of average household outlays. This comparative stability in outlays has implications for the capacity and willingness of households to accommodate any material shifts in transport costs.

In 2015-16, transport costs (AUD 207 per week for the average household) represented 14.5% of household spending, the third highest outlay after housing (AUD 279 per week) and food and non-alcoholic beverages (AUD 237 per week).[22] Although vehicle purchase and repairs, airfares, public transport fares and other items make up a large part of this amount, expenditure relevant to the funding of roads and a potential shift to a corporatised delivery model represent a reasonable proportion of outlays. The Productivity Commission estimates that government taxes and charges average around AUD 1 334 per vehicle per year. This figure comprises fuel excise (AUD 607), vehicle registration fees (AUD 270), stamp duty (AUD 139), licence fees (AUD 22) and other taxes AUD 269).

Moreover, as shown in Table 5, households in less accessible areas of the capital cities are paying more for fuel and in tolls than those living in easily accessible locations. In many, though not all cases, these less accessible locations are also areas where household incomes are lower than the average.[23]

In conjunction with the "trust deficit" alluded to above, these statistics underscore the difficulty governments will face in extending a corporatised delivery model to light vehicles. A sceptical electorate, one that is concerned about rising living costs, will need to be convinced of the case for change.

In general, the community is probably largely unaware of the scale of the challenges facing the road sector and the nature of potential changes in that sector.[24]

The cost implications of a shift to a commercial delivery model will need to be openly addressed. Media commentators and some road user associations argue that drivers of light vehicles already pay for their use of the road network through fuel excise and other charges. Debates about shifting from fuel excise and registration charges to a more direct form of road user charging are therefore typically initiated with a proviso that any new funding system will be revenue neutral.

Table 5. Average weekly household expenditure (AUD) on vehicle fuels, registration, insurance, tolls and public transport, 2015-16

	Non-metropolitan households	Metropolitan households				All households
		Limited/low accessibility	Moderate accessibility	High accessibility	Very high accessibility	
Petrol	38.73	49.17	41.60	37.35	26.36	37.52
Diesel fuel	8.16	6.36	4.13	3.04	1.55	5.30
LPG and other fuels	0.72	0.64	0.83	0.32	0.39	0.66
Vehicle registration and insurance	33.13	45.07	42.34	36.80	30.00	35.54
Tolls	0.89	3.32	2.61	2.40	1.74	1.78
Sub-Total	81.63	104.56	91.51	79.91	60.04	80.80
Public Transport Fares	2.46	5.89	6.22	6.55	12.33	5.83
Total	84.09	110.45	97.73	86.46	72.37	86.63

Note: It needs to be emphasised that the figures for tolls are averages for the geographic areas in question. In locations without tollways, the figure will be zero (or close to zero), whereas the figure will be higher in communities where tollways are present or more present, e.g. Sydney, Melbourne and Brisbane.

Source: Author analysis of data in Australian Bureau of Statistics (2017b)

This may be a necessary starting point for any debate about governance and funding issues (and indeed a necessary medium-turn outcome). However, such provisos assume that:

- Current aggregate funding for roads is sufficient to provide a road network that continues to meet user needs. The evidence of maintenance backlogs and significant government investment in capital expenditure suggests otherwise.
- Productivity gains in constructing, maintaining and operating the road network can in fact be realised and will be sufficient to meeting any funding gap.

Moreover, this view ignores the prospective fall in fuel excise (and perhaps other road-related revenues) and how quickly this could occur.

It is vital, therefore, that governments understand the current and prospective road network and its associated funding requirements before starting engagement with the community. Development of a RAB can provide the information necessary for informed community debate. Without this understanding, the parties involved in debating road reform options could have misplaced expectations. Governments and road agencies must have a solid and detailed understanding of the ability of a revenue-neutral commercial model to meet the community's reasonable expectations of the road network. Setting a declining revenue base as the starting point for the corporatised delivery of roads will not provide sufficient revenues to maintain the road network, much less cover the cost of capital improvements. The overall model would inevitably need to change.

Governments have received advice on options to address these issues. For example, the COAG was presented with advice in 2007 on options to deal with urban congestion. The options included road pricing and moving registration of light vehicles from an essentially flat system to one based on kilometres travelled annually. Infrastructure Australia proposed in 2011 that consideration be given to applying a per kilometre toll on the east coast highway network to fund the conversion of those highways to motorway standard roads and to meet their recurrent maintenance and operating costs. Certain exemptions were suggested to allow local road users to use the roads without paying unduly large tolls.

The transition to something new will be the key issue for governments and the community, especially in negotiating any path towards light vehicle charging.

Widespread and ongoing engagement with the community will be required, both in relation to the concerns of road users and fiscal realities. Clear communication of the first steps of reform will be necessary, for example explaining that introduction of a RAB does not presuppose charging light vehicle users directly for driving on the road network. It will be important to distinguish between the introduction of a RAB (just good management) from the introduction of a corporatised delivery model for roads with user charging.

That said, development of a RAB will almost certainly highlight issues concerning service levels provided by different sections of the road network. It could focus industry and, in turn, community discussion about the cross-subsidies between different parts of the network. This will present major challenges for policy makers and governments.

Securing government and road owner agreement on the direction and pace of change

Governments, opposition parties (ministers, shadow ministers and backbenchers) and their senior officials will need to be convinced of the direction and pace of change. Even interim steps, such as the development of a RAB (shadow or otherwise), cannot happen without government support.

However, support for road reform across and within governments is likely to vary or be conditional. The road and central agencies might be expected to be broadly supportive. This support could vary by jurisdiction, though, depending on whether the agencies see their jurisdiction being a net winner from reform. Inter-governmental funding arrangements, especially the scale of funding from the Australian Government to individual states and territories, can be expected to affect levels of support.

The central agencies, especially the treasuries, are likely to be cautious about the scale and duration of future funding commitments associated with road reform. In Australia, government budgets are typically prepared for the forthcoming financial year, and include forward estimates for a further three years on a "no policy change" basis. Application of a corporatised delivery model will probably require governments to make longer-term commitments to future expenditure on new projects and road maintenance, both in aggregate and potentially for relevant geographical subdivisions of the network. Indeed, once corporatisation evolves to a point where an economic regulator is making charging and other determinations (for example in relation to efficient costs to deliver particular service levels), credible financial commitment of relevant funding by governments will be essential.

The setting of service levels that might determine Community Service Obligation payments by government will be a very significant consideration for all governments. Given the level of vertical fiscal imbalance in the Australian system of government, the territorial governments (the smaller jurisdictions in particular) can be expected to seek ongoing financial assistance from the Australian Government. At the same time, it is possible to envisage a situation where a decline in fuel excise forces a future Australian Government to consider moderating the rate of growth in road grants to the territorial governments.

The pace of reform over the last decade strongly suggests governments will be careful in proceeding with reform in future; they are unlikely to take positions too far ahead of industry and community opinion on the direction and pace of reform. External advocates and trusted public figures will be required to assist governments in building up the confidence and commitment to pursue any changes. The Australian Government has committed to holding a public inquiry, to be led by an eminent person, into light vehicle charging.

Given the breadth of the road network, the level of vertical fiscal imbalance and the variety of inter-governmental relationships, the reform of road governance arrangements will need to be led by the Australian Government. Equally, though, the territorial governments will demand the ability to negotiate an outcome. After all, they own the road networks. Moreover, as sovereign governments, they each face different economic and social challenges and will look to pursue their own transport and road-specific approaches to addressing those challenges.

The Australian experience of public policy reform often involves the national government using its comparatively greater financial power and resources to secure the participation of the territorial

governments. Reforming the governance of Australia's road network is likely to be another case where the Australian Government will need to buy the involvement of the territorial governments.

Private road owners

Transferring existing tollways to a new framework will require careful consideration. Most of the existing PPP contracts have end dates in the late 2040s or early 2050s, although some contracts terminate earlier and others extend into the 2060s.

The private operators will probably seek to be kept financially whole, i.e. they will look to ensure they suffer no commercial loss from a shift to a broader system of road governance. Complex and commercially difficult negotiations are likely. The role of a road regulator (or a prospective regulator) in those negotiations will need some consideration. Governments will need to gear up for that exercise.

The experience in Melbourne regarding the CityLink PPP project is indicative of the potential for complex negotiations. It appears there have been different interpretations of the relevant contract provisions as to whether the concession-holder has earned a rate of equity return, which would trigger profit sharing with the Victorian Government. Moreover, assessment of the relevant contract provisions has been complicated by several renegotiations of the original contract, undertaken as part of subsequent negotiations about new projects. Recent media coverage in Sydney has referred to similar issues in relation to other projects.

Contracts presently under negotiation will introduce their own complexities. For example, the shift to some form of change in road governance and potentially to a new system of road user charging is a reasonably foreseeable matter. As such, it would be prudent to consider inserting into those contracts a regime to deal with the prospect of such change.

Securing agreement on the design of a corporatised delivery model

Beyond securing stakeholder agreement on the need and broad direction for change, agreement is also required among governments and stakeholders on the design and staging of a corporatised delivery model. As noted earlier, initial steps should not close off options for broader reform in the longer term.

The following subsections address a number of issues that will require resolution, including:

- determining which roads would be subject to corporatised delivery
- establishment of an economic regulator for the road sector
- establishment of a regulated asset base and the need for improved road-related data
- geographic "bundling" of the road network
- dealing with uncertainty

- staging implementation of a corporatised delivery model.

Determining which roads would be subject to corporatised delivery

Pursuing a corporatised delivery model will require Australian governments to agree the extent of the road network to which such a model might apply. The options range from the whole road network to the approximately 25 960 kilometres of highways comprising the currently legislated National Land Transport Network (NLTN), or possibly a subset of that network. Between those end points, further options include:

- the highways on the NLTN and some other "higher order" roads, for example the key freight routes agreed by TIC ministers
- the roads covered by the option above, as well as various first and last kilometre roads providing a link between the higher order roads and key locations such as intermodal terminals.

In reaching an agreement on the network, governments are likely to address some or all of the following issues and criteria:

- The relative economic importance of different parts of the network – this suggests focusing, initially at least, on roads that carry the greatest traffic volumes, especially the greatest freight volumes. For example, the non-urban parts of the NLTN accounted for 38.3% of total heavy vehicle road use in Australia in 2013-14 (measured in VKT). However, there is significant variation in traffic volumes across the NLTN (and the heavy vehicle share of traffic). Some sections of the NLTN carry under 1 000 vehicles per day (in total) and fewer than 500 heavy vehicles per day[25].
- The extent of intergovernmental agreement about the existing road network – the currently defined NLTN includes roads that provide inter-regional and cross-border connections across Australia's large land mass. This reflects Australians' conception of themselves as one nation of people.
- Intergovernmental funding issues – the NLTN is the subject of an intergovernmental agreement under which the Australian Government provides funding to the territorial governments for maintenance of relevant highways. Similar arrangements do not exist for other roads that are off the NLTN, including many of the key freight routes agreed by transport ministers. On the other hand, the agreement provides for various forms of project-specific funding to the territorial governments. This project-specific funding can be spent on projects beyond the NLTN.
- The ability to build on current or imminent efforts in related areas, for example the recent asset registers and expenditure plans for key freight routes.
- The availability of asset data – although asset registers have been compiled for the key freight routes, they are still incomplete in various respects. Data for local roads is often incomplete and probably of variable quality.
- The willingness of the parties to participate in road reform efforts and the need to maintain sound relationships between governments, i.e. to minimise the risk that future reforms are not compromised by an early breakdown in negotiations. As seen in other areas, for example progressive adoption of the heavy vehicle national law, this may mean accepting that some

parts of a truly national network are not included in a corporatised delivery model in the first instance.

- The risk of overreaching in the first instance – governments will recognise the scale and potential complexity of the undertaking, and, as a result, are likely to be cautious about applying a commercial model too widely in the first instance.
- Ensuring the network covered by a commercial model can be extended over time – governments will want to ensure that additional parts of the road network can be covered by the commercial model in a reasonable timeframe.
- Lessons from overseas – experience in the United Kingdom and elsewhere suggests that efforts to commercialise road development and operations would probably start with the higher order networks.

Privately owned roads will present a range of issues. Those roads are clearly part of the higher order road network in a number of cities; indeed, they are part of the key freight routes. However, the roads in question are covered by existing contractual relationships between the private owners and the relevant state government. The private owners may be willing to participate in initiatives that do not compromise their commercial position, but not be willing to participate in initiatives that have a commercial impact. Resolution of the contractual and commercial issues is likely to be complicated.

Notwithstanding the issues associated with privately owned roads, a case can be made for moving (relatively quickly) to apply a commercial model to the key freight routes. These routes are agreed between all governments, and handle most of the significant road freight volumes. In the cities (and on some inter-regional routes), the roads also carry substantial numbers of light vehicles. In other words, the roads are also significant for passenger traffic. The routes incorporate highways on the existing NLTN. Finally, initial asset registers and expenditure plans have been published for those routes.

Even on the NLTN, traffic volumes and the percentage of heavy vehicles vary greatly between different road segments. Lower volume segments of the NLTN in regional parts of Australia (and probably many of the other key freight routes) are likely to remain dependent on Community Service Obligation (CSO) payments from governments.

A small number of private tollways are funded entirely from tolls. Other publicly owned roads handle high traffic volumes but are not presently tolled. These may or may not be capable of being managed on a fully commercial basis.

No doubt, funding issues will be keenly debated. The Australian Government is likely to be wary about taking on additional funding responsibilities, for example subsidies towards maintenance of those key freight routes not already on the existing NLTN.

These financial complications may require governments and industry to agree some intermediate steps, such as the creation of a common RAB, before adoption of a full commercial delivery model.

Establishment of an economic regulator for the road sector

The structure and role of a road regulator will be a key issue. Decisions will need to be taken as to whether the regulator is a national entity, such as the current Australian Competition and Consumer Commission (ACCC), or whether state-based regulators such as NSW Independent Pricing and Regulatory

Tribunal and the Victorian Essential Services Commission take on this role (perhaps operating under an agreed national code).

National and state-based regulations have been used across other Australian infrastructure sectors. For example, the Australian Energy Regulator (AER) regulates electricity networks and covered gas pipelines in all jurisdictions, except Western Australia. The AER works under a "statement of expectations" set by the COAG Energy Council (a ministerial council similar to the Transport and Infrastructure Council).

State-based economic regulators set prices for urban water supplies in most states, although prices in some states (and regions in other states) are not subject to independent regulation. Principles for economic regulation were set down in a 2004 intergovernmental agreement on a National Water Initiative (NWI). The findings from a recent review of progress against the NWI indicate that pricing arrangements used by the state regulators are generally consistent with the NWI principles, although there is some evidence of under-pricing (among other issues).

The Australian experience is broadly consistent with international practice. Albon and Decker (2015) observed that: "In terms of assignment of regulatory functions between national and sub-national governments, there has been a trend towards national regulation of national markets (energy, communications and national rail), and of markets where there are inter-jurisdictional externalities (non-urban water and wastewater). Urban water and wastewater, airports and ports, are more frequently subject to sub-national regulation."

Road networks exhibit characteristics that lend themselves to either national or state-based regulation. Clearly, there are roads that provide the foundation for inter-state/territory transport. In the Australian context, these include the NLTN and at least some of the key freight routes. The fact that many of these roads are also used for wholly intra-state transport bears on the regulatory question.

As noted earlier, transport ministers agreed in December 2015 to move towards independent price regulation. The Australian Government released a discussion paper in mid-2017 seeking views on the establishment of an economic regulator for heavy vehicles. Industry opinion broadly favours giving the ACCC the power to regulate heavy vehicle charges.

Nevertheless, it must be acknowledged that most roads are used almost exclusively for inter or intra-regional or, indeed, local transport. Most governments have acknowledged the need to manage urban transport demand, especially road use. This suggests a case for territorial-based regulation, given state/territory governments will probably want to retain some ability to set their own transport policy parameters. For example, territorial governments may seek to set mode split and other planning targets to achieve broader policy objectives. They may also seek to impose access constraints on some vehicles as a means of managing environmental and asset management concerns.

Balancing these competing considerations will be a difficult task. There are likely to be efficiency benefits associated with a national approach to regulation of use of the road network by inter-state traffic. On the other hand, as most road use occurs within a single jurisdiction, state-based regulation (both for freight and, potentially in the future, for private travel) would better support multi-modal transport planning. These competing considerations strongly suggest that a first step focused on heavy vehicle regulation is appropriate, but that the first step must be designed with a view to potential extension of road regulation to a broader network of roads and (potentially) to other vehicle classes.

The role of the regulator will also attract discussion. An independent monitoring and reporting function akin to the UK Office of Rail and Road would be the minimum responsibility of Australian regulator. In the Australian case, the monitoring role is likely to be complemented by a more conventional regulatory function, at least for heavy vehicles. In the short to medium term, this is likely to focus on funding issues

(i.e. the share of funding attributable to heavy vehicles). In the longer-term, subject to government decisions on light vehicle charging, a greater focus on economic efficiency, for example variable link-based charging, is possible.

Lessons from the introduction of economic regulation in other sectors will need to be applied. For example, some former industry participants argue that the regulator(s) at the time were under-resourced compared to the electricity utilities in terms of their capacity, skills and knowledge. Necessarily, they were somewhat reliant on the utilities for asset condition and customer performance data. It has been argued this led to soft regulatory outcomes, and opportunities to "game" the regulator.

To limit those opportunities and avoid regulatory shocks in the road sector, comprehensive benchmarking data will need to be shared early on. Action to minimise capability disparities between the regulator and road entities will also be required.

Establishment of a regulated asset base and the need for improved road-related data

Adopting a consistent asset base and data across jurisdictions offers the prospect of:

- lowering maintenance costs over time through more transparent reporting of costs and contracts
- (potential) allocative efficiencies arising from better decision making, particularly in relation to capital improvements and maintenance priorities.

The benefits from adopting a RAB for the Australian road network (for example improved asset management and improved benchmarking) are important for all parts of the road network. Developing a RAB for the whole network – or at least parts of that network – is a necessary yet "no regrets" step towards a broader system of charging. If charging is not pursued, the creation of a nationally consistent set of data on road assets will still support improved decisions about the allocation of government budgets.

At present, the territorial governments provide expenditure data to the NTC to calculate heavy vehicle charges that are then recommended to ministers for adoption. However, as noted by the Department of Infrastructure, Transport, Cities and Regional Development in its discussion paper on price regulation of heavy vehicles, "The process is light touch in ensuring accuracy and quality of the inputs into the [NTC's] model, with periodic data checks and guidance provided to states and territories with the expenditure template."

Moving from the current approach used by the NTC (which focuses on recovering past expenditure, regardless of the efficiency of that expenditure) to an asset base that could be used for the purposes of economic regulation requires decisions about:

- the roads to be covered in such an asset base (see above)
- the extent and quality of the data, including data on asset valuations.

While the recent publication of asset registers and expenditure plans for the key freight routes provides an indication as to which roads might form an initial network for the purposes of a RAB, that agreement has not yet been secured. Moreover, even for those freight routes, a significant amount of work is required to deepen the existing asset register information into a form that is rigorous, consistent across jurisdictions, and capable of being used for regulatory purposes.

As noted above, Austroads has been developing a road data standard for the last two years. Agreement on the formal adoption of the draft data standard still has not been reached, even though the economic appraisal on the draft standard suggested it could generate substantial benefits. There is concern from some state road authorities and perhaps from local governments, for example about the cost of collecting data, and the availability of professional resources. There may also be concerns about the cost of adapting systems to new formats, the cost of improving the currency and quality of data, political or other risks associated with increased transparency and questions about diminishing returns associated with collecting more data.

Limitations on the range and quality of data on local roads suggest that those roads would not form part of an initial regulated asset base. For example, reviews of local government road-related data show a considerable difference remains in the assessment of asset consumption of roads and bridges as reported by road asset managers and that reported by depreciation in councils' financial reports. For example, a 2015 review of data for NSW councils by the Institute of Public Works Engineering Australia found that the depreciation expense for local roads and bridges (excluding the roads' ancillary assets) was less than what was required. This is consistent with an aging infrastructure profile where the annual renewal requirement is more than depreciation as assets age. On average, the depreciation expense in council financial accounts was 64% of the asset managers' assessment of the expenditure needed for 2013-14.[26]

In light of these issues, a decision to include local roads in an initial asset base would significantly delay progress towards a corporatised delivery model. There may be some exceptions. For example, local roads that are important for freight and/or road-based public transport could be added to an initial RAB for the higher order road network.

Nevertheless, local government organisations recognise the potential benefits in improved asset management that could come from adoption of a road data standard. Those organisations are likely to seek Australian Government (and territorial government) support for the development of their in-house systems and staff, as well as the progressive collation of data at the required standard.

Depending on the depth of the road contractor market, the returns from introducing a (shadow) RAB (i.e. without formal economic regulation) could be significant.

However, simply moving to a shadow RAB (akin to the prototype forward-looking cost base being developed by the NTC), but without reform of heavy vehicle charging and independent price regulation, will limit the benefits that are potentially available from the asset information. Some of the benefits associated with more rigorous decision making are likely to be at least partially foregone. The full benefits from using the information are realised only if it is used for regulatory purposes.

Not using the asset base information for regulated pricing decisions also raises additional financial risks. For example, governments or ministers may decide not to set or maintain charges at a level that recovers the attributable cost of maintenance and capital expenditures that earlier governments have made in the expectation that future charges would continue to be set at a level to recover those outlays. Protection from those decisions only comes with an independent regulatory structure.

Geographic "bundling" of the road network

In establishing a corporatised model, decisions will need to be taken on the scope of the network to be subject of that model, and the number of smaller network "bundles" within that larger network.

The UK road management reforms of the last few years suggest that an initial focus on a higher order network (for example all of the key freight routes agreed by the Australian and territorial governments) should be pursued. However, the Australian system of government (notably the existence of three levels of government) is more complicated than in the United Kingdom. As a result, while a focus on higher order networks is correct in principle, application of that principle will probably require more compromise and negotiation than has been the case in the United Kingdom.

Smaller bundles could be used as the basis for contracting specific services such as road maintenance and operations as well as capital works, for performance reporting to governments and benchmarking. Ultimately, these bundles could be used as the basis for economic regulation.

These bundling decisions will be influenced by a range of considerations, including:

- decisions as to whether any future economic regulator has a national and/or territorial mandate
- ability to secure competition for the relevant contracts – too many bundles may be inefficient, while too few may exclude various market participants and lead to a loss of competition
- scale economies – bundles of sufficient geographic scale and duration to encourage bundle owners, managers and contractors to invest in productivity-enhancing technology and management systems
- geographic and climatic differences between bundles – the geographic and climatic differences across Australia are very large, and substantially affect the cost and durability of road works
- the extent to which a road owner should be able to recover costs by cross-subsidies within a bundle (or perhaps even across bundles) as opposed to relying on broader CSO payments from governments
- ability to derive reliable data for benchmarking purposes
- government transport policies – for example, state and territory governments may wish to assert various transport policies relevant to their jurisdiction
- community of interest and social policies – some governments may wish to ensure that contract bundles are designed to maximise opportunities for local employment, especially in regional areas.

Applying these criteria may lead to conflicting conclusions. Compromises around the application of the criteria will be required, for example keeping bundles within the confines of the territorial governments' geographic boundaries. In some cases, governments may need to consider whether allowing cross-border bundles might deliver a better result than insisting on alternatives driven by jurisdictional boundaries.

In addition, stakeholders will have different views. Major road users will look for bundling that allows for transparent assessment and reporting of costs and charges. Minor or irregular road users may be less concerned by these matters.

For their part, the territorial governments will want to ensure that their particular circumstances are fully considered. The jurisdictions' approach to management of their current networks is constantly evolving. Their contract bundles are changing. In addition, the jurisdictions are likely to be nervous about the publication of benchmarking data.

Private road owners will expect to be engaged in decision making on these matters, if only to protect their commercial position or identify areas where shareholder value can be created.

Agreement on the geographic scale of the network bundles will therefore require considered policy development and assessment of options by governments. The territorial governments' individual views will themselves be shaped by competing considerations, notably protecting their sovereign powers versus the possibility of securing funding from either the Australian Government and or road users.

Given current constitutional, fiscal and contractual circumstances, the outcomes will need to be negotiated at length. These negotiations are likely to lead to a bundling structure within existing territorial boundaries (perhaps with a few exceptions).

Dealing with uncertainty

Whatever the bundling structures and other aspects of a corporatised model, some matters will remain uncertain. The Australian Infrastructure Audit found that the range of uncertainties in the early 21st century is greater than before, and that this is making infrastructure planning and decision making more challenging than in the past. These uncertainties will bear on the design of future road governance arrangements and potential charging models. They include:

- Issues that bear on road transport demand, including:
    - Disruptive factors, for example changes in technology that increase the attractiveness of telecommuting and/or ridesharing
    - Social factors, for example changing preferences for driving or changes in the ability of some segments of the population to drive as the population ages
    - Macro-economic change, for example changes in the Australian economy or changes in the economy of particular regions, or changes in per capita income.
- Issues that bear on the future cost of operating, maintaining and developing roads, including:
    - Technological improvements that might reduce (or increase) maintenance and construction costs
    - Availability of materials – changes in the availability and therefore cost of resources used in construction and maintenance
    - Evolution of private vehicles – road owners may need to invest in additional technologies to enable vehicles to communicate with the road and vice versa
    - Climate mitigation and adaptation – the need for investment in both mitigating and adaptive measures is uncertain, as it will be driven by broader decisions by governments and others
    - Fiscal circumstances of governments – for example, broader fiscal circumstances may result in governments reducing road-related outlays, perhaps affecting the ability of road managers to implement optimised asset management strategies and meet conditions imposed by a road regulator.
- Issues that bear on governance, including:
    - Recognising the possibility that future governments may seek to withdraw from participation in a corporatised delivery model for roads, or may wish to change the terms of their participation. For example, given that territorial governments ultimately have constitutional responsibility for roads within their jurisdiction, it may be that one

or more governments may choose to withdraw from a national model, or qualify their participation in such an arrangement.

Most fundamentally, it is unclear how much of their income countries might choose to spend on transport infrastructure and services relative to spending on other needs. History suggests that countries will spend around 0.5-1% of GDP on the road networks. It is unclear, though, whether this is enough to provide and maintain the road infrastructure at the standards to which countries aspire. In fast-growing economies, such as Australia, there are pressures to expand the transport asset base to accommodate and support population and economic growth.

Equally, it is unclear whether societies will continue to allocate their resources as they have in the past. Potentially rising costs in health, security and elsewhere could place pressures on government and household budgets. Economic forces may moderate or increase rates of growth in GDP and, more particularly, in household income. Australia's GDP is projected to grow at 2.8% per year over the next 30-40 years. However, these are projections only; actual rates of growth may differ somewhat, especially if population rises faster or slower than anticipated or if growth rates in multifactor productivity remain flat or decline.

These issues raise profound questions about the extent to which transport infrastructure is funded through user charges versus government taxation. It is almost inevitable that there will be wide-ranging debate about the extent to which taxpayers versus users are responsible for funding our roads. These debates will inevitably invoke discussion about desirable versus minimum service levels, community service obligations, availability of other transport options (such as public transport) and the affordability of user charges.

Ultimately, it is up to governments to address these matters. For the time being at least, road networks are owned almost entirely by governments. Any shift in ownership or management will only occur under policy and regulatory regimes that are set by governments.

Some thoughts on demand risk

Demand risk is arguably the most significant challenge facing governments and private sector parties involved in the road sector. Experience with PPPs strongly points to this conclusion, as does the range of future technological, social and economic uncertainties noted above.

It is therefore relevant to reflect briefly upon how governments and societies have treated demand risk in the past.

In effect, the demand risk associated with the development of almost all existing road networks has been shared by governments through general taxation. Instead of expecting users of individual links to meet all or a substantial proportion of the cost of providing specific projects, governments paid for those projects and spread the associated demand risk across all taxpayers. This might in fact be considered a form of network charging, albeit an inefficient one. Clearly, the current system for funding roads does not guarantee rigorous decision making, nor is it financially sustainable. Therefore, something must change.

Nevertheless, the experience of spreading demand risk across a large number of parties is instructive. Indeed, risk spreading occurs in some PPP projects; for example, where private owners of a network of tollways are able to accept a higher risk on an individual road segment because of the potential to capture additional traffic on other parts of their network. On a grander scale, it also occurs within the

national motorway networks managed by motorway companies in Europe and elsewhere (e.g. Austria, Slovakia and Slovenia).

Similarly, in the case of other network infrastructure such as electricity and water, the capital cost of most new infrastructure is generally spread across a large number of existing and potential users.

Experience therefore suggests that governance models such as the corporatised delivery of a network of roads are more likely to deal effectively with demand risk than PPP models. The corporatised model allows demand risk to be sensibly and transparently spread across users of the road network (rather than individual links) and taxpayers.

Staging implementation of a corporatised delivery model

Lessons from the past, and recent decisions by governments, suggest that the introduction of a corporatised model for roads and (potentially) some form of direct road charging will be a staged process. At present, the reform process in Australia is focused on:

- completing preparatory work over the next three years
- possible decisions to proceed with heavy vehicle governance and charging reforms in the early 2020s
- possible decisions in the late 2020s or early 2030s to extend application of any heavy vehicle governance and charging processes to light vehicles – this decision would only follow a public inquiry and multi-year process of community engagement.

There is little evidence that governments and industry are approaching the reform task with a sense of urgency. The steps above and the speed of prospective change are perhaps understandable, but leave governments, taxpayers and road users exposed to some risks. They are understandable, given the political sensitivity of these issues, and given the experience both in Australia and overseas of the time needed to implement significant public policy reform. On the other hand, they create a variety of risks, notably (but not only) if technological change and associated declines in road-related revenues occur faster than anticipated.

Governments have an opportunity to reconsider these broad steps and the pace at which reform might occur. If that opportunity is taken, it will be critical for governments to reach early agreement on:

- specific objectives of the reform process
- a potential endpoint where reform might lead to - especially what level of reform governments are willing to aspire to
- the timetable for reform – especially whether:
    - the pace of reform is driven by the lowest common denominator, in which all governments have to agree to reforms before proceeding
    - a more agile approach is followed, in which the Australian Government and some but not all territorial governments participate in reforms, with the aim that other jurisdictions may join in at a later date.

Decisions by transport ministers concerning heavy vehicle reform confirm that individual jurisdictions are willing to participate in these broader processes, but that they are cautious. There is a high probability

that some may reserve their position or hold out on final agreement in order to negotiate what they see as being a better outcome. This "better outcome" is likely to involve demands for additional funding (interim or otherwise) from the Australian Government.

The key question for the Australian Government is whether and to what extent it is prepared to use its financial and other resources to drive reform. It has the power to provide "tied" funding for specific purposes, for example providing grants to the territorial governments to assist them in updating their road asset data to a common standard to be used in a regulated asset base. The Australian Government also has the power to make special payments – referred to over the last 25 years as "national competition payments" – to reward jurisdictions for agreeing to pursue important but difficult policy reforms. These payments have been used on a number of occasions by successive Australian Governments including, more recently, to encourage the territorial governments to sell or lease (on a long-term basis) various infrastructure assets, including ports.

Equally, though, the ability of the Australian Government to make these types of payments is constrained. The government has set fiscal targets it wishes to achieve over the medium term, aimed at improving the budget balance. Still, if the productivity benefits that flowed from reforming other infrastructure sectors in the 1990s were to be replicated in the road sector, the economic dividend for Australia will be significant. That being the case, there is an argument for the Australian Government to underpin its leadership in road reform with appropriate financial support to the territorial governments and local government.

Appendix 3 sets out a potential pathway for road reform over the next 20 years. The timetable in the appendix reflects the author's assessment of the likely pace of reform, rather than a more aspirational and driven approach to change. Regardless of the pace of reform, work across several inter-related themes will need to be staged. These are set out below.

Agreement on staged extension of road networks to be the subject of a corporatised delivery model

The logical road network to start with is the key freight routes, initially agreed by transport ministers at their meeting in November 2014. These routes include the defined NLTN, which comprises less than 3% of the Australian road network yet handles around 60% of all traffic and 18% of all freight. Including the additional roads making up the balance of the key freight routes previously agreed by transport ministers would demonstrate substantive commitment to reform of the road sector.

It should be possible for governments to reach an agreement quickly about a small set of additional first and last kilometre roads to be added to the network of key freight routes.

This initial network could be added to progressively, for example as new industrial development or intermodal terminals are developed. The network could also be added to as further work is undertaken by the territorial governments and local councils to improve their asset data to the requisite standard.

Some local councils may want to manage some or all of their roads under a corporatised delivery model. Thought will need to be given to the conditions under which councils might "opt-in". The main policy and practical considerations will lie in the quality of the councils' asset data, financial arrangements and, possibly, whether inclusion of some roads complicates application and development of the overall model.

Establishment of a regulated asset base

The first step in establishing a regulated asset base is for governments to adopt a road data standard. The draft standard developed by Roads Australia may be able to meet this requirement.

A significant amount of work will then be required to collect asset data that can then be used for benchmarking purposes and, in turn, to prepare initial:

- asset valuations for the road network and various sections within that network
- estimates of the efficient cost of operating, maintaining and developing different parts of the road network.

Until an economic regulator is established, the asset data would exist as a shadow regulated asset base. The data could be used by existing road agencies and governments as the basis for improved asset management and for benchmarking across networks.

Demonstrating that asset management improvements and benchmarking can lower costs, the UK Office of Rail and Road has argued that "base case" asset management improvements could improve the productivity of Highways England's resource spending (as opposed to capital spending) by between 0.6-0.9% per year (UK Office of Rail and Road, 2017: 25).[27] While each road organisation has its own unique circumstances – for example, network scale and condition, existing level of organisational capability, and market conditions – these results are a useful guide to what better asset data and management could offer, even in the absence of formal regulation.

Thought will need to be given to how better information on asset condition (as it becomes available) is incorporated into valuations of the road asset base and, in turn, regulatory determinations by the regulator. These issues – depth of understanding of the asset base and, in turn, revisiting of RAB valuations and price determinations – have been confronted in other infrastructure sectors in Australia.

Agreement on hypothecation of existing road-related revenues

Depending on the structure of the regulatory arrangements and the structure of road organisations, this matter will inevitably raise financial issues requiring early negotiation between governments.

Establishment of the economic regulator and structure of road management organisations

There is some momentum to establish an economic regulator, with a regulatory impact statement on the creation of a regulator due by the end of 2018. Given its experience in economic regulation, the Australian Competition and Consumer Commission is the obvious choice to take on this role.

Agreement on service standards to be used as the basis for regulatory determinations and any community service obligation payments by governments to the road management organisations

This will be a complex and contested part of any transition to direct road charging. The setting of service standards will be critical for two reasons:

- the economic regulator(s) will need to apply service standards in their regulatory determinations

- setting the standards will have consequential implications for future government funding of the road network.

Clear service standards will be central to the role played by any future economic regulator for the road sector. As in other regulated infrastructure sectors, the standards will inform the regulator's decisions on the efficient cost of providing the necessary infrastructure, and, in turn, the determination of any revenue caps. Minimum service standards are necessary to avoid a situation developing where a regulated entity simply cuts costs to maximise its returns.

The service standards (both generally and in specific locations) will have significant consequences for how the road network is funded, and, in particular, how much various governments (as opposed to users) will fund the development, maintenance and operation of the road network in future. Some roads may not have the traffic volumes that are necessary to provide a road at a high level of service. In those circumstances, the response of governments and regulators may range from:

- governments lowering the expected service standard (even though this may not align with user expectations)
- governments and regulators allowing some level of cross-subsidisation between road users, for example between types of road users or between users of different parts of the network
- governments maintaining a higher service standard (for policy or political reasons) and choosing to meet the additional costs through CSO payments.

This is not an abstract issue. As noted earlier, Australia's large road network is characterised by substantial geographic differences in road usage. In addition, the cost of providing roads varies appreciably across the nation. For example, it is more costly to build and maintain roads in the tropical north of Australia - because of seasonal weather conditions and the north's comparative isolation.

As noted earlier, although there are many aspirations for Australia's road network; there are few specific service standards. The transition from aspirations to standards will almost certainly lead to keenly contested arguments. Debate will turn on whether certain sections of the road network fail to meet service standards (at the time they are set), and, if so, which government(s) and/or users will be responsible for additional expenditure that may be required to make good any "backlog" expenditure required to bring the road up to standard. For example, there is some evidence of higher per capita road backlogs in rural areas than in urban areas (NSW Government, 2013). In turn, this will bear on the setting of a starting point for the standards, the trajectory for service standards over time (both up and down), how roads are assessed against the standards, and the valuation of road asset bases.

A shift to a system of road charging and the setting of service standards will almost inevitably have an impact on the current distribution of road funding, both between the Australian Government and territorial governments and between territorial governments and local councils.

There will almost certainly need to be a period of adjustment in funding arrangements.

Extension of telematics

The present heavy vehicle fleet is equipped with different vehicle tracking capabilities. While the capability to obtain data on vehicle location is now reasonably commonplace, the capability to track vehicle mass is less common.

Governments will need to consider requiring all heavy vehicles to have on-board technology to track vehicle movements and, potentially, the capability to provide data on vehicle loading. Without those

capabilities, road owners (and their service providers) will not have the richer information necessary to optimise their asset management plans and spending. Genuine mass-distance-location charging cannot occur without this information.

Early decisions are required so that owners of heavy vehicles can plan renewal of their fleets.

Conclusions

We have reached a challenging point in history. Governments are facing a range of current and prospective fiscal pressures that they have not faced for many decades. These challenges bear on the road sector, increasing the urgency in agreeing new means of managing and funding our road networks.

At the same time, public expectations of governments are undiminished; indeed, they could be growing. Yet, paradoxically, trust in governments and public institutions - and their capacity to deal with major economic, social and environmental issues - is at a low ebb.

In that context, a range of uncertainties is now complicating decision making, especially decisions having long-run costs and implications, such as those in the road sector. These include:

- demand uncertainty associated with new technology, for example whether automated vehicles will increase the demand for transport (for example increasing trip rates among the older segments of the population who might otherwise have reduced their travel) or demand might moderate because of ridesharing (experience in New York so far suggests otherwise)
- demand uncertainty associated with new energy technologies, for example whether potential reductions in the cost of travel associated with electric vehicles might increase trip rates for travel difference and the distances travelled (i.e. as the cost of fuel becomes cheaper)
- demand uncertainty due to changing economic conditions and, in particular, the possibility of slower rates of income growth in western economies compared to those elsewhere
- cost uncertainties associated with mitigating and adapting to climate change.

This conjunction of fiscal challenges, “trust deficits”, and increased uncertainty has major implications for the transport sector. Dealing with this complex mix of issues requires structural solutions; simply responding to individual problems with individual, tactical solutions will not fix the bigger “wicked problem”.

In this regard, PPPs have been pursued principally as a means for seemingly (but not actually) overcoming the funding constraints facing governments. However, experience also demonstrates a range of issues where, if PPPs are to be pursued as a model for delivering roads, application of the model needs to be improved – the assignment of demand risk is one example, supplier de-risking proposed in Kennedy et al (2018) another. Ultimately, governments need to understand their investment proposals better before putting them to market.

In light of the uncertainties noted above, projecting demand for new and existing roads is an increasingly difficult exercise for governments and the private sector. As other Working Group papers have shown,

the premiums associated with transferring that risk to the private sector will be inefficiently high. In any event, PPPs will not be able to address the wider road funding challenge.

Furthermore, broader structural reform is required to establish a sustainable means of funding Australia's road networks, and to improve decision making in the Australian road sector. The prospects of ensuring the Australian community's expectations of a well-functioning road network will improve as a result of these broader reforms. Moreover, the associated improvements in transparency should also increase the community's trust in decision-making processes. The establishment of a corporatised model creates an opportunity to provide road users (and the community at large) with potentially a greater say in what type of road network they want and greater transparency.

Equally, though, the limited trust that many voters have in governments has to be acknowledged. Road users and taxpayers are sceptical about governments, the opposition and others with "big ideas". Dealing with that scepticism is all the harder, given the limited understanding that many road users have of how roads are managed and how they are funded.

Moving the governance of our road networks on to a corporatised footing – and reforming the way we pay for our roads – therefore needs to be handled progressively.

Most importantly, the case for change needs to be made. In so doing, a sceptical electorate needs to be admitted into and allowed to participate in discussions that, to date, have occurred almost exclusively among the road and transport elite.

Equally, there needs to be more honesty and frankness; it is naïve and misleading to suggest that all road users and taxpayers will be better off. There will be winners and losers, even if society overall will be better off. It is better to start the conversation early about the adjustment process and means of assisting those most affected by the prospective changes.

It is also vital that efforts are made to secure commitment across governments – and, as far as reasonably possible, across the political divide – on a medium to longer-term architecture and timeline for reform. Without this, the chances of maintaining support over time, and over electoral cycles, are perhaps slim. This architecture and timeline needs to embrace:

- The creation of a regulated asset base for an initial network of roads. Even if it is never used as part of a broader system of road charging, establishing a regulated asset base will equip road managers to improve the overall performance of the road network, reducing costs and enabling scarce funds to be more effectively applied to meeting the needs of the community and road users.
- Hypothecating road-related revenues. Many road users complain that their road-related taxes are being spent on other things. It would better to address those concerns quickly, dedicate road-related revenues to road-related outlays and minimise the reaction to the broader changes.
- Establishing an independent economic regulator, or, possibly over time, economic regulators.
- Agreeing service standards to be applied by the regulator(s) – one of the most important yet challenging parts of this broader reform.
- A means of bringing existing and prospective PPPs into the broader framework. In the interim, governments need to consider the implications of future reform before PPP contracts are executed, amended or extended.

- Establishing a charging regime to be overseen by the regulator (backed by agreed community service obligation payments where charges cannot meet the cost of achieving the service standards).

However, the deployment of the full potential of a corporatised delivery model for Australia's road network is a complex undertaking. It will take some time to reach fruition, however all the reform pieces need not be put in place at once. Each part will contribute to improvement. A potential gradualism or moving forward in stages may be a useful approach in the face of particularly challenging factors, such as:

- intergovernmental financial relations
- the number of governments and other parties involved
- nervousness about reform and associated challenges in making the case for change.

Drive from the Australian Government, and commitment from territorial governments, will be required to secure meaningful outcomes.

The interjurisdictional complexities in Australia – the presence of three levels of government; the various constitutional responsibilities of the different levels of government; and the extent of vertical fiscal imbalance – arguably make the reform task more difficult than in other countries. The geographic scale and diversity of the Australian road network also introduces complexities that may not be so evident in other countries.

The following uncertainties will need to be addressed throughout the process of designing and implementing a corporatised model for the Australian road sector:

- demand projections, especially due to uncertainty about technological and economic change
- future costs, given uncertainty about the accuracy of current asset condition and rates of expenditure
- the rate of decline in fuel excise receipts (if a corporatisation model is limited to hypothecation of existing road-related revenue streams)
- government transport policy, for example policy to encourage use of public transport, passive modes and demand management in the cities
- community and political reactions to use of a corporatised model (it will highlight service level and funding trade-offs).

These uncertainties are likely to be greatest in the first several years of using a corporatised model. They have implications for contract design (scope, duration, terms). There is an argument for erring on the side of caution in terms of contract duration, at least until the quality of the road assets and the asset data becomes better known.

Staged development of the corporatised delivery model – focusing initially on heavy vehicles and then on light vehicles – will minimise the risk of mistakes being made and the loss of industry, community and political support.

While there are significant challenges, there is also cause for some optimism.

Notes

1 See Gibbs (2014). The Productivity Commission (2017: 32) observed that "…multifactor productivity (MFP), has fallen away since 2002. MFP has risen slightly over the past few years, but the brevity of the period and the fact that recovery has been limited to only some industries does not provide robust evidence of an enduring recovery."

2 All of the toll roads are in urban areas - see BITRE (2016) for details. In Melbourne, the 25 km Peninsula Link road opened in January 2013 as an availability-based PPP – no tolls are paid by motorists. Two toll roads are under construction in Sydney: WestConnex (33 km) and NorthConnex (nine km).

3 The statistics on road length are published by the Bureau of Infrastructure, Transport and Regional Economics (2017). The growth rate in road kilometres was 2.35% between 1985 and 1995, and 1.72% in each of the subsequent decades. The growth rate in lane kilometres was 2.64% between 1985 and 1995, 2.00% between 1995 and 2005, and 1.90% between 2005 and 2015. Drawing comparisons with years prior to 2010 is not straightforward, as there appears to have been a break in the data series around that time. For example, the Bureau's 2012 statistical yearbook indicates that, in 2010, the national road network was 825 592 kilometres in length, whereas the 2016 publication shows the 2010 road network being 873 856 kilometres in length.

4 The Bureau uses definitions of roads applied by PSMA Australia Limited, a government-owned company providing geo-spatial data. Highways are defined as "Roads which are of importance in a national sense, and/or are a major interstate through route, and/or are principal connector roads between capitals and/or major regions and or key towns/commercial centres/inter-transport hubs." Arterial roads are defined as "Well maintained and widely used roads which are major connectors for national highways or state highways, major centres, key towns, or have major tourist importance or which main function is to form the principal avenue of communication for metropolitan traffic movements". Busways are defined as "A road which has been dedicated as a rapid bus-only transit way. This does not include roads which have bus-only lanes."

5 The road network comprised 779 668 Value Equivalent Lane Kilometres (VELK) in 1985 and 1 476 201 VELK in 2015.

6 The figure should be used with some caution. It includes roads, bridges, traffic control systems and the value of the land under the road. Although all road agencies broadly apply established accounting standards to the valuation of their asset base, there are still differences in the agencies' approach to asset valuation.

7 It is difficult to obtain consistent and reasonable data for local government road assets. An audit of local government infrastructure in NSW - see NSW Government (2013) - found that, in 2012, council roads had a written down value of AUD 45.4 billion, about 56% of the value of all local government infrastructure assets in NSW (excluding land). On the other, a 2015 survey by the Australian Local Government Association (ALGA) of 230 councils (out of around 550 nationwide) found that roads represented slightly less than half value of the infrastructure assets of the councils in question (AUD 73.7 billion out of a total of AUD 179.5 billion). The same report stated that the total gross replacement value of all local council infrastructure assets across the country was AUD 438 billion.

8 The most recent statistics, released by the Bureau in December 2017, do not provide data on spending by the private sector on roads. As a result, the paper refers to the 2014-15 data, which does include private sector spending data. In 2015-16, overall public sector spending had grown to AUD 26.17 billion (in 2015-16 prices), of which spending by general government accounted for AUD 22.78 billion.

9 See International Transport Forum (2012). The paper found that, excluding Japan, average spending on inland transport (road, rail and inland waterways) across the OECD countries was fairly consistently around 0.8% of GDP between 1995 and 2010. Of this amount, the majority was spent on roads. In western European countries, around 60% of the total, i.e. around 0.5% of GDP, was spent on roads, while in central and eastern European countries, road spending accounted for between 70-80% of total spending on inland transport. Maintenance spending typically accounted for 30-40% of total spending in 2010.

10 Excise is currently (January 2018) charged at AUD 0.403 per litre of petrol and diesel. The amount is indexed on 1 February and 1 August each year in line with the Consumer Price Index (an Australia-wide measure of inflation). A fuel tax credit regime is in place for businesses for the use of diesel fuel in a heavy vehicle. This credit is equivalent to the difference between the road user charge and the general rate of excise. See also note 16 below.

11 Total revenue was AUD 30.28 billion in 2015-16 (2015-16 prices). As a point of comparison, 2014-15 road related revenue totalled AUD 29.97 billion in 2015-16 prices).

12 Fuel excise revenues fell by 1.86% between 2014-15 and 2015-16, and accounted for 36.25% of all road-related revenues in 2015-16.

13 The data is drawn from the National Transport Commission (2016). The Commission determines the heavy vehicle share of expenditure based on its own cost allocation model.

14 The registration charge varies with vehicle size and axle configuration. In 2017-18, it ranges from AUD 611 for a two axle truck to AUD 13 225 for a long combination truck. The road user charge is currently (January 2018) AUD 0.258 per litre of diesel.

15 The data in this section is drawn from Bureau of Infrastructure, Transport and Regional Economics (2017a).

16 Australian Bureau of Statistics (2017). The estimated resident population has grown to 24.6 million at June 2017.

17 If experience over the last 30 years is a guide, the road network could grow by about 5-6% over the next 30 years. However, rates of growth in the road network have been slowing. Future growth in the network will depend on: the rate of suburban development in the capital cities; the spending priorities of governments, especially the extent to which other sectors, such as health, attract more spending; and the rate of arterial road development compared to investment in public transport (several governments appear to be spending slightly more of their transport budgets on public transport than was the case in the past).

18 Australian Government (2015a: 14). The NSW Government's equivalent report - see NSW Government (2016) - projects that the state budget primary balance will shift from a surplus of 0.3% of Gross State Product (GSP) in 2014-15 to a deficit of 3.4% of GSP in 2055-56.

19 The figures for tolls in Table 4 are national averages. As tollways are present in Sydney, Melbourne and Brisbane only, average household outlays on tolls would be higher in those cities (Sydney especially) and zero in the five other capital cities.

20 Recent experience in the state of New South Wales is typical. In its February 2018 State Infrastructure Strategy, Infrastructure NSW, an independent advisory body to the government, recommended that "… it [INSW] partner with NSW Government agencies to develop a 'road map' by the end of 2020 that examines the merits of, and outlines a pathway to, an integrated, system-wide user pricing regime across the Sydney metropolitan road and transport network that contemplates the impacts of electric and autonomous vehicle technology." In its March 2018 response to the Strategy, the NSW Government noted the recommendation and stated, "The government has no plans for changes to current road funding arrangements."

21 The Australian Government's budget outcome for 2016-17 shows that petrol and diesel excise accounted for approximately 4.3% of Australian Government taxation receipts in 2016-17, down from around 7-8.5% during the 1990s.

21 The Council of Australian Governments, COAG, is the peak forum for the heads of the Australian, state and territory governments (and a representative of local government).

22 The smaller percentage of outlays attributable to transport in 2015-16 may be due to lower costs (for example lower vehicle purchase and operating costs) and/or reductions in transport outlays to accommodate increases in other areas (for example increases in energy costs).

23 As an indication of these differences, the average weekly toll payment per household in Sydney was AUD 3.80, compared to AUD 2.73 in Melbourne and AUD 3.33 in Brisbane. Households in the other capital cities paid nothing or effectively zero, in tolls.

24 As part of its trial in 2016 of alternate means of paying for roads, Transurban surveyed trial participants about their knowledge of how much they were paying for road use and how roads are paid for at present. The survey results showed that a large proportion of respondents had a comparatively limited understanding of how the road network is funded.

25 See BITRE (2016a). BITRE estimates total vehicle use on the non-urban NLTN corridors was approximately 42.8 billion vehicle kilometres in 2013–14, with light vehicle use approximately 35.2 billion vehicle kilometres and heavy vehicle use approximately 7.6 billion vehicle kilometres. These estimates imply that vehicle use across the inter-capital and inter-regional NLTN accounts for approximately 17.5% of estimated total vehicle road use across Australia—244.4 million vehicle kilometres in 2013–14 (ABS 2015), with light vehicle travel on the NLTN around 15.7% of total light vehicle road use in Australia and heavy vehicle travel on the NLTN somewhat higher at around 38.3% of total heavy vehicle road use across Australia.

26 The possibility of a similar issue with road-related data for the higher order roads managed by the territorial governments cannot be ruled out.

27 The 0.6–0.9% range is described as a "central" estimate. Against several different productivity measures, all results fell within a range of 0.3–0.9% per year.

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Appendix 1. Trends in passenger kilometres travelled

Table 6. Estimated passenger kilometres travelled (billions) in Australian capital cities and outside of capitals, 1984-85 to 2014-15

Financial Year	Passenger Car		Bus		Rail		Other		Total	
	Capital Cities	Outside Capitals	Capital Cities	Outside Capitals	Capital Cities	Outside Capitals	Capital Cities	Outside Capitals	Capital Cities	Outside Capitals
1984-85	93.03	74.90	4.20	8.82	6.33	2.50	9.29	12.70	112.84	98.93
1989-00	111.50	88.55	4.79	12.94	7.44	2.53	10.47	13.26	134.20	117.28
1994-95	123.70	99.17	5.00	11.10	8.04	2.20	11.33	14.06	148.06	126.53
1999-00	134.57	105.24	5.23	11.77	8.99	2.41	12.31	15.29	161.10	134.72
2004-05	146.80	115.26	5.48	12.36	9.70	2.16	13.70	17.19	175.67	146.98
2009-10	148.52	113.71	6.48	13.06	12.10	2.65	16.84	21.43	183.94	150.85
2014-15	157.85	117.17	7.13	14.17	12.94	2.73	19.33	24.34	197.26	158.41
CAGR 84-85 to 99-00	2.49%	2.29%	1.47%	1.94%	2.36%	-0.24%	1.89%	1.24%	2.40%	2.08%
CAGR 99-00 to 14-15	1.07%	0.72%	2.09%	1.24%	2.46%	0.83%	3.05%	3.15%	1.36%	1.09%
CAGR 84-85 to 14-15	1.77%	1.50%	1.73%	1.56%	2.41%	0.29%	2,47%	2.19%	1.88%	1.58%

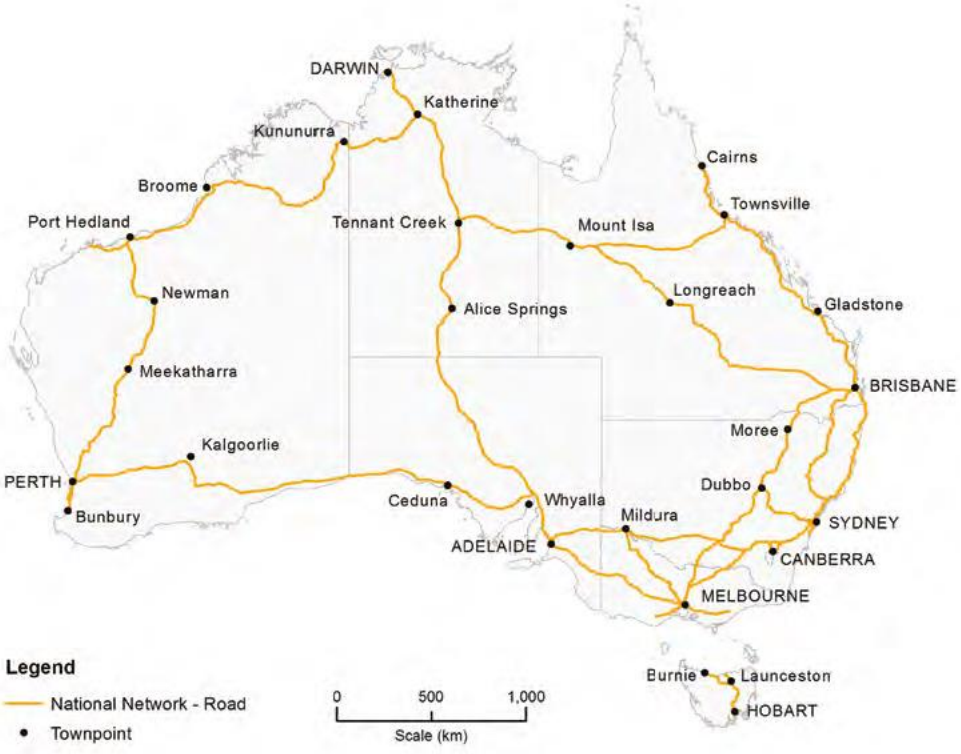
Source: Author analysis of data in BITRE (2016)

Table 7. Estimated passenger kilometres travelled per capita by mode in Australia, 1984-85 to 2014-15

Financial Year	Passenger Car		Bus		Rail		Other		Total	
	Capital Cities	Outside Capitals	Capital Cities	Outside Capitals	Capital Cities	Outside Capitals	Capital Cities	Outside Capitals	Capital Cities	Outside Capitals
1984-85	9 261.3	12 993.9	418.1	1 530.1	630.2	433.7	924.8	2 203.2	11 233.4	17 162.8
1989-00	10 260.3	14 289.4	440.8	2 088.1	684.6	408.3	963.5	2 139.8	12 349.2	18 925.5
1994-95	10 765.1	15 076.2	435.1	1 687.5	699.7	334.5	986.0	2 137.5	12 885.1	19 235.6
1999-00	11 046.4	15 102.1	429.3	1 689.0	738.0	345.8	1 010.5	2 194.1	13 224.2	19 332.6
2004-05	11 163.9	16 407.3	416.7	1 759.5	737.7	307.5	1 041.9	2 447.0	13 359.4	20 922.7
2009-10	10 237.0	15 120.0	446.6	1 736.6	834.0	352.4	1 160.7	2 849.6	12 678.3	20 058.6
2014-15	9 947.0	14 821.4	449.3	1 792.4	815.4	345.3	1 218.1	3 078.9	12 430.5	20 038.0
CAGR 84-85 to 99-00	1.18%	1.01%	0.18%	0.66%	1.06%	-1.50%	0.59%	-0.03%	1.09%	0.80%
CAGR 99-00 to 14-15	-0.70%	-0.12%	0.30%	0.40%	0.67%	-0.01%	1.25%	2.28%	-0.41%	0.24%
CAGR 84-85 to 14-15	0.24%	0.44%	0.24%	0.53%	0.86%	-0.76%	0.92%	1.12%	0.34%	0.52%

Source: Author analysis of data in BITRE (2016)

Appendix 2. National land transport network (road)



Appendix 3. Potential evolutionary path of road governance reform in Australia

Issue	Current System	Stage of development[1]					
		Application of Forward Cost Base (FCB)	Application of FCB and establish Independent Heavy Vehicle Price Regulation (IHVPR)	Regulated asset base + full economic regulator for heavy vehicles	Broader application of a regulated asset base to heavy vehicles and precursor steps to light vehicle charging	Regulated asset base and direct charging and regulator for all vehicles	Regulated asset base and price regulator for all vehicles and policy-based pricing, e.g. congestion charging
Possible timing	**Now**	**2 years**	**3-4 years**	**3-5 years**	**4-8 years**	**10-15 years**	**15-20 years**
Revenue							
Government	Funded from tax base - in practice offset to significant degree by fuel tax and registration charges (rego.) and other road-related revenue.	Funded from tax base - in practice offset to significant degree by fuel tax and rego. and other road-related revenue. Govts. commit to funding projected outlays included in cost base.	Funded from tax base - in practice offset to significant degree by tax and rego. and other road-related revenue.	Funded from tax base for non-regulated network, and for Community Service Obligation (CSO) payments for regulated network to achieve non-commercial service levels (in practice offset to significant	Funded from tax base for non-regulated network, and CSOs for regulated network to achieve non-commercial service levels (offset to moderate degree by tax and rego. and other road-	Road-related taxes and charges would have been abolished as part of broader charging reform. CSO payments to achieve particular non-commercial service levels in particular locations to be funded from	Road-related taxes and charges would have been abolished as part of broader charging reform. CSO payments to achieve particular non-commercial service levels in particular locations to be funded from

				degree by tax and rego. and other road-related revenue).	related revenue), i.e. the disparity between road-related revenues and outlays is likely to be more pronounced.	general taxation.	general taxation.
Heavy vehicle (HV) charging	Heavy vehicle charge + fuel tax + registration (Recovery of govt. road expenditure attributable to heavy vehicles over past several years).	Heavy vehicle charge + fuel tax + registration (Cost recovery on FCB rather than recovery of past expenditure)	Heavy vehicle charge + registration (Cost recovery on forward cost base)	Hypothecated HV charge + fuel tax and registration charges. Network to which funds applied TBC. Some of the funds may be spent on non-regulated part of the network, e.g. first and last km. roads.	Hypothecated HV charge, Network to which funds applied TBC. Some of the funds may be spent on non-regulated part of the network, e.g. first and last km roads. Potential integration of existing tollways into network subject to HV charging.	Hypothecated heavy vehicle charge.	Hypothecated heavy vehicle charge. (Some revenues possibly directed to other outlays to support achievement of other policy, e.g. demand management and mode shift).
Light vehicle charging	No direct user charge (other than limited no. of tollways). Fuel tax + rego. are an indirect charge.	No direct user charge (other than limited no. of tollways). Fuel tax + rego. remain an indirect charge.	No direct user charge (other than limited no. of tollways). Fuel tax + rego. remain an indirect charge.	No direct user charge (other than limited no. of tollways). Fuel tax + rego. remain an indirect charge.	Hypothecation of fuel tax + registration charges.	Light vehicle charging (probably late in this period), probably for particular parts of the network only.	Light vehicle charge. (Some revenues possibly directed to other outlays to support achievement of other policy, e.g. demand management, emissions reduction, and mode shift).

Who makes charging decisions?	Ministerial Council re extent of cost recovery from heavy vehicles.	Ministerial Council re extent of cost recovery from heavy vehicles.	Price regulator, within cost recovery framework for heavy vehicles set by ministers.	Price regulator, within cost recovery framework for heavy vehicles set by ministers.	Price regulator, within cost recovery framework for heavy vehicles set by ministers.	Price regulator within framework set by ministers. Possibility of multiple regulators, e.g. if territorial govts. insist on managing local sensitivities re light vehicle charging, and transport planning priorities (esp. in cities).	Price regulator within framework set by ministers. Possibility of multiple regulators, especially if jurisdictions wish to pursue own policy priorities.
User Input							
Heavy vehicle users	Opportunities limited to lobbying on costs and charging issues and network gaps.	Opportunities limited to lobbying on costs and charging issues and network gaps.	Submissions to regulator on costs/charging and service requirements, and lobbying of governments.	Submissions to regulator and lobbying on costs/charging and service requirements and lobbying of governments (regarding non-regulated network).	Submissions to regulator and lobbying on costs/charging and service requirements and lobbying of govts. (re non-regulated network).	Submissions to regulator and lobbying on costs/charging and service requirements and lobbying of govts. (re CSOs for regulated and non-regulated network),	Submissions to regulator and lobbying on costs/charging and service requirements and lobbying of govts. (re CSOs for regulated network),
Light vehicle users	Via lobbying and other electoral processes.	Via lobbying and other electoral processes.	Via lobbying and other electoral processes.	Via lobbying and other electoral processes.	Via lobbying and other electoral processes.	Submissions to regulator and lobbying.	Submissions to regulator and lobbying, e.g. re policy settings and CSOs.
Expenditure (Who decides, what, where, when)							
Heavy vehicle	Determined by government(s), based on their plans	Determined by government(s), based on their plans and own	Determined by government(s), based on their plans and own	Determined by commercial highway organisation for	Determined by commercial highway organisation for	Determined by commercial highway organisation for	Determined by commercial highway organisation for

	and own priorities.	priorities.	priorities. Regulator could provide independent, public advice on spending priorities.	regulated part of the network with aim of meeting govts. and user expectations. Regulator sets allowance for capital works in revenue determination and monitors performance and efficiency. Govts. set priorities on unregulated part of network.	regulated part of the network with aim of meeting govts. and user expectations. Regulator sets allowance for capital works in revenue determination and monitors performance and efficiency. Govts. set priorities on unregulated part of network.	regulated part of the network with aim of meeting regulator, and govts. and user expectations. Regulator sets allowance for capital works in revenue determination and monitors performance and efficiency. Govts. set priorities on unregulated part of network.	regulated part of the network with aim of meeting regulator, and govts. and user expectations. Regulator sets allowance for capital works in revenue determination and monitors performance and efficiency.
Light vehicle	Determined by government(s), based on their plans and own priorities.	Determined by government(s), based on their plans and own priorities.	Determined by government(s), based on their plans and own priorities.	Determined by government(s), based on plans and own priorities.	Determined by government(s), based on plans and own priorities.	Determined by commercial highway organisation(s) for the network with aim of meeting regulator, and govt. and user expectations. Regulator to approve charging, asset base value etc, and monitor performance and efficiency.	Determined by commercial highway organisation(s) for the network with aim of meeting regulator, and govt. and user expectations. Regulator to approve charging, asset base value etc, and monitor performance and efficiency.
Network subject to economic regulation							
Legislated NLTN[2]	No [3]	No	No	Yes. Heavy vehicles only.	Yes. Heavy vehicles only.	Yes. All vehicles.	Yes
Key freight routes	No[2]	No	No	Yes. Heavy vehicles only.	Yes. Heavy vehicles only.	Yes. All vehicles.	Yes

KFRs and selected other significant roads	No[3]	No	No	No	Yes. HV only. Existing tollways added. Opportunity to add further roads via 'Intelligent Access Programme' (IAP) and private investment	Yes. Heavy vehicles only.	Yes. All vehicles.
Whole network	No[3]	No	No	No	No	Yes Heavy vehicles only.	Yes. All vehicles.

Notes: 1. Highlighted cells show main changes between stages; 2. National Land Transport Network defined under the Commonwealth *National Land Transport Act 2014*; 3. Network subject to access regulation for heavy vehicles, aimed at addressing safety and road damage considerations.

Appendix 4. Research questions and outputs of the Working Group on Private Investment in Infrastructure

Introduction: Getting the basics right

What are the economic characteristics of infrastructure? What is infrastructure and what are operations? What are the models of private participation in infrastructure and through which significant private investment actually takes place?	Makovšek, D. (2019), "What is Private Investment in Transport Infrastructure and Why is it Difficult?", Working Group Paper, International Transport Forum, Paris.
Can private investment improve productive efficiency? Improve project selection? Close the infrastructure funding gap? Have other positive effects when it is private?	Makovšek, D. (2019), "The Role of Private Investment in Transport Infrastructure", Working Group Paper, International Transport Forum, Paris.
What have the private investment trends in transport infrastructure been over the last 20 years? How much of that was foreign private investment?	Mistura, F. (2019), "Quantifying Private and Foreign Investment in Transport Infrastructure", Working Group Paper, International Transport Forum, Paris.

Defining the challenge: How uncertainty in contracts matters

How does uncertainty affect risk pricing? Beyond investors, do suppliers in PPPs also have issues with risk pricing? How does its transfer to the private sector affect competition? What does uncertainty mean for the public vs. private cost of financing?	Makovšek, D. and Moszoro, M. (2018), "Risk pricing inefficiency in public-private partnerships", *Transport Reviews*, *38*(3), 298-321.
Is uncertainty also an issue in long-term services/operations contracts?	Beck, A. et al. (2019), "Uncertainty in Long-term Service Contracts: Franchising Rail Transport Operations", Working Group Paper, International Transport Forum, Paris.
What is the competition for large transport infrastructure projects in the EU market? Is there a difference between traditional procurement and PPPs?	Roumboutsos, A. (2019), "Competition for Infrastructure Projects: Traditional Procurement and PPPs in Europe", Working Group Paper, International Transport Forum, Paris.

Addressing uncertainty for suppliers: the construction phase as example

Adversarial vs. collaborative procurement – is collaborative contracting the future?	Eriksson, P. et al. (forthcoming), "Collaborative Infrastructure Procurement in Sweden and the Netherlands", Working Group Paper, International Transport Forum, Paris.
What lessons in dealing with risk and uncertainty were learnt in Danish mega projects from Storebaelt to Femernbaelt?	Vincentsen, L. and K. S. Andersson (2018), "Risk Allocation in Mega-Projects in Denmark", Working Group Paper, International Transport Forum, Paris.
What can governments do in the short run to reduce inefficient pricing of risk by construction contractors?	Kennedy, J. et al. (2018), "Risk Pricing in Infrastructure Delivery: Making Procurement Less Costly", Working Group Paper, International Transport Forum, Paris.

Addressing uncertainty in long-term contracts in the absence of continuous pressure for efficiency

What is the public sector organisational counterfactual on which private investment should seek to improve?	Holm, K.V. and T.H. Nielsen (2018), "The Danish State Guarantee Model for Infrastructure Investment", Working Group Paper, International Transport Forum, Paris.

Partial fixes to the public-private partnership approach

How would an organisational structure consisting of PPPs come close to a network-wide management approach? What benefits would it yield?	Vassallo, J. (2019), "Public-Private Partnerships in Transport: Unbundling Prices from User Charges", Working Group Paper, International Transport Forum, Paris.
Should the public or the private side bear the cost of long-term uncertainty? How could we design a PPP contract to avoid hold-up due to incomplete contracts?	Engel, E., R. Fischer and A. Galetovic, (2019), "Dealing with the Obsolescence of Transport Infrastructure in Public-Private Partnerships", Working Group Paper, International Transport Forum, Paris.

Long-term strategic approach

How do the PPP and regulated utility model (RAB) compare in terms of efficiency incentives?	Makovšek, D. and D. Veryard (2016), "The Regulatory Asset Base and Project Finance Models", International Transport Forum Discussion Papers, No. 2016/01, Paris.

What basic considerations underlie the choice between a PPP and RAB approach?	Hasselgren, B. (forthcoming), "Risk Allocation in Public-Private Partnerships and the Regulatory Asset Base Model", Working Group Paper, International Transport Forum, Paris.
What are the preconditions a country would need to take to establish a RAB model on a motorway network? Is user-charging a must?	Alchin, S. (2019), "A Corporatised Delivery Model for the Australian Road Network", Working Group Paper, International Transport Forum, Paris.
From the investors' point of view, does a RAB need to be fully reliant on user-charging?	Francis, R. and D. Elliot (2019), "Infrastructure Funding: Does it Matter Where the Money Comes From?", Working Group Paper, International Transport Forum, Paris.
Incentive regulation can also yield perverse incentives. Can the capex bias be managed?	Smith, A. et al. (2019), "Capex Bias and Adverse Incentives in Incentive Regulation: Issues and Solutions", Working Group Paper, International Transport Forum, Paris.
Does it make sense to pursue hybrid solutions between PPP and RAB?	Zhivov, N. (2018), "The Thames Tideway Tunnel: A Hybrid Approach to Infrastructure Delivery", Working Group Paper, International Transport Forum, Paris.
Uncertainty and private investment mobilisation in transport infrastructure	
What lessons can we draw from recent attempts to mobilise private investment in infrastructure in the aftermath of the global financial crisis?	Makovšek, D. (2018), "Mobilising Private Investment in Infrastructure: Investment De-Risking and Uncertainty", Working Group Paper, International Transport Forum, Paris.
Synthesis	ITF (2018), *Private Investment in Transport Infrastructure: Dealing with Uncertainty in Contracts*, Research Report, International Transport Forum, Paris

A Corporatised Delivery Model for the Australian Road Network

This paper investigates the conditions of and argues for a shift towards a corporatised approach to road governance in Australia, including the application of a Regulatory Asset Base or RAB. The paper is part of a series of 19 papers and a synthesis report produced by the International Transport Forum's Working Group on Private Investment in Transport Infrastructure.

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