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Australian Trucking Association

A future strategy for road supply and charging in Australia

Final Report

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AUSTRALIAN TRUCKING ASSOCIATION

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Executive summary

Road freight is a critical enabler for the Australian economy. More than 70 per cent of domestic freight is transported by road. The total road freight task in tonne-kilometres is expected to double by 2030, and triple by 2050. The ability of Australia's road network and current heavy vehicle access arrangements to support this future freight task is a major challenge for the nation.

Over $15 billion is raised in road user charges each year by governments with around $3 billion collected from heavy vehicles. Yet there is little clarity about whether investment in roads for both heavy and light vehicles is well targeted and delivered at efficient cost.

By contrast, natural monopolies like electricity and water supply are tightly regulated with independent assessment of efficient costs, use-based charges and achievement of standards overseen by national regulators. More transparent funding models are also being extended to social services, such as health.

A more transparent and efficient model for investment in roads and charging for their use is overdue. The road freight sector can be a significant contributor to economy wide productivity improvements. However, the full potential of the sector will not be realised unless investment in roads to improve access for freight vehicles is better targeted and more efficient than at present.

A series of recent and current reviews have primarily focused on road freight user charging models. Enhanced charging mechanisms are desirable but given road freight's relative unresponsiveness to changes in charges, we consider an improved investment model is the first priority for road reform. It will achieve the greatest productivity enhancements.

We have developed a set of staged recommendations that will enable a shift to a more mature, demand-led, road freight investment and charging model over the short and longer term. It has elements of the proven models applied in other sectors but is tailored to fit the unique characteristics of the road network, the diversity of the freight industry, the existing institutional framework, and currently available data and technology. It also has potential to be extended beyond the road freight sector to broadly encompass all road investment.

Short term recommendations

The main elements of our proposed freight road supply and charging model that can be introduced in the short term are:

1. **Defining a three-tier road freight network** – with each tier targeting a particular heavy vehicle access level to focus investment, reporting and funding:
   - Tier 1 – primary land freight transport corridors
   - Tier 2 – significant 'last mile' higher mass limit connections
   - Tier 3 – remaining freight network

   This tiered approach is akin to defining service standards (eg reliability) in the utilities sectors and can be commenced in the short term. Tiers and access levels can be defined based on access requests from industry to the National Heavy Vehicle Regulator, as well as direct consultation with industry.

2. **Reporting, benchmarking and review of road costs** – state, territory and local government road owners should report investment and maintenance on each tier of the road freight network. The information should be compared with cost benchmarks and the level of access achieved relative to targets to increase transparency and accountability.

3. **A transparent formula for allocating funding to road suppliers** – this should be established by the National Transport Commission to direct funding to road suppliers. Allocations should reflect road costs, heavy vehicle usage and access upgrades required for Tier 1 and Tier 2 roads. Existing and emerging data can support this allocation. The funding formula should incorporate a mechanism for funding low-volume roads (generally Tier 3 roads) as community service obligations. This is similar to the activity based approach to funding health which incorporates mechanisms to provide additional funding in rural and regional areas to sustain adequate levels of health services in these areas.

4. **Improving cost reflectivity of road charges** – in the short term, this would involve adjusting the existing pay as you go (PAYGO) scheme to be more reflective of road use as well as a third-party review of PAYGO inputs.

Medium and long term recommendations

Over the medium to long term, elements of the short term model can be extended further if the benefits of these reforms are found to exceed their implementation and operating costs:

1. **Reporting, benchmarking and review of efficient costs** – in the medium term, independent assessments of efficient road investment and maintenance costs can be tied more explicitly to funding allocations. Incentives to outperform benchmarks should be provided, for instance, by allowing a road supplier to retain unspent funds and invest in other priorities.

2. **Potentially establishing a national road fund** – in the long term, an independent road fund would assess available freight demand data and submissions of all levels of government and the freight industry to develop forward looking investment and maintenance plans on the Tier 1 and 2 freight network. These plans would be used to direct road owner spending and inform charging requirements. Spending would be financed mostly from heavy vehicle road user charges, though the Australian Government could top-up funds if it desired.

3. **Further improving the cost reflectivity of road charges** – in the medium term, a majority fuel-based charge should be adopted, reducing the role of registration charges.

4. **Continuing with a fuel and registration based charge until a strong business case for variable charging emerges** – variable charging should be implemented if the government can demonstrate that the detailed data obtained through variable charging can, and will, be used to improve road investment decision-making such that the added cost, time and complexity is warranted.

   The most promising form of variable charging would distinguish operators by road freight network tier used (location), vehicle combination (at a designated mass), and distance travelled. To ensure a low cost of implementation of such a system, the information requirements for charging should be developed in consultation with industry to harness the natural uptake of real time position and communications systems. Data requirements should be collected using 'open standards', rather than specifying new and potentially incompatible systems.

Table 1 sets out PwC's recommended supply and charging model across the short, medium and long term.

The pathway to road reform is challenging. However, by lowering the cost of living, the cost of doing business and the impact on the environment, the dividends extend beyond the freight industry and reach every individual, business and community.

In recent years, various levels of government and industry have demonstrated a willingness to pursue meaningful road reform. With greater collaboration and a practical approach, beneficial reforms can be achieved – putting Australia back on the road to tackle the challenges of the decades ahead.

Table 1: Recommended road supply and charging model

		Short term (ST) (0-3 years)	Medium term (MT) (3-6 years)	Potential long term (LT) (7+ years)
Supply	Network	• Define initial 3-tier network and agree aspirational access levels for each tier **(ST Recommendation 1)** • Road owners to report investment and maintenance on each tier of the network **(ST Recommendation 2)**	• Update 3-tier network periodically • Access levels are increasingly met	• Update 3-tier network periodically • Original access levels are met • Access levels evolve with technology and freight task requirements
	Investment & maintenance decisions	• Road owners / road agencies make decisions based on industry consultation, cost and network hierarchy		• National road fund for state roads • Local government retains control of local roads **(MT/LT Recommendation 2)**
	Access	• Guided by 3-tier network, but ultimately determined by road owners • Industry makes applications to NHVR who collates and pursues (with road owners) potential ad hoc improvements (local roads) or movement of roads up tiers (state roads)		• National road fund direction for state roads **(MT/LT Recommendation 2)**
	Funding	• Commonwealth collects road user charge and states collect registration charges • Funds directed to road owners based on road costs, heavy vehicle usage and access upgrades **(ST Recommendation 3)**	• Commonwealth collects road user charge and states collect registration charges • Funds more explicitly linked to independent assessments of efficient road investment and maintenance costs **(MT/LT Recommendation 1)**	• Central collection of MDL charge • National road fund **(MT/LT Recommendation 2)**
	Investment & maintenance provision	• Mix of private and road owner provision	• Full contestability between private and road owner provision	
Charging	Charging mechanism	• Registration (relatively large) • Fuel charge (single rate)	• Registration (small) • Fuel charge (single rate or tiered by vehicle class) **(MT/LT Recommendation 3)**	• Variable charging (potentially mass-capability, distance, network tier) **(MT/LT Recommendation 4)**
	Charging principles	• Some averaging of charges across vehicle classes • Some sensitivity through higher fuel charges with heavier loads • Cross subsidies across road types		• Reduce cross subsidies across vehicle classes and across tiers • Some explicit cross subsidisation of low volume roads (and potentially low mass carriers)
	Cost base	• Backward-looking actual expenditure	• Backward-looking 'efficient' expenditure (i.e. in line with efficient cost benchmarks) **(MT/LT Recommendation 1)**	• Forward-looking (proposed) expenditure within each tier • Dollar matched grants to local govt
	Charge setting	• NTC determinations (implemented by state governments)		• Economic regulator (cost recovery within tiers)
	Charging & cost oversight	• Improved PAYGO **(ST Recommendation 4)** • Third party review of PAYGO formulas and inputs **(ST Recommendation 4)**	• Reject costs too far in excess of benchmarked rates **(MT/LT Recommendation 1)**	• Economic regulator approves / rejects proposed expenditure plans

Contents

Abbreviations

ABS	Australian Bureau of Statistics
AC	Ashphaltic concrete
ACCC	Australian Competition and Consumer Commission
ATA	Australian Trucking Association
BITRE	Bureau of Infrastructure, Transport and Regional Economics
CML	Concessional Mass Limits
COAG	Council of Australian Governments
CRRP	COAG Road Reform Plan
CS	Cement stabilised
CSO	Community Service Obligations
ESA	Equivalent Standard Axle
FMS	Freight Movement Survey
FY	Financial Year
GDP	Gross Domestic Product
GML	General Mass Limits
GN	Granular
HML	Higher Mass Limits
HPV	Higher Productivity Vehicle
HVCI	Heavy Vehicle Charging and Investment Reform
IA	Infrastructure Australia
MDL	Mass Distance Location
NBN	National Broadband Network
NHVR	National Heavy Vehicle Regulator
NLTF	National Land Transport Fund
NTC	National Transport Commission
NZTA	New Zealand Transport Agency
PAYGO	Pay As You Go
PCU	Passenger Car Unit
RFS	Road Friendly Suspension
RIS	Regulatory Impact Statement
SMVU	Survey of Motor Vehicle Use
Tkm	Tonne-kilometre
US	United States
USO	Universal Service Obligations
WACC	Weighted Average Cost Of Capital
WIM	Weigh In Motion

1 Why road freight matters

1.1 Scope

There is widespread recognition that action is required to lift the productivity and efficiency of the road freight sector. Since the Productivity Commission *Inquiry into Road and Rail Infrastructure Pricing* in 2006, road supply and charging have been on the national reform agenda.

The Council of Australian Governments' Road Reform Program (CRRP) published numerous discussion papers and background studies in pursuing this agenda. The CRRP terms of reference focussed on heavy vehicle charging options, with road supply reform playing a secondary role.

CRRP has been recently renamed as the Heavy Vehicle Charging and Investment Reform (HVCI). HVCI is now progressing a number of supply and charging reform models through to a Regulatory Impact Statement (RIS) by the end of 2013. The HVCI work has more scope to consider supply and charging arrangements.

Within this context the Australian Trucking Association (ATA) has commissioned PwC to review recent road supply and heavy vehicle charging technical evidence with a view to suggesting practical and beneficial reform options, and recommend a set of short, medium and long term reform priorities.

The report aims to provide insight into ways forward that will deliver lasting improvements in road charging and supply arrangements to the mutual benefit of government, industry and the wider economy.

1.2 Integral role of freight for all Australians

Freight plays a vital part in all our lives. The freight industry brings fresh produce to our supermarkets; transports consumer goods to our homes; and carries raw materials and components to our factories.

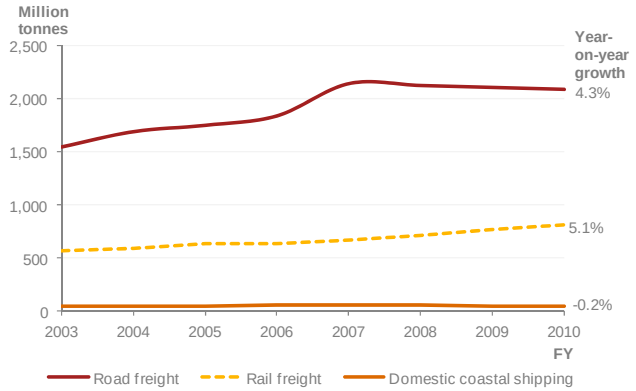
Freight transport underpins the functioning of the national economy by connecting producers, wholesalers and retailers in capital cities and regions of Australia.

The cost of moving freight is directly reflected in the prices of the goods we consume and the competitiveness of our exports. The vastness of the Australian continent and the geographic dispersion of Australia's major towns and cities mean that efficient freight networks are critical to our national productivity.

1.3 Lion's share of the freight task is by road

Road is the dominant mode of transport for freight in Australia. Road freight transports more than 70 per cent of the 2,930 million tonnes of Australian domestic freight in FY2010 (Figure 1).

Figure 1: Tonnes of freight by mode (FY2003 to FY2010, million tonnes)

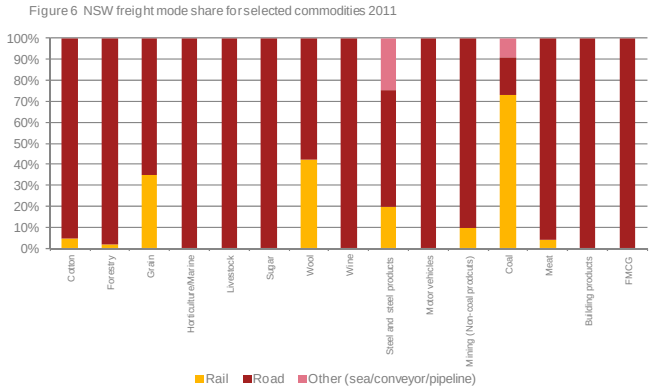


Notes: Throughout this report, year-on-year growth is calculated as the Compound Annual Growth Rate (CAGR), unless otherwise specified

Source: Bureau of Infrastructure, Transport and Regional Economics (2012)

Road freight is critical to the production and distribution of a diverse range of commodities, as suggested by the mode shares in NSW in Figure 2.

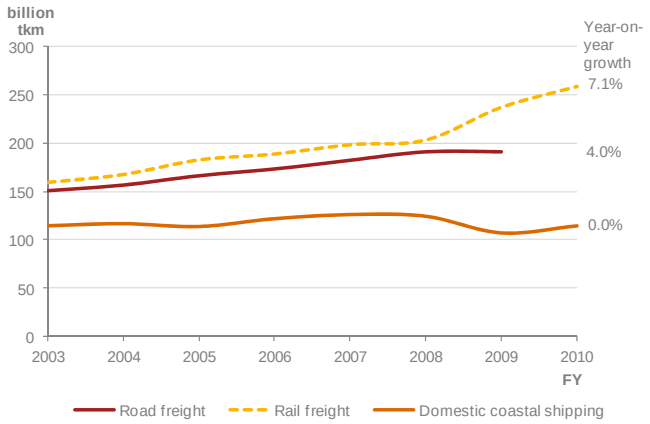
Figure 2: NSW freight mode share (% of tkms, 2011)



Source: NSW Government (2012a)

Trucks tend to carry high-value non-bulk freight, such as consumer goods, over short distances. Given the high volumes of bulk minerals transported by rail over large distances, though, on a tonne-kilometre (tkm) basis, road transport's share of the national freight task is slightly lower than rail freight at around 36 per cent in FY2009 (Figure 3).

Figure 3: Tkms of freight by mode (FY2003 to FY2010, billion tkm)

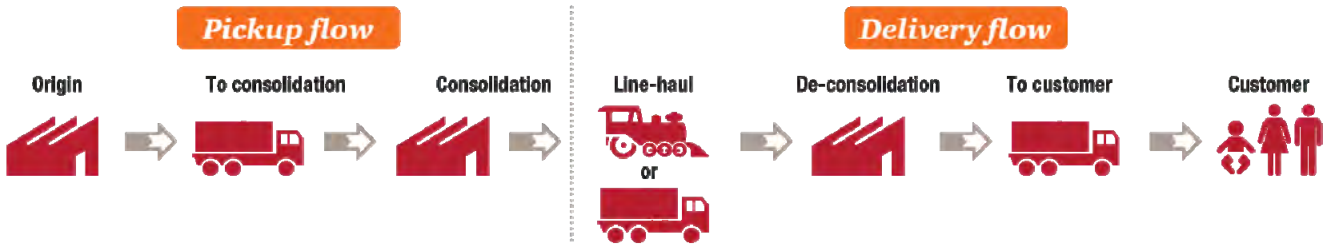


Source: Bureau of Infrastructure, Transport and Regional Economics (2012)

Even when rail or coastal shipping is used, road freight transport often complements rail and coastal shipping by providing the local pickup and delivery services to and from rail terminals and ports in domestic and international freight journeys (Figure 4 and Figure 5).

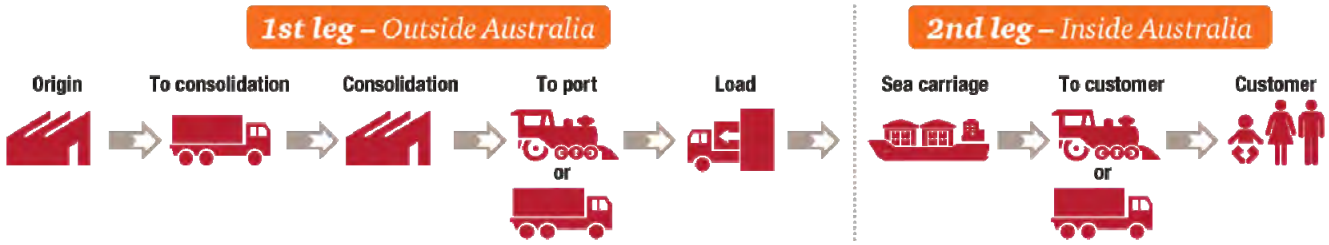
Only 10 per cent to 15 per cent of the total freight task is contestable by road and rail or coastal shipping.[2] The Henry Tax Review recommended that heavy vehicles should face additional charges where road freight is in direct competition with rail freight and where this would improve the efficient allocation of freight between transport modes.[3] However, the Review also acknowledged the extreme difficulty of estimating a charge that would achieve an 'efficient' modal split. As a result, competitive neutrality between road and rail is not considered further in this report.

Figure 4: Role of road freight transport in the domestic supply chain



Source: National Transport commission (2009b)

Figure 5: Role of road freight transport in the international import supply chain



Source: National Transport commission (2009b)

2 Productivity Commission (2006)

3 Australian Government (2009), Recommendation 64

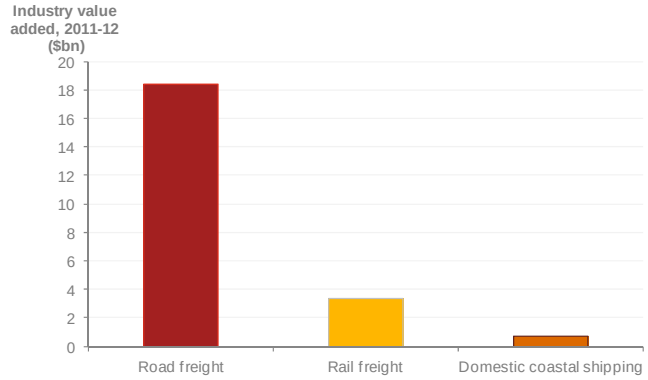
1.4 Facilitator of economic activity

The freight industry makes a significant contribution to the Australian economy, generating direct as well as flow-on activity through its contribution to a diverse range of industries and supply chains.[4]

The direct value generated by specialised road transport businesses added over $18 billion to the Australian economy in FY2012 or 1.4 per cent of Gross Domestic Product (GDP).[5] This is similar to major industries such as electricity (1.4 per cent contribution to GDP), coal mining (1.7 per cent) and agriculture (1.9 per cent)[6] and several orders of magnitude higher than other modes of freight transport.

The gross value added by the road freight industry was almost six times gross value added by the rail freight industry and more than 19 times that of the coastal shipping industry (Figure 6).

Figure 6: Direct economic contribution by freight mode (FY2012)



Source: IBISWorld (2012a), IBISWorld (2012b) and IBISWorld (2012c)

1.5 Provider of national employment opportunities

The road freight sector is a diverse source of business and job opportunities. Australia-wide, over 50,000 specialised road freight businesses employ over 180,000 people.[7]

There are also numerous people employed to drive trucks and manage freight activities for businesses that specialise in other industries such as retail and agriculture (ie freight is an *ancillary* service).[8]

Collectively, these specialised and ancillary road freight operators moved more than 190 billion tkms of raw inputs for production, final goods for consumption, imports and exports[9] using more than 334,000 rigid trucks, 88,000 prime movers and 219,000 load-carrying trailers.[10]

4 PricewaterhouseCoopers (2009)

5 The economic contribution of industries is measured by 'Industry Value Added' which represents the value added by an industry to the intermediate inputs used by the industry. For more information, see Australian Bureau of Statistics (2012b).

6 Australian Bureau of Statistics (2012c)

7 IBISWorld (2012b)

8 Bureau of Transport and Regional Economics (2003)

9 Bureau of Infrastructure, Transport and Regional Economics (2012)

10 Australian Trucking Association (2012)

2 The challenge ahead

2.1 The freight task is set to double

The growing Australian population will sustain demand growth for local and imported goods while strong growth in China, India and other emerging Asian economies will underpin strong demand for Australian exports – driving long term growth in freight services.[11]

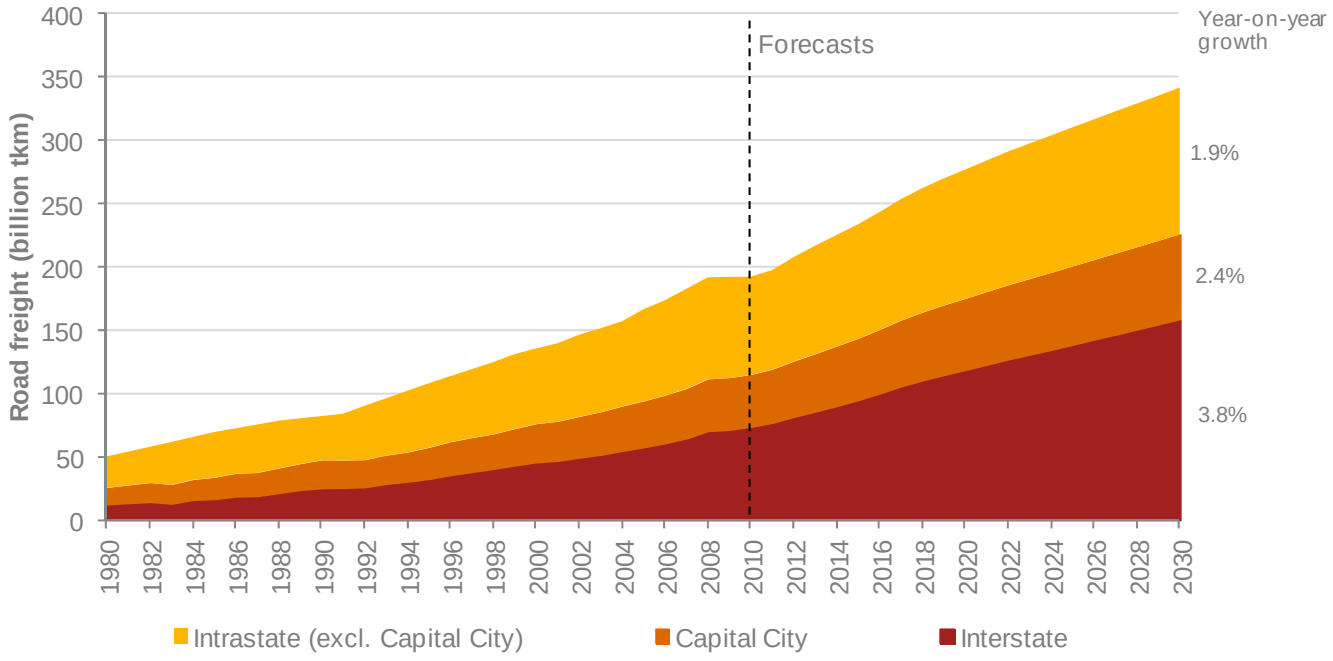
The total freight task in tkms is expected to double by 2030 and triple by 2050.[12] The challenge of transporting the enormous freight task will be met by road and rail freight transport.

The road freight sector has enduring competitive advantages in speed, convenience, price and geographical reach. Consequently, BITRE expects the road freight task to grow strongly – at 2.8 per cent year-on-year between 2012 and 2030 (Figure 7).[13]

The growth in the road freight task is more than double Australia's forecast population growth of 1.3 per cent[14] and higher than forecast growth in GDP of 2.6 per cent on average over the same period.[15]

The ability of the existing road network and current heavy vehicle access arrangements to support this future freight task is a major challenge for the nation.

Figure 7: Growth in Australia's road freight task (1980-2030, billion tkm)



Source: Bureau of Infrastructure, Transport and Regional Economics (2010)

11 Department of Foreign Affairs and Trade (2012)
12 PricewaterhouseCoopers (2009)
13 Bureau of Infrastructure, Transport and Regional Economics (2010), p 9
14 Australian Bureau of Statistics (2008)
15 KPMG Econtech (2010), p 62

2.2 Freight is increasingly a cross border issue

Current industry revenues are focused on regional trips

Australia's road freight is moved over a mix of short and long distances, as well as through urban and regional areas. The specialised road freight industry currently generates:

- 39 per cent from intrastate travel outside the city
- 40 per cent of its revenue from interstate services
- 21 per cent of industry revenue from urban services.[16]

The large interstate freight task is growing fast

The capital city, intrastate and interstate road freight tasks are each expected to grow significantly to 2030. Figure 7 suggests that growth is forecast to be most concentrated in long-distance interstate freight.

The trucking industry has traditionally held advantages over other modes of transport for freight haulage over short distances (approximately less than 1,600 km[17]) where it has a comparative advantage in speed, reliability, convenience and price. Trucks deliver a flexible door-to-door service in markets with dispersed origins and destinations. However, with the adoption of longer and more productive vehicle combinations, such as B-doubles and B-triples, road is increasingly able to compete with rail over longer distances, including the Melbourne to Brisbane corridor.[18]

Given that state and local governments are currently responsible for raising a large portion of their own road-related expenditure and make their own investment decisions, the increasing volume and size of cross border freight movements mean national coordination and cooperation is more important than ever. There is also a need to better understand revenue splits and funding flows to ensure that adequate and targeted investment in road infrastructure that spans across jurisdictions is made.

Road use can differ from vehicle registrations by state

States and territories directly receive around 38 per cent of road user charges from heavy vehicle operators. This revenue flows from registration fees for vehicles and trailers (see section 4.2).

Yet the shares of road freight tkms travelled can be quite different from the proportion of heavy vehicles that are registered in each jurisdiction (Figure 8).

Roads are used most intensively by heavy vehicles along the east coast of Australia, where more than 73 per cent of tkms are travelled. These same eastern states account for only 68 per cent of national multi-combination vehicle registrations.

The variation among these states can be more dramatic. For example, 34 per cent of heavy vehicle tkms are transported on roads in NSW, where only 17 per cent of national multi-combination vehicles (and 30 per cent of all heavy vehicles) are registered.[19] As a result, NSW needs to attract disproportionately more funding from non-registration sources to finance the heavy vehicle related spending on its roads.

The current road charging arrangements allow flexibility by giving states discretion over registration charging. This creates unintended incentives for road freight operators to shop around for the lowest registration fees. This may change with the introduction of a national heavy vehicle registration system through the National Heavy Vehicle Regulator (NHVR).

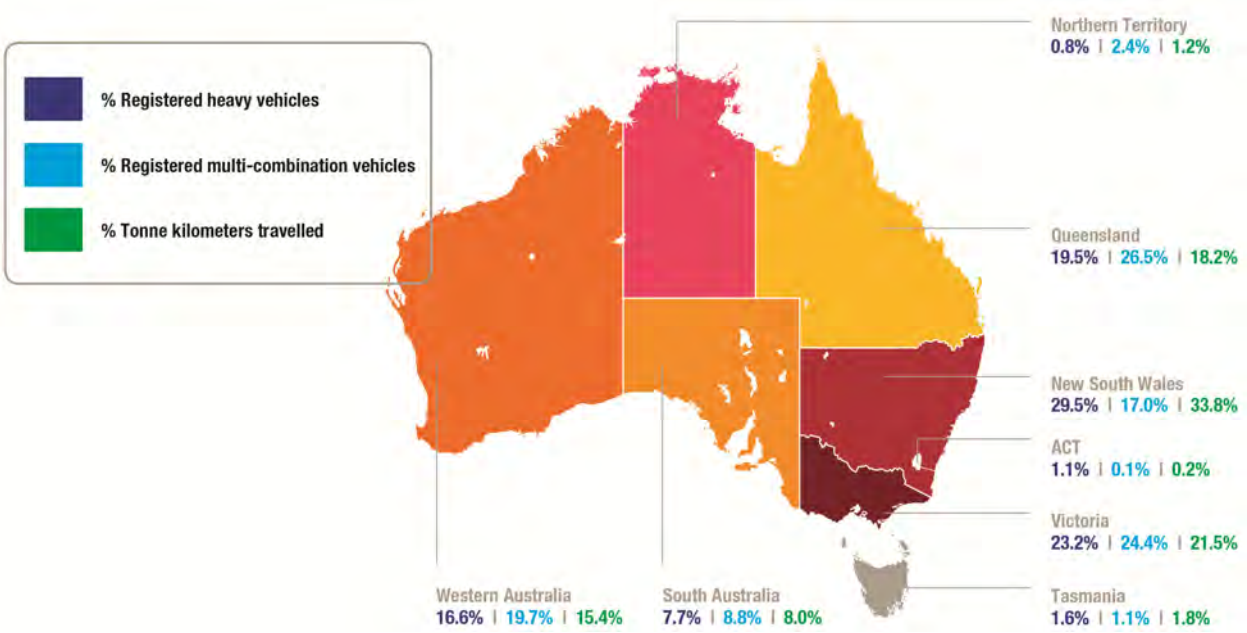
16 IBISWorld (2012b)

17 Bureau of Infrastructure, Transport and Regional Economics (2009a)

18 IBISWorld (2012b)

19 Bureau of Infrastructure, Transport and Regional Economics (2010) and ATA (2012a)

Figure 8: Location of registration vs. road freight travel (% of registration and % of tkms, 2012)



Source: Bureau of Infrastructure, Transport and Regional Economics (2010), IBISWorld (2012b) and ATA (2012a)

2.3 Diverse operating models mean one-size does not fit all

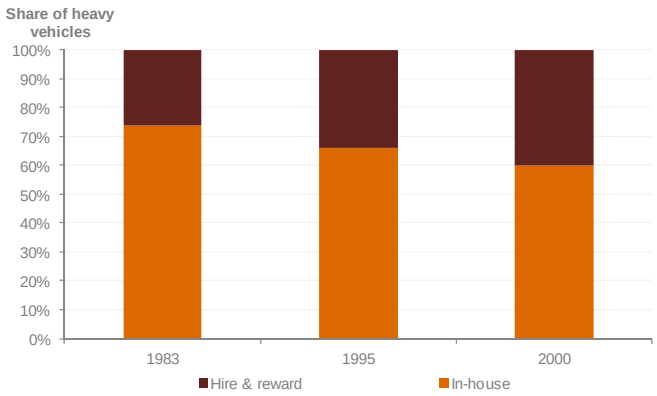
The road freight sector is complex and diverse, comprising numerous different vehicle classes, trip types, driving and traffic situations, varying from small operators that are owner-drivers to large rigs and multi-vehicle fleets. The markets in which they operate and the burden of costs they face can be very different, which will dictate their capacity to respond to any road charging reforms.

There are two main types of freight operators:

- **Specialised (hire and reward) operators** – transport and logistics businesses that specialise in carrying freight for other firms, ranging from large freight and logistics companies like Toll and Linfox to small employers and owner-operators
- **In-house (ancillary) operators** – businesses that focus on activity other than transport but use trucks to transport their own products, for example trucks used on farms to transport livestock and trucks owned and operated by retailers. Most recent estimates suggest that the majority of in-house operators are within the agriculture, forestry and fishing sectors.

On the basis of vehicle kilometres travelled, the majority of road freight is moved by specialised hire and reward road freight operators; yet the majority of the heavy vehicle fleet is owned by in-house operators.[20] The balance is likely to tip as the historical trend has been for businesses to increasingly outsource their in-house freight needs to specialised freight transport businesses (Figure 9).

Figure 9: Growth of the hire & reward sector (1983 to 2000)



Note: 1983 data is for trucks over 2 tonnes, 1995 and 2000 data are for trucks over 4.5 tonnes.

Source: BITRE (2003)

20 Bureau of Transport and Regional Economics (2003)

Any road supply and charging reform agenda must consider that what might be appropriate for some is not necessarily appropriate for others. Industry-wide data hides the diversity of the road freight sector which has important implications for road charging.

The specialised road freight industry is dominated by small businesses with over two-thirds of businesses being owner-operated and a further 15 per cent employing fewer than four people.[21] These industry structures are reflected in the vehicle ownership profiles, with more than 70 per cent of operators having only one truck while only one per cent of businesses own 10 or more trucks (Figure 10).

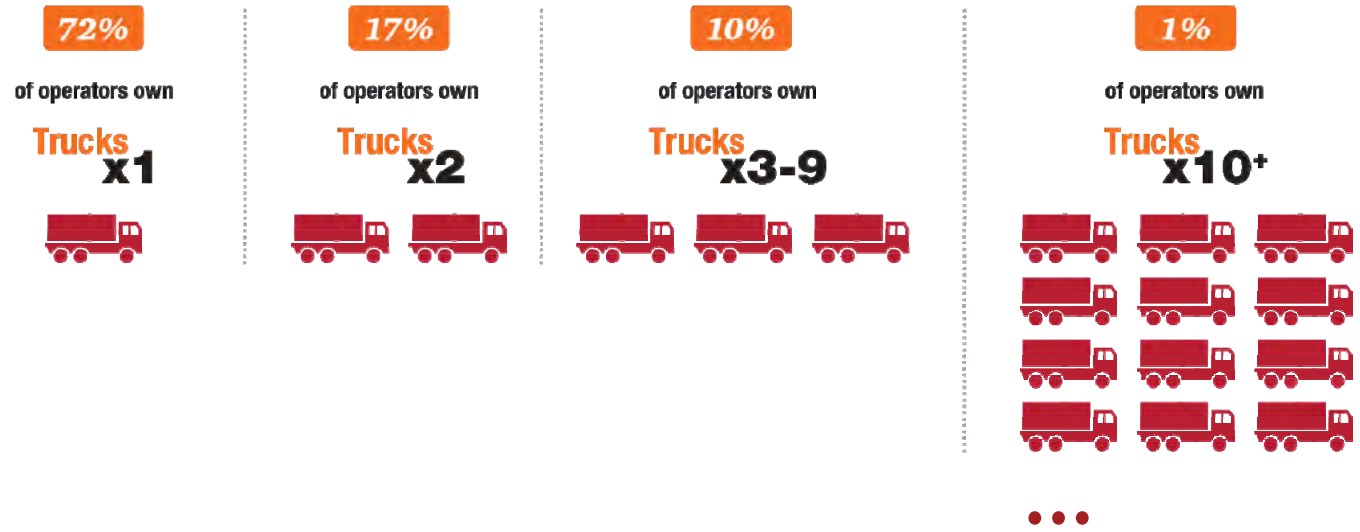
Cost structures also vary significantly depending on the freight task undertaken. For example, urban freight operations tend to be much more labour intensive, with smaller vehicles travelling at much lower average speeds, compared with regional and interstate freight operations. Box 1 shows the cost profiles for a diverse range of operators that PwC consulted with as part of this review, the industry average as reported by the Australian Bureau of Statistics (ABS), and their corresponding diversity in expenditures.

Any changes to current road charging arrangements could affect operators very differently in terms of their ability to pass on cost increases, cash flows and overall profitability. For example, smaller operators are in relatively weaker positions to negotiate pass through of costs to their customers due to the large amount of competition in the market while the major players have some price-setting power.[22] Smaller operators also have a disproportionately high administrative burden of complying with industry regulation and may not have access to the lines of credit available to large fleet operators.

21 IBISWorld (2012b)

22 IBISWorld (2012b)

Figure 10: Profile of the industry's vehicle ownership (1995)



Source: NRTC (1998). Businesses operating trucks with gross vehicle mass of 4.5 tonnes and over.

Box 1: Diversity of operators' cost profiles to the ABS average (FY2012)

	Sample operators	ABS average
Road user charges (% of total expenses)		
Registration	2% - 4%	3%*
Fuel charge	2% - 8%	3%
Vehicle running expenses (% of total expenses)		
Fuel (net of rebate)	11% - 45%	15%
Repairs & maintenance	8% - 15%	8%
Vehicle rental & other running expenses	2% - 12%	4%
Insurance	1% - 3%	*
Toll fees	0%	1%
Non vehicle running expenses (% of total expenses)		
Labour	10% - 52%	per cent
Capital	4% - 8%	8%
Other	5% - 14%	per cent

Source: Discussions with seven operators and ABS (2012b)
* Insurance costs are bundled with registration

2.4 The fleet has evolved to meet the task

The heavy vehicle fleet has changed rapidly over time with the adoption of newer, more productive and safer vehicle combinations. The first fully-loaded B-double began operation in 1991 between Sydney and Melbourne. Since then, the B-double network has progressively expanded and the uptake of B-doubles has increased commensurately.

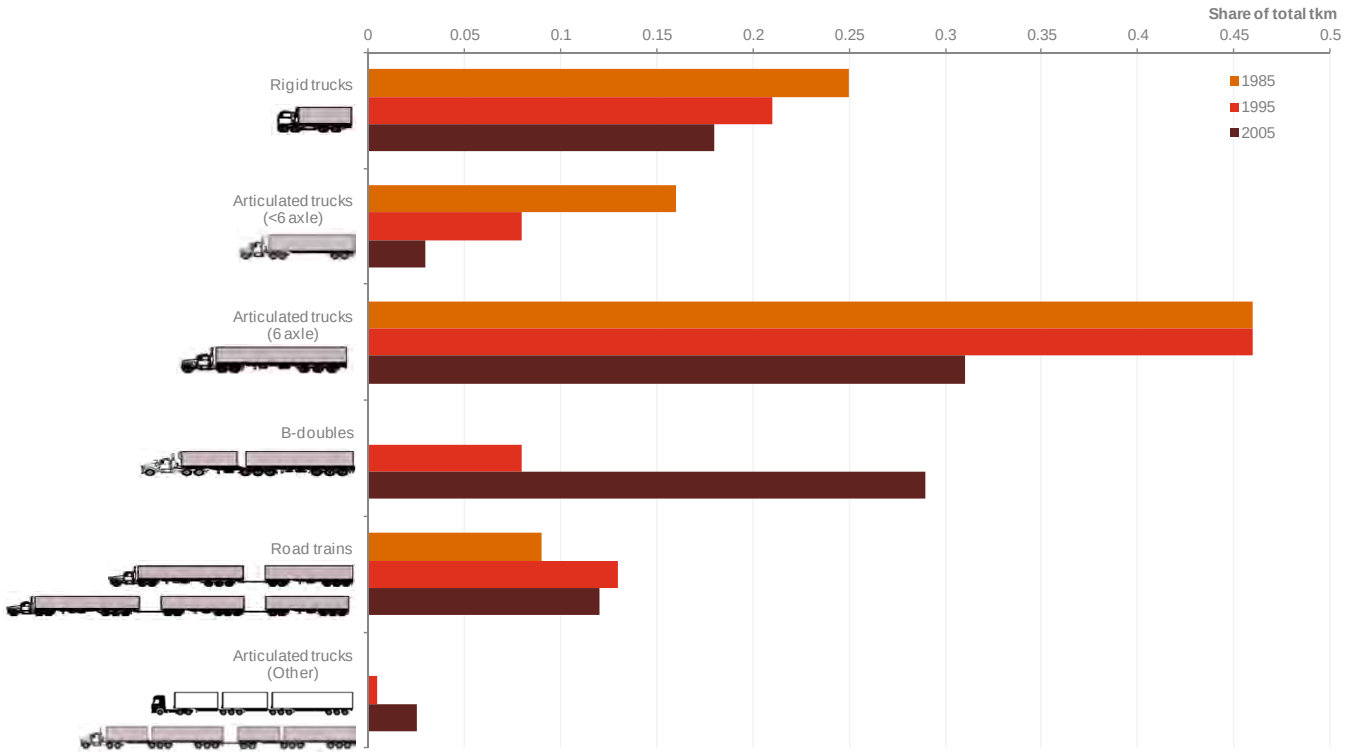
Since 1995, the B-double share of the road freight task in tkms has more than tripled, replacing five and six axle articulated trucks (Figure 11).

The adoption of B-doubles has been a major driver of heavy vehicle productivity over the past two decades. Articulated vehicle loads are estimated to be at least 16 per cent higher across the fleet on average than they would be without B-double adoption.[23] This extra loading has benefited consumers, operators and the community as fewer heavy vehicle trips are required for a given task. [24]

More recently, the share of the road freight task being undertaken by B-triples is also increasing but still low due to restrictions on their access to the road network (see section 3.6).

The B-triple and other higher productivity vehicles (HPVs) represent the next opportunity for heavy vehicle productivity, innovation and efficiency in Australia. B-triples have 12 per cent less road wear and 7 per cent less fuel use per tonne of freight compared to a B-double.[25] Super B-doubles, which are B-doubles capable of carrying four 20-foot containers, have also emerged around mines and ports in Australia. Supporting the uptake of super B-doubles and B-triples is essential to continuing the growth in productivity in the heavy vehicle industry, which is forecast to plateau over the coming decades without future reform (Figure 12)

Figure 11: Share of road freight tkms by vehicle type (1985, 1995 and 2005)



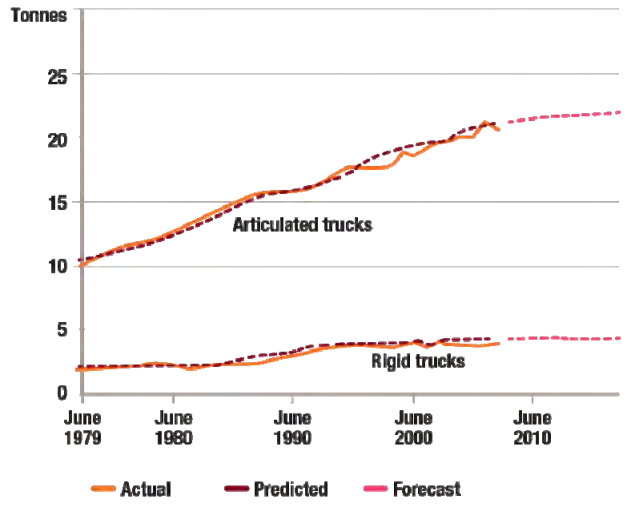
Source: Adapted from Bureau of Infrastructure, Transport and Regional Economics (2011b)

23 Bureau of Infrastructure, Transport and Regional Economics (2011b), p 61

24 The Bureau of Infrastructure, Transport and Regional Economics (2013) Australian Road Deaths Database suggests that in the last 20 years the number of fatalities in crashes involving heavy vehicles (rigid and articulated) has approximately halved in spite of the large increase in tkms carried by road freight.

25 Juturna (2012), p 16

Figure 12: Heavy vehicle loads without further reform to road supply



Source: Bureau of Infrastructure, Transport and Regional Economics (2011b)

2.5 Externalities of freight growth

While the road freight task delivers many social and economic benefits to Australians, there are costs that trucks impose on local communities and other road users when they travel. Heavy vehicles add to the risk (and severity) of crashes, environmental pollution and the levels of congestion on busy roads and the growing freight task will only exacerbate this further without commensurate increases in safety, efficiency and productivity.

'Externalities' of road freight are not directly captured in road user charges. CRRP's analysis suggests that the direct pricing of externalities is not optimal at this time in the absence of direct charging mechanisms for each particular externality.[26]

However, regulation in the road freight industry has aimed to implicitly include some of the negative externalities associated with road freight. For example, Australian Design Rules for heavy vehicle engines in Australia have been gradually refined over the years to target particulate matter emissions and nitrogen oxide emissions. The most recent Australian Design Rules (introduced in 2010) for diesel engines means a 92 per cent reduction in particulate matter emissions and a 75 per cent reduction in nitrogen oxide emissions compared to engines manufactured in 1996.[27]

Similarly, the Productivity Commission has pointed out that legal liability rules imposed by legislation and the courts internalise a significant part of the property damage caused by road accidents, and all jurisdictions have compulsory insurance for the cost of personal injuries to third parties.[28]

The Australian Government proposes to introduce carbon pricing of around 7 cents per litre for fuel used in road freight from mid-2014.

2.6 Consequences of failing to act

The growing Australian population, sustained demand for imported goods and strong export growth will drive long term demand with the total freight task in tkms expected to nearly double by 2030.

We are already nearing the limits of productivity growth which have been extracted from heavy vehicle productivity reform of the past.[29]

With national productivity plateauing, there is a strong case to improve road supply and pricing in Australia given reforms in many other areas of the economy are well advanced.

Improving road supply and charging arrangements is imperative not only on economic grounds but also on social and environmental fronts. Unless practical approaches for future supply and charging in Australia can be implemented, the impacts of falling freight productivity can manifest in many ways; such as:

- Economic impacts such as higher prices for the goods we consume and reduced competitiveness of our exports
- Social impacts such as reduced safety and amenity for our community
- Environmental impacts such as higher greenhouse gas emissions and noise pollution.

The next chapters explore the current road supply, access and charging regimes and recommend ways in which these can be improved in a way that supports national productivity objectives.

26 COAG Road Reform Plan (2011c), p 10
27 CIE (2011), pp 15-16
28 Productivity Commission (2006), pp 168-169
29 Bureau of Infrastructure, Transport and Regional Economics (2011b), p 67

3 The case for more demand-led investment in roads

3.1 Rationale for government road provision

Almost all roads in Australia are provided by government, and hence road networks are mostly public goods that are non-excludable and non-rivalrous.

This makes road infrastructure fundamentally different from other goods and services – and in many cases other infrastructure in Australia because:

- It would be nearly impossible to exclude people from driving, cycling or walking on Australia's vast road network extending more than 817,000 kilometres[30]
- Its scale means that one person's use of the road network does not affect another person's use in uncongested conditions
- Roads are not merely economic infrastructure but also important social infrastructure which connects the community to social, economic and recreational opportunities.

These characteristics mean that a private provider of a road network would tend to provide less than the efficient quantity of road infrastructure, which is why the majority of roads in Australia and around the world are publicly funded.

Government provision introduces tradeoffs into road supply decisions because government will target not only productivity, but also has an ongoing obligation to promote social objectives beyond those of a commercial road owner. There is no single agreed recipe for balancing these priorities.

These road supply decisions affect the heavy vehicle industry's productivity and profitability – through the maximum mass and dimensions limits which constrain vehicle access to the network and through the costs of road supply which are ultimately recovered through road user charges.

Current road supply arrangements are underperforming for the road freight sector with respect to heavy vehicle access. While industry accepts that it must pay for its contribution to road wear, the current road supply arrangements fail to transparently identify these costs and efficiently link charges back to road expenditure.

Road pricing reform is on the public policy agenda. However, unless road supply decisions are efficient and targeting the right investments, road charging reform will not reap the productivity gains that are expected in this sector.

3.2 Lack of national cohesion in road supply decisions

The current institutional road supply arrangements date back to the time when roads were a small part of the government's total spending program and the freight task was concentrated in coastal shipping and rail. Today they are one of Australia's highest value assets and are a critical input to the transportation of the growing freight task that underpins the economy – yet institutional structures for road funding and expenditure have not changed markedly.

National leadership is required to capture the productivity opportunities presented by industry investment in world-class freight technology and innovation and meet the challenges associated with future road freight demand. However the responsibility for road supply decisions are fragmented amongst various departments and road agencies at the Commonwealth, state and local level.

State and local governments are responsible for asset management, heavy vehicle access decisions and network planning on *arterial* and *local* roads respectively. These functions are supported through a complex planning system and funding allocations.

In addition to arterial and local roads, there are also several nationally significant transport corridors that are collectively referred to as the *National Land Transport Network* which are the combined responsibility of states and the Australian Government. These three types of roads form the current network hierarchy (Box 2).

The Australian Government contributes funding to road projects on all three networks, particularly on the National Land Transport Network, but has no specific jurisdiction over roads in Australia.

30 World Bank (2012)

Box 2: Australia's road network hierarchy

National Land Transport Network (2.8 per cent of Australia's roads by length): Network of 'nationally significant' roads which form the primary land transport corridors in Australia, including national highways, links to ports and airports, rail and intermodal connections. The National Land Transport Network is defined in the *Auslink (National Land Transport) Act 2005*.

Arterial roads (around 20 per cent): Roads in urban areas with heavy volumes of traffic movements and roads in rural areas which are the primary links between a capital city and adjoining states and their capital cities, between a capital city and key towns, between key towns and between important centres. Arterial roads include the **National Land Transport Network**.

Local roads (around 80 per cent): Roads which connect urban centres, town centres and local areas to arterial roads. Local roads also connect homes to schools, shops and recreational areas.

Source: Austroads (1998), World Bank (2012) and AusLink (National Land Transport) Act National Land Transport Network Determination 2005 (No. 1)

There are a number of *national* bodies that play leadership, coordination, regulation and / or investment roles in road transport – each with different scope, purpose and powers:

- The **Department of Infrastructure and Transport (DoIT)** advises the Australian Government and its Ministers on all matters of infrastructure and transport. DoIT evaluates, plans and administers funding for major infrastructure projects, including the Nation Building Program.
- The **Standing Council on Transport and Infrastructure (SCOTI)** aims to coordinate policy direction on transport and infrastructure issues across all levels of government.[31]
- The **National Transport Commission (NTC)** advises SCOTI on road and rail reform, and regulates the road and rail sector, including the determination of heavy vehicle charges; however the NTC relies on Commonwealth and State governments to implement its findings.
- **Infrastructure Australia (IA)** promotes a national, strategic approach to infrastructure planning, investment and delivery by working with all levels of government as well as the private sector. One function is to identify priority infrastructure investments.
- The **National Heavy Vehicle Regulator (NHVR)** will regulate heavy vehicles over 4.5 tonnes in the states and territories that join the national regulatory system. The NHVR will act as an intermediary for access applications for local roads.

The diffusion of responsibility among the multiple national bodies, road agencies at the state level, and over 500 local councils and local governing bodies, means there are very weak incentives for any one agency to make the tough decisions around long term road supply reform.

Moreover, there is a lack of national cohesion in road supply decisions. Competing interests among different levels of government and different agencies at each level can result in 'patch-protection and bureaucratic processes blocking meaningful transport reform'.[32] The inconsistencies in access across the national road network mean that some operators need to make a number of truck reconfigurations in one journey – this is restricting productivity and efficiency gains from the increased investment in more productive vehicle combinations.

3.3 Lack of accountability and transparency

There is debate about whether current funding of roads is adequate. Numerous studies suggest that insufficient funds have been allocated by all levels of government to maintain roads to an adequate level (eg Econtech suggests underinvestment of $10 billion [33] and the Allen Consulting Group also suggests $10 billion for all current required roadwork[34]).

Greater transparency and accountability are seen by industry as necessary conditions before it would agree to wide-ranging charging reforms. PwC suggests that even without tackling the issue of whether funding is adequate, there is scope to allocate the current level of funds in a more transparent and efficient way.

31 http://www.scoti.gov.au/about/

32 National Transport Commission (2008), p 6

33 KPMG Econtech (2004)

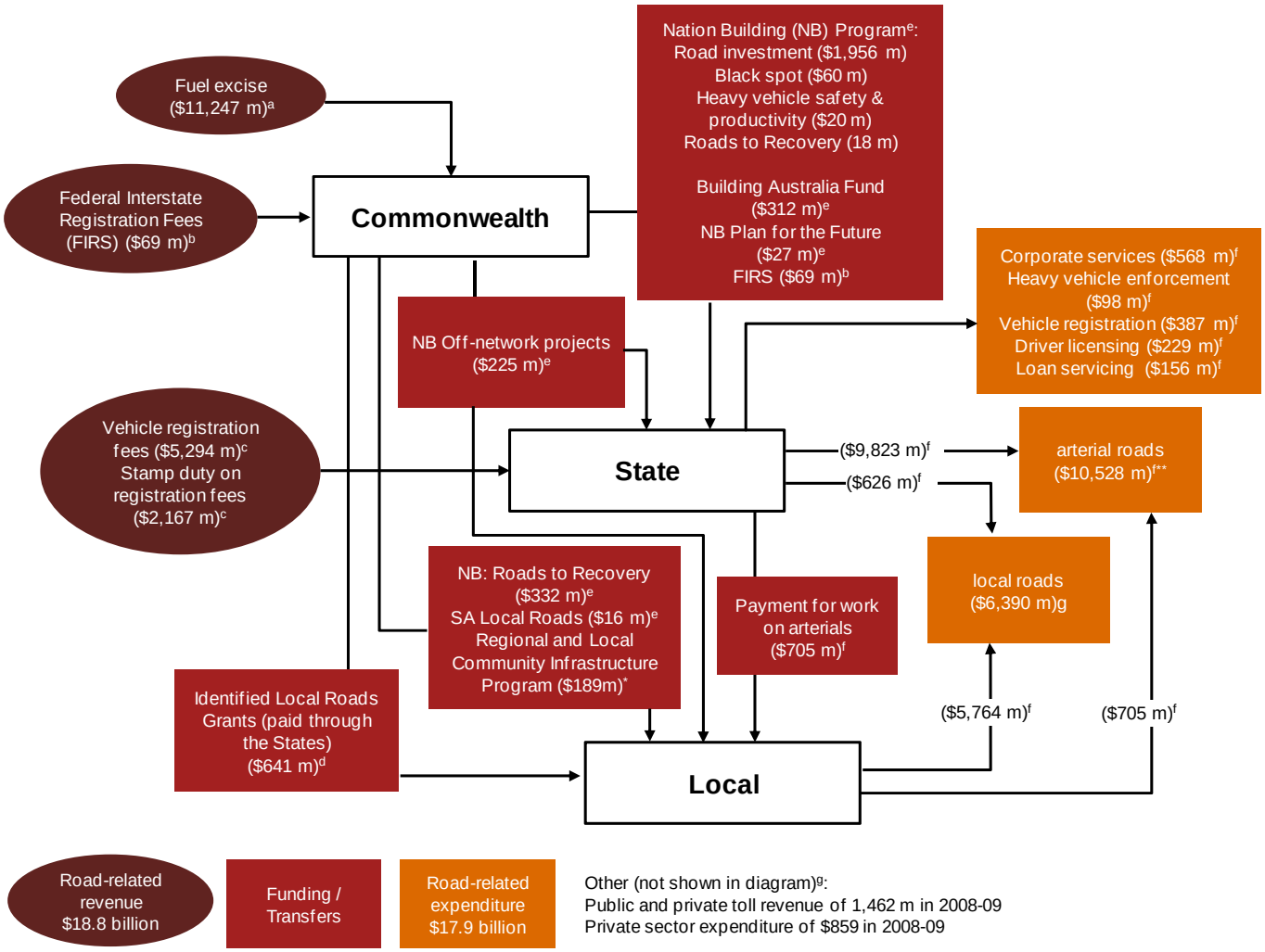
34 Allen Consulting Group (2003)

A legacy of Australia's federation and three-tiered government is that road funding is complex. Road user charges form part of the Commonwealth and state governments' general revenues which is then allocated between the three levels of government via a series of grants and programs (Figure 13).

Road suppliers currently only have broad accountability to tax payers and voters: the main mechanism to hold the government or their department to account for wasteful spending or poor prioritisation is at the ballot box.

Even so, it is difficult for road users or tax payers to hold these agencies accountable due to their diverse mandates and convoluted funding flows. There is no single authority that receives road user charges and that has the direct responsibility to deliver supply outcomes to users.

Figure 13: Sources and uses of funds for government roads in 2010-11



Source: Adapted from Productivity Commission (2006)

[a] Figure is net of fuel tax credits (total petroleum and non-petroleum based fuel excise was $16,358 million, total fuel tax credits was $5,111 million). Australian Taxation Office (2012)

[b] Australian Government (2010b)

[c] Australian Bureau of Statistics (2012a)

[d] Department of Regional Australia, Local Government, Arts and Sport (2011)

[e] Australian Government (2010a)

[f] National Transport Commission (2012a)

[g] National Transport Commission (2012d)

[h] Bureau of Infrastructure, Transport and Regional Economics (2011a)

Note: Nominal prices

3.4 Diverse needs of road users

In making road supply decisions, road suppliers are faced with the challenge of making the best use of available funding to meet the competing demands of different road users, including a basic level of access for the broader community.

- Road suppliers aim to satisfy the needs of light vehicle users by providing an extensive network which connects homes with schools, jobs and recreational centres. Light vehicles benefit from a greater number of lanes as they improve travel speeds in areas of high demand.
- Road suppliers also aim to satisfy the needs of heavy vehicle users by providing heavy vehicle access to a road network between ports, intermodal terminals, producers, wholesalers and retailers. The increasing use of HPVs has generated demand for increasing pavement depth, bridge strength and other enhanced facilities such as longer rest bays.
- Road suppliers are also responsible for supplying common infrastructure such as footpaths and signage.
- Road suppliers also have an obligation to meet the broader needs of the community by providing an adequate level of service and all-weather access to local businesses and residences, even where these are remote and have low levels of traffic (ie community service obligations (CSOs)).

As all road-related revenue and expenditure is currently recycled through general consolidated revenues, road agencies and local government road budgets also compete with other government priorities, such as hospitals and schools for a share of funding from the general revenue pool through the annual budget process. Furthermore, heavy vehicle related expenditure competes with other road investments. As light vehicles account for about 90 per cent of all road use, the political decisions about investing in heavy vehicle infrastructure and access can be challenging – even if they will result in productivity benefits for the broader community.

Providing the right roads and the right capacity for all of its competing users is a difficult task, yet one that is vital for the economic and social development of the nation. A long term strategy would need to consider how heavy vehicle, light vehicle and community infrastructure investment and planning decisions are integrated.

3.5 Poor incentives for heavy vehicle access

Gaining access to the road network is critical to the road freight industry and the community generally.

A 10 per cent increase in allowable mass limits across all heavy vehicles is estimated to reduce fleet and driver requirements by 2.6 per cent for a given freight task.[35] Similarly, the operation of larger vehicle combinations, such as B-triples can reduce the number of trucks required to complete a given freight task by over 30 per cent relative to a B-double.[36] Such higher dimension vehicles can also perform freight tasks with lower impacts on the roads overall – even if the impact per truck is higher (Box 9 in section 4).

However industry investment in heavy vehicle productivity improvements is wasted without commensurate access to the road network for new vehicle configurations and loadings.[37]

CRRP identified a number of inter-related limitations to heavy vehicle productivity, including:

- The physical capabilities of the existing road network
- Vehicle standards that limit vehicle mass and volume capacity
- Regulatory access impediments to road access by HPVs.[38]

Individual road owners (state, territory and local government departments) are ultimately responsible for setting road access arrangements that industry must comply with. These arrangements are complex and highly variable across jurisdictions, location and vehicle type.

Operators seeking upgraded access to the road network have a number of options, each with different administrative burdens (Box 3). This access can be on a 'permanent' basis or a 'once-off'. In both cases, the road owner assesses applications from operators on a case by case basis.

However, under the current arrangements, there are limited incentives for road providers to grant access to HPVs and insufficient incentives to optimise network maintenance and investment to unlock heavy vehicle productivity.

35 Juturna (2012), p 28

36 Australian Trucking Association (2011)

37 Bureau of Infrastructure, Transport and Regional Economics (2009b), p 172

38 COAG Road Reform Plan (2011c), p 18

Box 3: Road access arrangements

Road access is defined in terms of the types and loads of heavy vehicle that may operate on a given stretch of road. General Access is such that all heavy vehicles are able to operate in the absence of specific exclusion. General Access limits are defined in terms of:

- **Size** – Smaller heavy vehicles have General Access to the road network (maximum dimensions: width 2.5 metres, height 4.3 metres and length 12.5 to 19 metres).
- **Mass** – Commonwealth legislation provides model regulations to assist jurisdictions in developing maximum masses for each vehicle class under General Access conditions. Actual implemented mass regulations can vary across state boundaries.

Beyond these limits, road owners can restrict access due to the capability of the road (or bridge), as well as the maintenance burden that would result from road wear from heavier or higher dimension vehicles. Operators of larger and heavier vehicles need to gain explicit access to the road network. There are a number of programs and processes that can vary across jurisdictional boundaries:

- **Gazettal notice** – jurisdictions may define a specific part of the road network as open to higher dimension vehicles without a permit (eg NSW has defined extensive B-double and road train networks). This network can be amended from time to time at the discretion of the road owner.
- **Concessional mass limits (CML)** – operators can access mass limits two to five per cent above General Access limits by application to road agencies, typically with some operating conditions, such as vehicle accreditation.
- **Higher mass limits (HML)** – operators can access mass limits two to 13 per cent above General Access limits by application to road agencies, with some operation conditions, such as the installation of compliance telematics equipment and / or use of 'road friendly' air bag suspension.
- **Over-dimension permits** – operators can move large indivisible loads with the support of an escort vehicle, warning lights, etc.
- **Performance based standards** – operators may be able to operate innovative vehicle combinations under CML or HML, with applications being assessed based on safety and infrastructure impact performance.

Road freight operators can also apply to road owners for specific access to a road. From mid-2013, the NHVR will coordinate this process through an online portal. All approved permits and rejections will be issued by the NHVR on the counsel of the road owner and displayed online.

The new role of the NHVR will go some way to simplifying and harmonising the application process. The NHVR database will also capture information about heavy vehicle access priorities which could help inform funding and infrastructure prioritisation. However, state and territory road authorities and local governments will retain responsibility for assessing routes and making the final decision regarding access. As long as access decisions are still disconnected from funding – current access issues will continue to exist.

Source: National Heavy Vehicle Regulator (2012) and National Transport Commission (2009a)

There is no direct connection between the collection of heavy vehicle road user charges and the allocation of funds to the relevant road suppliers. There is no direct funding payoff to a road provider that provides upgraded heavy vehicle access to compensate for additional road wear. Nor is there a direct mechanism for road owners wishing to undertake asset improvements to enable more productive heavy vehicle configurations and loadings to prioritise this work over any other work on the network.

When the funding does not 'follow the truck', a road agency may prefer to minimise road and bridge wear by limiting heavy vehicle access to the road network.[39] This issue needs to be addressed ahead of any charging reform because as long as the link between funding and access is disconnected, changes to the charging method will not provide incentives for road agencies to improve heavy vehicle access.

39 GHD (2011a), p 27

3.6 Disjointed access for heavy vehicles

Having road ownership spread across so many different jurisdictional boundaries creates discontinuities in heavy vehicle access levels and definitions.

For example, allowable B-double lengths in WA are up to 27.5 metres compared with 26 metres in other states and territories. However, freight productivity depends on end to end access for freight vehicles. An interstate B-double would only be able to run at a length consistent with the shortest allowable length encountered on the trip.

Another common manifestation of discontinuous heavy vehicle access for the road freight industry is in 'last mile' access to the local road network (see Box 4). The last mile refers to the first and last part of a freight journey, which often occurs away from the core state road network.

The sheer scale of the 650,000 kilometre local road network in Australia where last mile issues are most commonly found means a strategic approach is required to identify and target the most urgent investments in infrastructure that may be required to enable HML and HPV access.

The NHVR is planning to take on an intermediary role from mid-2013 and coordinate local access applications, though the barriers to unlocking productivity-enhancing access will largely remain as long as access decisions are still disconnected from funding.

PwC supports this move as it will reduce the administrative burden on operators. The NTC has identified economic gains from harmonising heavy vehicle access arrangements of up to $12 billion in present value terms over 20 years with the majority of the gains to be found in harmonising HPV access to more roads. This harmonisation will also lead to gains in productivity throughout the supply chain.

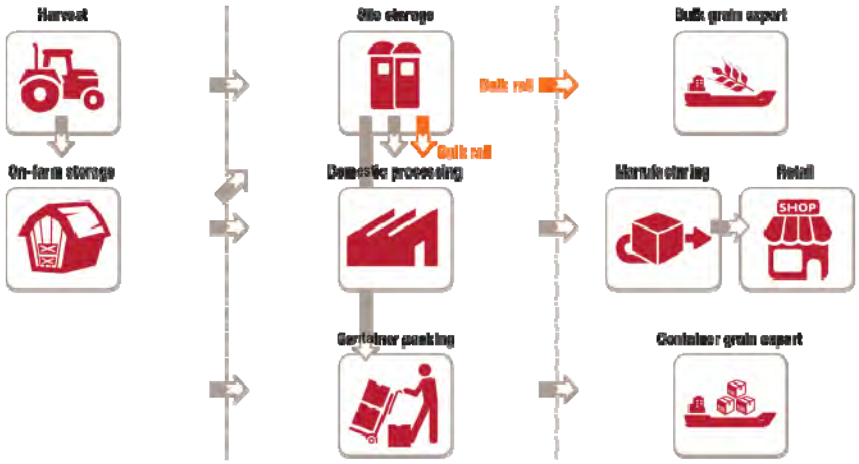
Box 4: Last mile access

The majority of businesses need access to some local government roads, with many regional and interstate freight journeys using local roads at the start or end of a journey (before using a state road for the majority of the journey). However the efficient and productive transport of freight on the national and state network is often inhibited by access restrictions on local roads. Road freight productivity and total freight productivity depends on end to end access for HPV and HML vehicles. Mass restrictions particularly affect productivity, as vehicles operating at HML must reconfigure their load which is more complex than re-combining trailers.

The deficiencies of local roads and bridges that prevent access to HPVs or HML operated vehicles act as the 'weakest links' in the supply chain. Figure 14 illustrates the grain supply chain and the potential last mile issues before bread reaches the shop or grain reaches wharves for export. Potential last mile issues, which we have developed from real road freight industry experiences, include:

- A small rural road with restricted mass access between the farm where the grain is harvested to the silo a few kilometres away where it is stored means the operator must make more trips to transport the same volume of grain
- An HML deficient bridge between the farm or silo and the container packing plant which means the entire journey must be made on general mass limits
- A restriction on HPVs leaving the container packing plant for the wharf due to traffic volumes at a busy intersection. The operator may be willing to contribute towards the cost of installing traffic lights but there are no arrangements in place for government and industry to negotiate such an outcome.

Figure 14: Potential last mile issues in the grain supply chain



All jurisdictions have made progress in improving HPV and HML access with the approved network gradually widening each year yet this progress is slow. In many cases, the challenge is only a few kilometres of local road on a thousand kilometre journey which prevents the use of HPV and HML vehicles. Such access limits on local roads can constrain heavy vehicle operators who would otherwise be able to take full advantage of the improved HPV and HML access granted by governments in recent years. These local road restrictions can adversely affect the productivity of HPV or HML freight journeys in a diverse range of ways:

- Some operators of HPV or HML vehicles may take a longer journey on an alternative route to avoid local roads that cannot accommodate the vehicle
- Some operators may choose a smaller vehicle (or lower axle loading) for the entire journey (including on roads where larger or higher loadings would have been acceptable for most of the journey)
- Some operators may be forced to decouple a HPV and re-configure it to meet local road dimension restrictions - often just for the last kilometre of the journey.

Each of these impacts generates additional costs for the freight industry (eg time and risks associated with de-coupling trailers or extra fuel and time associated with route detours) as well as lost productivity from not being able to operate the most efficient vehicle size or loading for the complete freight journey.

Source: NSW Government (2012b), National Transport Commission (2007b) and PwC discussions with operators

3.7 Uncertainty about how to treat CSOs

Roads and bridges which would not be provided by a commercial road supplier (eg due to the low levels of traffic) are often still provided by governments as CSOs.

Under the current road supply arrangements it is difficult to differentiate which roads and bridges are provided on CSO terms because they are implicit. For example, road owners construct roads to a standard that allows safe and all-weather access under General Access conditions. The pavement could be deeper or lanes are wider than what would have been under commercial provision.

The 2006 Productivity Commission *Inquiry* recommended that road users should pay their marginal costs of all road infrastructure use whether or not it was provided on CSO terms.[40]The Productivity Commission also argued that the component of infrastructure costs related to CSOs should be funded from general government taxation rather than through road user charges. If it could be implemented, this approach would remove any cross-subsidisation between road users for CSO roads.

Currently, CSOs are to some extent funded through general government revenues. Around 75 per cent of local rural road expenditure and 50 per cent of local arterial road expenditure is excluded from the Pay As You Go (PAYGO) cost base and recovered through municipal rates.[41] However, road-related revenues have exceeded all road-related expenditure from FY2001 to FY2008 – indicating that CSOs have often been implicitly covered by road-related revenue that is recycled through general government revenues.

An alternative option is the adoption of Universal Service Obligations (USOs) for roads that provide access to essential services of an appropriate quality (eg roads to sparsely populated rural areas) with costs recovered through cross-subsidisation rather than general government revenues. Australia's electricity, water and telecommunications industries are precedents for the USO model where these utilities are legislated to connect every house to the network on reasonable terms where it is practically feasible – subsidised by the costs paid by users in urban areas (Box 5).

An ATA member has argued for the adoption of USOs rather than reliance on government contributions to guarantee better network access and reduce the influence of government decisions on road infrastructure provision. Furthermore, Australia's roads like any other network exhibit 'network economies'. That is, local roads feed the main arterials and generate sufficient traffic to enable those roads to be provided more efficiently and at lower cost.[42]

The CRRP *Community Service Obligations* working paper proposes that CSOs do not need to be quantified at this time and can be revisited once road reform options are finalised.[43] However PwC considers that CSOs are one of the most important issues that need to be addressed prior to finalising road reform options. A large proportion of Australia's regional roads are likely to have been provided on CSO terms – ignoring this component in the consideration of road reform is a real risk to the long term sustainability and management of Australia's network.

Box 5: Definitions of CSOs, USOs, marginal costs and cross-subsidisation

Community Service Obligations (CSOs): A CSO is defined as goods and services which are provided by the government which would not have otherwise been provided on a commercial basis, and when governments do not require other businesses in the private or public sector to undertake.

Universal Service Obligations (USOs): A USO is the obligation placed on universal service providers to ensure a baseline level of service is reasonably accessible to all people in Australia on an equitable basis, regardless of where they reside or carry on business.

Marginal cost: Marginal costs are the additional costs (private or public) of providing an extra unit of good or service. In relation to road infrastructure, short run marginal costs refer to the additional costs of providing an extra unit of pavement depth or bridge strength given the road or bridge has already been built. The long run marginal costs include the capital costs of increasing capacity and hence capital expenditure to meet the additional demand. When capacity is at the optimal level, short run marginal costs equal the long run marginal costs.

Cross-subsidisation: Cross-subsidisation occurs when one user is not paying their marginal costs. The cross-subsidisation can also occur at a group level, for example if one group of users does not cover their average marginal costs.

Source: Adapted from Steering Committee on National Performance Monitoring of Government Trading Enterprises (1994), p xi, Industry Commission (1997), p 30 and Productivity Commission (2006), p 47

40 Productivity Commission (2006), p 99
41 National Transport Commission (2007a)
42 Australian Livestock and Rural Transporters Association (2012)
43 COAG Road Reform Plan (2011b), p 5

3.8 Demand data to inform investments

The long standing approach to transport infrastructure investment has been described as 'predict and provide' - ie road infrastructure planners at the Commonwealth, state and local levels make road supply decisions with minimal input from industry, the community and road freight data.[44]

In recent literature, there has been the presumption that allocation decisions are limited by data gaps. For example, CRRP noted that a key failure of the current system is limited information on road use which will significantly help infrastructure planning (ie identifying the right new roads or expanding the capacity of existing roads) and the allocation of heavy vehicle revenue to jurisdictions.[45]

In reality, a number of existing and prospective data sources can be drawn on to understand road freight flows and types of commodities carried on major freight routes which could provide a low-cost approach to improve road investment and target the most important freight investments. Some of the currently available data sources include:

- **State and territory weigh-in-motion (WIM) data** – State road authorities operate an extensive network of WIM stations around the national network which measure the weight of moving vehicles. WIM data provides a reasonably accurate picture of road freight flows between capital cities, though with less coverage of rural and regional roads.[46]
- **State and territory commercial vehicle traffic counts for small-sections** – States and territories record average daily total traffic counts and estimates of heavy vehicle classes and numbers on an ad hoc basis using rubber tubes.
- **ABS Survey of Motor Vehicle Use (SMVU)** – The ABS SMVU contains statistics on heavy vehicle kilometres and tkms travelled by broad categories of location (eg capital city, other urban areas, other intrastate, interstate), fuel consumption and laden / unladen travel. The SMVU will be produced biennially from FY2012 onwards.[47]
- **ABS Freight Movement Survey (FMS) –** The ABS has recently proposed to update the previous FMS from 2001, which provides origin-destination estimates of freight flows by commodity and transport mode.[48]
- **BITRE research and analysis** – BITRE collects and publishes time series estimates of freight flows and other infrastructure statistics. Some examples include *National road network intercity traffic projections to 2030* and *Road freight estimates and forecasts in Australia: interstate, capital cities and rest of state.*

Where a particular data source has gaps, these may be overcome by cross-tabulating data from other sources. These data sources combined can provide a relatively reliable picture of road freight flows, particularly if the FMS becomes a regular exercise.

The ABS is exploring the collection of road freight information directly from business information systems such as data collected from in-vehicle telematics to provide detailed information on national freight movements (Figure 15).[49] New Zealand is also exploring this data to support its investment and maintenance decisions.[50]

It was estimated that telematics systems were already fitted in more than 30 per cent of Australian heavy vehicles by 2005.[51] Consultations with industry showed that in-vehicle telematics are a standard option in new vehicles and the natural progression of technology and fleet investment cycle means that in-vehicle technologies is likely to reach the majority of the fleet within the next decade.

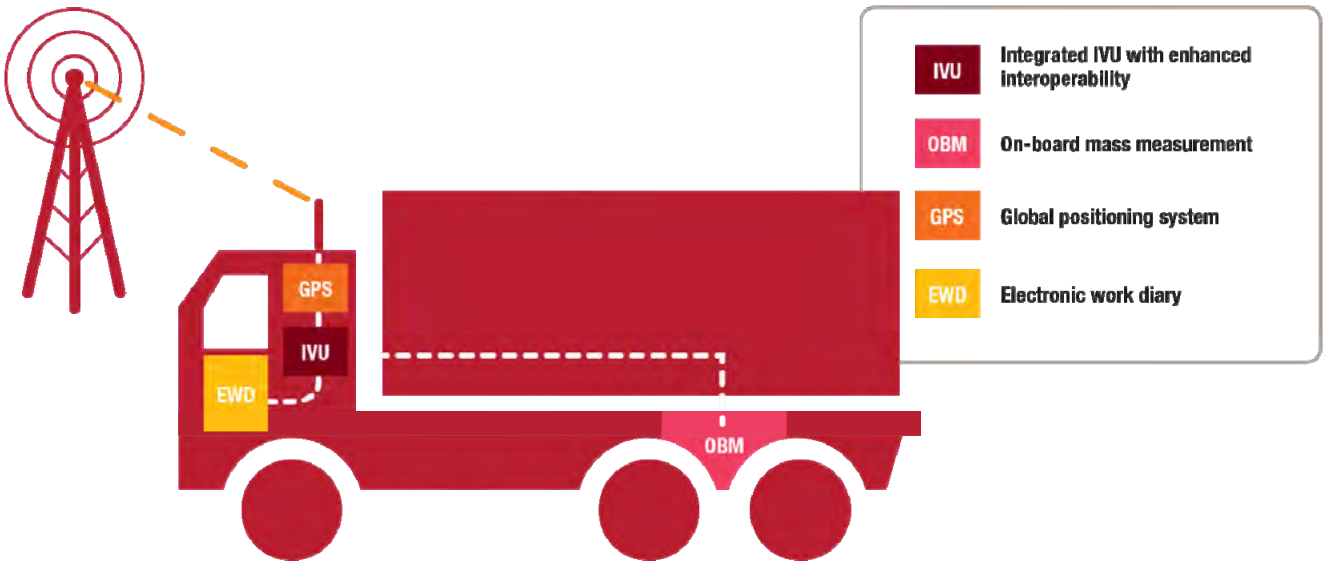
On-going collection of industry data has real potential to be used to improve infrastructure planning. Government and industry would need to agree on confidentiality and uses of this data and acknowledge that the use of this data for supply decisions will have mutual benefits.

The ABS could collect industry data to supplement and enhance its other data sources and then provide collated information to road decision makers. The ABS is already backed by the confidentiality provisions in its founding legislation, the *Census and Statistics Act 1905*, which allows this data to be used for statistical purposes only.[52]

A further potential source of prospective heavy vehicle demand data will be the NHVR's access request database. The NHVR will be able to collate the routes with high latent demand for HML and HPV access on the road network.

44 Infrastructure Australia (2011b), p 17
45 COAG Road Reform Plan (2011d), p 13
46 Mitchell (2010)
47 Australian Bureau of Statistics (2010)
48 Advice from the ATA
49 Australian Bureau of Statistics (2012d)
50 Discussions with the New Zealand Transport Agency
51 COAG Road Reform Plan (2011a)
52 Australian Bureau of Statistics (2012e)

Figure 15: In-vehicle telematics can store and send information on movements and mass



Source: National Transport Commission (2010b)

3.9 Recommended action: target heavy vehicle access

Given the productivity challenge that Australia is facing, supply reforms should be pursued with urgency. PwC proposes a number of short, medium and long term recommendations to focus more demand-led investment. This will better ensure that spending is efficient and targeting the right investments. More demand-led investment in roads is critical as there is a large backlog of road maintenance and investments, while the funding pool is limited.

Greater inter-jurisdictional cohesion and more targeted road investment is a logical first step to any road supply reform regardless of the long-term vision.

To focus investment, PwC recommends that a national road freight network hierarchy be agreed by industry and road suppliers. Each level of the hierarchy will be associated with harmonised and aspirational levels of heavy vehicle access; higher tiers will be associated with higher allowable vehicle loads and greater vehicle dimensions.[53] Cost, demand data and industry insight will be critical in facilitating this process.

IA has already made progress in this aspect in its *Land Freight Network Strategy* work which proposes a seamless freight network comprising core roads, rail networks and intermodal nodes. These tend to be interstate highways and heavy vehicle routes to ports.[54]

As described in this chapter, there are likely to be economically justifiable improvements to non-national freight infrastructure such as bridge deficiencies on an otherwise HML approved route or arterial roads from local industry sites to interstate highways. A secondary freight network could be determined in consultation with industry and through the use of data – as well as the new NHVR database for local access applications – for more targeted investment.

Roads that do not fall into either of these networks should continue to be provided to a minimum standard to provide basic access.

The scope of each network (and the levels of access) will change over time as the freight task grows and vehicle technologies evolve. The third tier of the network aligns with IA's recommendation that roads with a primary social purpose are differentiated from roads with a predominantly economic purpose.[55]

Short term recommendation 1

Within three years, define a three-tier road freight network with each tier targeting a particular heavy vehicle access level to focus investment, reporting and funding:

- **Tier 1 – primary land freight transport corridors –** the highest level of access, building on IA's National Land Freight Network

53 In practice, it is likely that the level of access relevant to each tier will vary based on rural or urban, but the aim is to have a nationally harmonised set of access levels.

54 Infrastructure Australia (2011b)

55 Infrastructure Australia (2012c), p 7

- **Tier 2 – significant 'last mile' higher mass limit connections –** level of access below Tier 1, but may align with Tier 1 mass limits to ensure end-to-end trip productivity is achieved
- **Tier 3 – remaining freight network –** a minimum level of access in line with current general access requirements, supplemented by ad hoc improvements overseen by the National Heavy Vehicle Regulatory (NHVR).

This tiered approach is akin to defining service standards (eg reliability) in the utilities sectors and can be commenced in the short term. Tiers and access levels can be defined based on access requests from industry to the National Heavy Vehicle Regulator, as well as direct consultation with industry. This process would be supported by:

- An agreed national approach to relating road / bridge asset capabilities to harmonised heavy vehicle access levels. For example, what pavement depths are reasonably required to allow B-doubles at General Mass Limits? What bridge characteristics would be required for operation of B-triples at Higher Mass Limits? How much will it cost to reach each of these service levels given the current state of the road network?
- An analysis of how access levels within each tier may need to differ between urban and rural roads. For example, rural communities may accept road trains operating on a given network tier, while road trains on the same road in a densely populated urban area would not be supported.
- An indicative profile of costs required to improve heavy vehicle access on the road network to inform decisions about the timing, scope and scale of road and bridge upgrades industry would seek. This in turn would require road agency information on current asset capabilities and indicative unit costs of road and bridge upgrades to reach heavy vehicle access levels
- Collation of existing (and proposed) heavy vehicle demand data to guide the definition of tiers.

3.10 Recommended action: spending transparency

The definition of the three-tier road freight network is seen as a mechanism for improving several aspects of heavy vehicle road supply. The first aspect of improvement from the current situation is transparency of road agency expenditure.

Short term recommendation 2

Within three years, state, territory and local government road owners should report investment and maintenance on each tier of the road freight network. The information should be compared with cost benchmarks and the level of access achieved relative to targets to increase transparency and accountability.

More transparent and functional reporting of expenditure will give industry, government and the community confidence that heavy vehicle related road funding is appropriately spent on delivering the desired access levels.

This detailed expenditure data should be published and will enable refinement of unit cost estimates of road maintenance and investment (eg by lane-kilometres on a given network tier). These estimates can be further developed into efficient benchmark investment and maintenance costs that could be used to inform the amount of expenditure that is recovered from heavy vehicle road users.

3.11 Recommended action: spending accountability

Hand in hand with the increased accountability, road owners need to be given greater funding certainty to perform their supply functions. Heavy vehicle road user charges should be 'hypothecated' directly to supporting heavy vehicle access to the road network.

Short term recommendation 3

Within three years, establish a transparent formula for allocating funding to road suppliers.

This should be established by the NTC to direct funding to road suppliers. Allocations should reflect road costs, heavy vehicle usage and access upgrades required for Tier 1 and Tier 2 roads. Existing and emerging data can support this allocation.

The funding formula should incorporate a mechanism for funding low-volume roads (generally Tier 3 roads) above the level suggested purely by demand levels. Such roads (Tier 3 state roads as well as local government roads) should continue to be provided largely as community service obligations (CSOs) and funded through a mix of local government rates, national general revenue grants, light vehicle user road charges, and all heavy vehicle charges (including a small cross-subsidy from users of Tier 1 and 2 roads).

This is similar to the activity-based approach to funding health which incorporates mechanisms to provide additional funding in rural and regional areas to sustain adequate levels of health services in these areas.[56]

Medium and long term recommendation 1

In the medium term (within six years), independent assessments of efficient road investment and maintenance costs can be tied more explicitly to funding allocations.

Incentives to outperform benchmarks should be provided, for instance, by allowing a road supplier to retain unspent funds and invest in other priorities.

3.12 Recommended action: consideration of a national road fund

A number of options for long term supply reform have been raised in Australia.

A cross-section of the freight industry has argued that the **current departmental model** is becoming increasingly incapable of grappling with the challenges of the growing pressure on infrastructure.[57] This model is characterised by road agencies and local governments providing and maintaining roads as well as determining heavy vehicle access conditions funded out of general government revenue.

A **departmental model with hypothecation** was considered by the Productivity Commission in 2006 and endorsed by industry but has not been explored by the reform program since.[58] PwC considers that this option provides a useful bridge between the current practice and a more dramatically changed institutional structure (Medium and long term recommendation 2), particularly when combined with a national structured approach to heavy vehicle road spending.

Road funds are a further supply option that has been considered and endorsed by the Productivity Commission and CRRP.[59] Industry has also been strong proponents of road funds.

A road fund is an autonomous body responsible for allocating funding for recurrent and capital road investments. Road funds can operate in a number of ways:

- The road funds' revenues could come from general tax revenues, hypothecation or a mixture of sources. Experience from road funds overseas (eg New Zealand, United States, Japan) has largely been hypothecation of road-related revenues with some additional funding from general revenues.
- The road fund can have responsibility for road supply decisions on all roads or for various sections of the network – for example the United States Highway Trust Fund is a road fund for the country's national highways only while HVCI is currently considering a road fund which finances the heavy vehicle portion of investment only
- A road fund could operate at a national level or individual road funds could be established in each state and territory – state governments have expressed reservations about a national road fund and the reduction in fiscal flexibility.[60] In recognition of the sensitivity of a national road fund, state-based road funds are part of a package currently being considered by HVCI[61]

Road funds generally select projects with the strongest business case based on demand, economic benefits, and social and environmental impacts – independently of day to day political considerations. Political representatives could set out the objectives, required outcomes and operating principles of the autonomous body through overarching legislation and the endorsement, by ministers, of a regular master plan.

The government's willingness to establish an autonomous body may present a challenge in itself and countries around the world have sought to address this in different ways. The road fund in New Zealand balances political considerations by assessing the strategic fit of each infrastructure project against national government policy priorities (Box 6). Meanwhile the road fund in the United States is not strictly an autonomous body but an accounting mechanism to separate national road-related tax revenue from other sources of revenue (Box 7).

56 Independent Hospital Pricing Authority (2012)

57 See submissions to the Productivity Commission Road and Rail Freight Infrastructure Pricing Inquiry in 2006

58 Productivity Commission (2006), p 269 - 272

59 See Productivity Commission (2006) and COAG Road Reform Plan (2011c)

60 See for example Queensland Government submission to the Productivity Commission Inquiry (2006) and Tasmanian Government submission to the Productivity Commission Inquiry (2006)

61 HVCI (2012b)

New Zealand was one of the first countries to set up a road fund and has gradually refined its design and governance over the decades. There are lessons from New Zealand's experience for consideration of an Australian road fund. For example, New Zealand's approach to balancing the consideration of government policy priorities with independent road supply decision making, the relationship between the road fund and the local councils, the network hierarchy, and the road fund's measures of performance.

However there are some important differences between New Zealand and Australia which add complexity to the successful operation of a road fund, such as the constitutional basis of Australia's states and the immensity of the Australian road network. In particular, the distribution of funding between the federal, state and local governments, and the treatment of the significantly larger pool of CSO roads are two standout issues which need to be addressed when considering a road fund model in Australia.

The United States Highway Trust Fund (see Box 7) is a good example of how a single national road fund distributes funding to many different road owners and operators. The Highway Trust Fund's revenues are apportioned according to fixed formulas which take into account road length, vehicle miles travelled, diesel fuel use and population. This also creates incentives for road owners to innovate and deliver the maintenance and investment at the lowest efficient cost.

A variation on the road fund is a **road portfolio manager** which performs the decision making function of a road fund but the funds are held and distributed by the government from an accounting perspective. IA has recommended a national roads portfolio manager to verify asset management plans and provide advice on road infrastructure policy and investment decisions.[62] A Juturna report for the Australian Rural Roads Group also recommended the establishment of a national road portfolio manager to oversee local government road asset management.[63]

62 Infrastructure Australia (2011a)

63 Juturna for Australian Rural Roads Group (2011)

Box 6: New Zealand's National Land Transport Fund

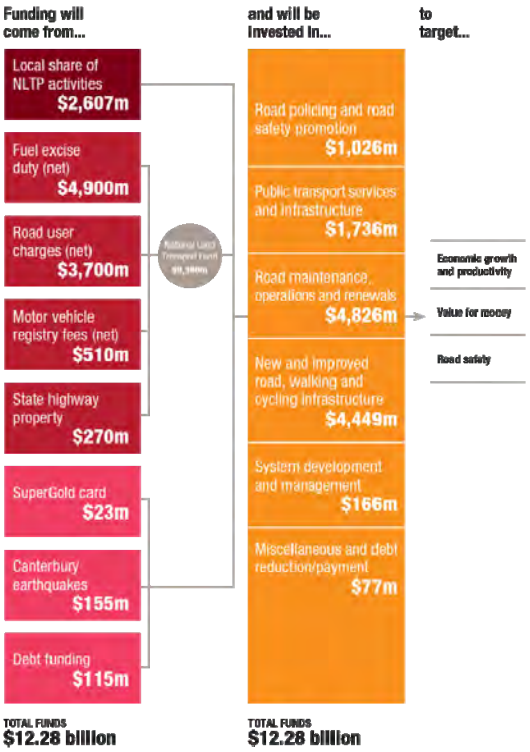
A road fund was established in New Zealand in 1953 and today is called the National Land Transport Fund (NLTF). The NLTF is managed by the New Zealand Transport Agency (NZTA), which is a Crown entity that is governed by a Board that is statutorily independent. The annual administration costs of the transport fund are around 1% of its expenditure each year.

The NLTF provides funds for the upkeep of the 11,000km state highway network (which covers around 12% of New Zealand's roads). The NZTA classifies the state highway network according to a four-tier hierarchy of road classification, determined with reference to traffic volumes and user segments served. The most important ('national strategic') roads are associated with access to and from major population centres, high volumes of heavy vehicles, port and tourism traffic. The function hierarchy then directly informs the standards to which roads should be built and maintained to best serve road users.

The NLTF also provides a contribution towards funding local roads, which account for the remainder of public roads and are managed by local authorities. The NLTF financially assists at a national average of 50% towards qualifying local government expenditure on local roads on an equity basis (ie the funding assistance rate takes into account the ability of local governments to raise funds for its road maintenance program relative to the size of that programme). The NLTF also provides funding for public transport and road policing. New Zealand's transport fund model is unique to other countries in that it provides local governments with relative certainty for cost sharing calculated by a fixed formula.

The NLTF is financed mostly through direct charges on road users (fuel excise duty for petrol powered vehicles, road user charges for diesel powered vehicles and motor vehicle registration fees which are set by government) as well as a short-term borrowing facility to manage fluctuations in outlays. The New Zealand Government also has discretion to top up the transport fund balance with funds from the general Crown account.

Figure 16: The NLTF's outlays, receipts and transfers FY2009-FY2012



The NLTF's short and long term funding distributions are based on three-yearly National Land Transport Programmes (NLTPs) which prioritise road infrastructure projects submitted by the NZTA's city, district and regional offices. Each submission is assessed against three criteria:

- 'Strategic fit' with national government policy priorities (the Government Policy Statement on Land Transport Funding) – the Statement effectively acts as a contract between road users and the government
- 'Effectiveness' in addressing the identified problem
- 'Economic efficiency' measured by the benefit cost ratio for improvements and benchmarked measures of cost effectiveness for maintenance and operational spending.

For projects included in the NLTP, the road fund pays the contractors and consultants directly based on certified invoices, certificates of work done and progress reports, with no accounting transfers from the fund to the road owner.

The NLTF assesses and reports publicly on its performance against a range of indicators. For example, in FY2011, the NLTF achieved 12% cost savings relative to its benchmark, but only 72% of construction projects were delivered to time as described pre-construction compared to the target of >85%. This transparent reporting gives rise to a level of accountability that is not achievable without a clear responsibility for supply – and to report on supply outcomes.

Source: New Zealand Transport Agency (2011), New Zealand Transport Agency (2012), and discussions with NZTA

Box 7: The United States Highway Trust Fund

Roads in the United States are classified as one of seven functional categories of roads: Interstate Highways, other freeways and expressways, other principal arterials, minor arterials, major collectors, minor collectors and local roads. All roads including the Interstate Highways are owned and operated by the States.

The United States (US) Highway Trust Fund (HTF) was established in 1956 to fund the 76,000km long Interstate Highway System and other selected roads. The HTF and the Interstate Highway System revolutionised the movement of freight across the US – the majority of goods are moved across the Interstate Highway on 18 wheels.

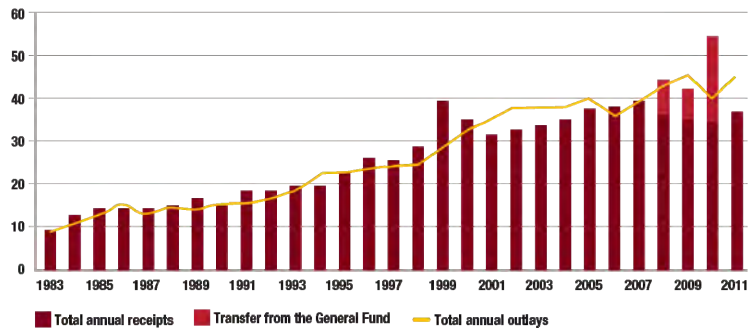
The HTF is an accounting mechanism in the federal budget which comprises two main accounts: a Highway Account to fund highway road construction and maintenance (around 85% of the HTF), and a Mass Transit Account to fund public transport (around 15%). The HTF is directly credited with revenue from the following sources:

- A federal excise tax of 18.4 US cents per gallon of fuel and 24.4 US cents per gallon of diesel (5 to 6 Australian cents per litre) which together make up around 90% of the HTF's revenue respectively
- Excise tax on tyres used by heavy vehicles, transaction tax on the sale of heavy trucks and trailers and annual tax on the ownership of heavy vehicles, which together make up 10% of HTF's revenue.

However these taxes have not recovered total highway expenditure in recent years. In fiscal year ending 30 September 2011, the HTF collected US$37 billion in revenue but was authorised by the US Congress to fund US$53 billion in highway and public transport projects. The shortfall was supplemented with transfers from the Treasury's general fund as the HTF is required to maintain a positive balance.

The recent divergence between receipts and expenditures has been driven by discretionary fiscal stimulus spending, an inability to pass Congress bills to increase excise rates, as well as increasing fleet fuel efficiency, decreasing car use and more purchases of hybrid vehicles that have eroded the HTF's receipts over time.

Figure 17: The HTF's annual outlays, receipts and transfers (1983 to 2011, billions of dollars)



The US Congress determines how much funding each state receives for the construction, improvement and maintenance of highways and bridges as well as safety, pollution reduction and planning using a range of apportionment formulas. For example:

- On the Interstate Highway System – funding is apportioned according to road length and vehicle miles travelled. Federal funding is provided for 90% of costs and states contribute the remaining 10%.
- On principal arterial routes which are not on the Interstate Highway System - funding is apportioned to States according to road length, vehicle miles travelled, diesel fuel use and population. In most cases, states and localities are required to match 20% of federal funds, which may increase if the benefits are likely to be contained at a local level.

The American Association of State Highway and Transportation Officials' *A Policy on Design Standards – Interstate System* outlines the standards for Interstate Highways. Examples of standards include a minimum of two lanes in each direction, 12-foot lane widths, 10-foot right paved shoulder and HS20 bridge strength (capable of supporting [x] vehicle type and axle mass).

Source: Congressional Budget Office (2011a), Congressional Budget Office (2011b), US Department of Transportation: Federal Highway Administration (2012), and American Trucking Associations (2008)

Road networks which are operated like a **utility** or a **commercial road company** have been proposed by industry (eg the Australian Automobile Association submission to the 1997 Neville Inquiry)[64] and governments (eg the New Zealand Roading Advisory Group proposal[65] and most recently HVCI[66]).

While privately operated urban toll roads are becoming more common, PwC is not aware of any international examples of whole road networks being operated like a **utility** or **commercial road company**.

This is largely due to the public good and natural monopoly characteristics of large proportions of national road networks. However, this does not justify, in itself, the exclusion of private sector involvement. Other nation-wide infrastructure networks such as water, electricity and even broadband have been corporatised or privatised in pursuit of lower-cost, more innovative, and more customer-focused service provision with agreed service standards (eg reliability). Businesses and private individuals pay directly for their consumption of electricity, gas and water; however CRRP has argued that the network infrastructure used to provide these services are orders of magnitude less complex than the road network.[67]

Nonetheless, there is potential to transfer some features of the governance model for utilities (Box 8) to the provision of road infrastructure. For example:

- Greater commercialisation in provision, such as the use of a direct, fee-for-service model, so that there is a greater use of price signals, which could enhance efficiency in the use of and investment in road infrastructure
- To address market power, federal or state agency regulation of rates, using a price control based on efficient costs of supply so that utility operators have incentives to operate and invest efficiently and innovate to reduce their costs
- Setting of prices over a regulatory period such as three years in order to enhance incentives for firms to cost minimise over a period given a certain revenue allowance
- A requirement to fulfil USOs or CSOs to ensure that all people in Australia, wherever they reside or carry on business, have reasonable access to essential road services on an equitable basis. These obligations could be funded by a combination of cross-subsidisation from more profitable users and general revenue.

The benefits and shortcomings of each of the road supply models discussed above are summarised in Table 2.

64 Australian Automobile Association (1997)
65 Roading Advisory Group (1997)
66 HVCI (2012)
67 COAG Road Reform Plan (2011c), p 3

Box 8: Public utilities

In Australia, utilities such as water, electricity and telecommunication services are commercially provided by privatised or government-owned corporatised public trading enterprises on a commercial fee-for-service basis. At the network level, these services are generally provided to customers at regulated tariffs / prices, which are set by regulators via a price control (as distinct from negotiate / arbitrate or price monitoring) on the basis of the total costs of supply. Whilst total allowable revenues are determined by the total cost of supply, there is some disconnect between the costs attributable to each individual customer and the price paid by that customer. Moreover, the fee for service is generally uniformly priced, taking into account affordability for low volume customers (eg rural customers). Given the costs to serve different types of customers varies, eg due to economies of density, it implies that there is generally a degree of cross-subsidy in the delivery of water, electricity and telecommunications services in Australia, with profitable customers in urban areas supporting the provision of services in higher cost rural areas.

How the cost base from which network charges are calculated can vary somewhat across the sectors:

- **Water & sewerage** services in Australia are currently operated by state-owned monopolies. Price setting governance varies by state, for example prices are set by independent regulators in NSW and Victoria, the state government in WA and SA and council owned retailers in Queensland. Regardless, every state has an independent body that is involved in setting, reviewing or advising on prices. Prices are based on the costs of infrastructure replacement, new infrastructure, bulk water costs and operating costs plus a return on capital, commonly referred to as the building blocks approach to regulation, which provides for the recovery of operating expenditure and a return of and on capital expenditure. Prices are structured broadly in two parts: a fixed service access charge and a variable water usage charge per litre. The water usage charge is in incremental blocks such that water used in excess of a certain volume is charged at a higher variable rate; however the price does not differ by location (eg urban versus remote).
- **Electricity** network prices in Australia are highly regulated by state and Commonwealth regulatory agencies. Network costs, which make up almost half of the average electricity bill, are calculated using the building blocks model, with the return on capital element calculated using the weighted-average cost of capital (WACC) approach. Electricity prices are charged per megawatt hour and "postage stamp" pricing is permitted in the market rules and is legislated in some states (eg South Australia). It should be noted that this arrangement applies in respect of smaller customers only. Network operators are generally profitable; however, in some cases operators are subsidised by the government when revenues from uniform tariffs fall short of the assessed efficient cost of supply.
- The Australian **telecommunications** sector has, until recently, been characterised by vertical integration, whereby incumbent operator Telstra owns and operates the ubiquitous legacy copper network, and provides a range of network services to downstream operators, including its own retail arm. Charges for these network services are regulated by the ACCC and essentially set on the basis of efficient costs. These charges generally do not differ by location. However, one notable exception to this is access to unbundled copper loops, which has had variable charges based on four geo-types, whereby there is gradation in charges to reflect the higher costs of serving increasingly less dense areas. At the retail level, however, Telstra is subject to a Universal Service Obligation (USO), whereby it is required to provide services to all Australians at uniform prices. The USO is funded by all telecoms operators via surcharges levied on access charges. Telstra's retail prices are also subject to a price cap under legislation, and administered by the Australian Competition and Consumer Commission (ACCC). The rollout of the government-owned and operated National Broadband Network (NBN) heralds significant change in industry structure and regulation, particularly its supplanting of Telstra as the ubiquitous network provider as well as its lack of vertical integration. NBN Co's access service is to be charged on a geographically averaged basis, thus implying a degree of cross-subsidy from customers in dense areas to those in less dense areas.

There are some broad economic and architectural similarities between these three utilities and road infrastructure, particularly regarding natural monopoly characteristics (substantial sunk costs, lumpy investment, economies of scale etc), and network externalities. For public utilities, the model has generally moved to privatised / corporatised provision, regulated to address the attendant market power derived from monopoly provision.

Source: Reserve Bank of Australia (2010), Department of Communications, Information Technology and the Arts (2007), Ministerial Council on Energy (2008), Telstra (2012), Department of Broadband, Communications and the Digital Economy (2012)

Table 2: Benefits and shortcomings of road supply models compared to the current situation

Supply model		*Benefits*	*Shortcomings*
Departmental model with hypothecation		• Road projects are assessed against other road projects rather than competing government priorities for funding • Road users have confidence their charges are being spent on the network - global experience suggests that industry and the community are more accepting of road user charges when they know that the money is reinvested in maintaining and upgrading their roads	• Hypothecation may not be adequate and therefore may need to be supplemented by general tax revenues • Success is still largely dictated by the policies and institutional processes in place • Hypothecation reduces flexibility and creates a risk that revenue is spent on hypothecated road programs where it could have delivered greater benefits to society elsewhere • Hypothecation does not necessarily lead to spending on the *right* roads
Road fund(s) or road portfolio manager	*General*	• Administrators of the road fund have independent oversight and make individual decisions devolved from the political agenda • Road projects are assessed against other road projects rather than competing government priorities for funding • Opportunities to improve road user and community inputs into planning decisions • Can draw on lessons from road funds around the world eg New Zealand and United States • Road users have confidence their charges are being spent on the network - global experience suggests that industry and the community are more accepting of road user charges when they know that the money is reinvested in maintaining and upgrading their roads	• Hypothecation may not be adequate and therefore may need to be supplemented by general tax revenues • The focus on economic analysis may be inefficient for evaluating smaller value projects or social infrastructure – detailed economic analysis is only justified for large spending decisions • Success is still largely dictated by the governance of the road fund • Road funds still face the challenge of how to allocate revenue across the vast portfolio of roads • Road funds creates a risk that revenue is spent on road programs where it could have delivered greater benefits to society elsewhere
	Specific to a national road fund	• Consistency in the national selection of projects will create greater transparency around the decisions made – for example, reporting the Benefit Cost Ratios or formulas against which funding is allocated	• Reducing the level of local control over local maintenance and investment may engender concerns about geographic equity if there were fewer projects selected in certain areas
	Specific to state-based road funds	• Greater local control over funding and access decisions and easier to coordinate with local government road owners make implementation more feasible	• May lead to different charging systems in different jurisdictions which create complexity for interstate operators. If a national charging system is used – there are still issues about how funding is distributed to the state-based road fund. • Lack of national coordination

Supply model	Benefits	Shortcomings
Utility / commercial road company	• Likely to be more efficient and accountable for their level of service and investment decisions • Greater sensitivity to the access and level of service needs of road users. Where road users demand greater road access or innovation, a market-generated price will emerge to capture this opportunity • Users pay a fee for service, which closely aligns with the costs they impose on the network and may encourage efficient mode, route and mass choices • Potential to unlock private spending to reduce government spending	• A utility model for the provision of road infrastructure presents a number of challenges in relation to social outcomes. For example, it may not be a profitable venture for the road company to construct roads in the many parts of rural Australia. • Risky to implement as it has not yet been pursued by any country around the world • A road network, like other networks, is valuable to its users due to its interconnectivity – a commercial model would need to consider how different owners of roads would interplay to maintain its connectivity • Roads have natural monopoly characteristics and strong regulation would be needed to ensure commercial road companies provide a socially acceptable quantity of roads rather than the profit-maximising quantity • Unlikely to be an option in the short to medium term in the absence of widespread direct charging mechanisms

Source: Adapted from Australian Transport Council (2009), COAG Road Reform Plan (2011c), COAG Road Reform Plan (2011d), Infrastructure Australia (2011a), Infrastructure Australia (2011b), Productivity Commission (2006)

Short term recommendations 1, 2 and 3 (and Medium and long term recommendation 1) are expected to improve the transparency of road supply and the accountability of road owners. PwC suggests that if the implementation of these recommendations is sufficient to address the weaknesses of the current road supply model, then further reform may not be warranted. However, if these weaknesses persist, an independent **national road fund** may be best placed to address the road supply challenges identified in this report.

Medium and long term recommendation 2

In the absence of significant improvements in transparency and accountability in the short to medium term, establish a national road fund in the long term (7+ years).

An independent body would assess available freight demand data and submissions of all levels of government and the freight industry to develop forward looking investment and maintenance plans on the Tier 1 and 2 freight network. These plans would be used to direct road owner spending and inform charging requirements. Spending would be financed mostly from heavy vehicle road user charges, though the Australian Government could top-up funds if it desired.

Under a road fund, industry and the community would need to have a genuine influence on planning decisions to ensure that these end customers are paying for the services they wish to consume. A comprehensive new government policy paper and supporting RIS would need to be undertaken to identify the exact operation of the road fund itself. These are considerable tasks that take a number of years to complete. Based on currently available information, PwC suggests the following design features:

- The road fund would receive road user charges from heavy vehicles only. It would also administer heavy vehicle charge contributions to the funding of low-volume roads
- The road fund's planning would be focused on reaching and maintaining the agreed access-based service levels for both tiers of the freight network

- Commonwealth, state and local governments as well as the freight industry would make submissions to the road fund to refine the composition and access level of the Tier 1 and 2 networks
- The selected projects and maintenance activities would feed into the road fund's three to five year plans for heavy vehicle infrastructure investment and maintenance on the two tiers of the national road network. These plans would be presented to Ministers for endorsement. The road fund would recover this overall expenditure through forward-looking charges (see Chapter 4 for more detail regarding charging). The Australian Consumer and Competition Commission or the NHVR (or a new regulator) would oversee charge setting to ensure that efficient costs of supply are achieved
- Road owners would continue to appoint project delivery contractors for heavy vehicle related maintenance and upgrades of Tier 1 and 2 roads, which would be directly financed by the road fund
- The road fund would also make an explicit contribution to the cost of CSOs. The third tier of state roads (and local government roads) would be funded through some form of dollar-matching out of the national road fund, though these would be planned and managed under current arrangements
- Political representatives could set out the objectives, required outcomes and operating principles of the road fund through overarching legislation, similar to New Zealand's *Government Policy Statement on Land Transport Funding*.
- Ministers could have 'ministerial power of direction' to draw a capped contribution from the road fund for projects of pressing importance, such as the projects funded under the *Nation Building – Economic Stimulus Plan* in 2008.

The independent national road fund would address the current shortcomings of road supply arrangements by providing consistent leadership and cohesion in road supply maintenance, investment and planning. Its independence and accountability to the heavy vehicle industry will ensure the right investments are targeted.

However PwC recognises that the immensity of the Australian network combined with the complexity of jurisdictional needs means that a national road fund which reduces some level of control over local funding and access decisions may engender jurisdictional concerns. PwC is mindful that genuine road reform needs to be practical and mutually accepted by government and industry. As such, consideration should be given as to whether sub-funds at the state / territory level will be required as a transition measure.

A further consideration is how a heavy vehicle freight only body would integrate investment and planning decisions with the light vehicle network, given the mixed use nature of all Australian roads.

4 Balancing charging reform with reality

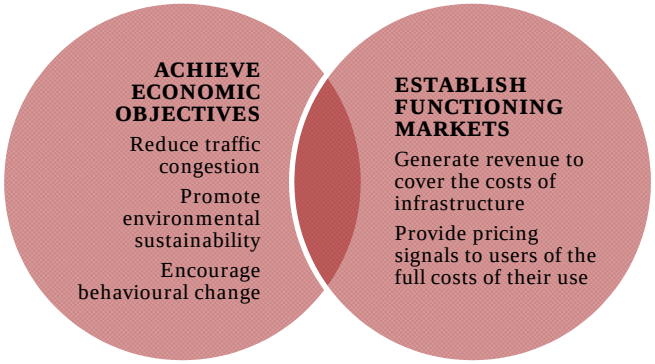
4.1 Why charge for use?

Heavy and light vehicles pay charges for accessing and using Australia's road network. Road charging has mainly been undertaken to recover road-related expenditure (Figure 18). However, road charging can also act as a mechanism to:

- Signal to users the full costs of their road use
- Manage demand and reduce traffic congestion, and time of day (peak versus off-peak hours)
- Promote behavioural change.[68]

In the context of heavy vehicles, there is a strong interest from policymakers in giving stronger signals about the road wear-associated costs of heavy vehicle use. The challenge with this approach is that road wear varies in dramatically different ways depending on vehicle configuration, loads carried, road structure, pavement type, road condition, bridge capability, and distance travelled.

Figure 18: Purposes of road charging



Source: Adapted from Transport Research Board (2010)

4.2 Australia's fuel and registration based system for road user charging

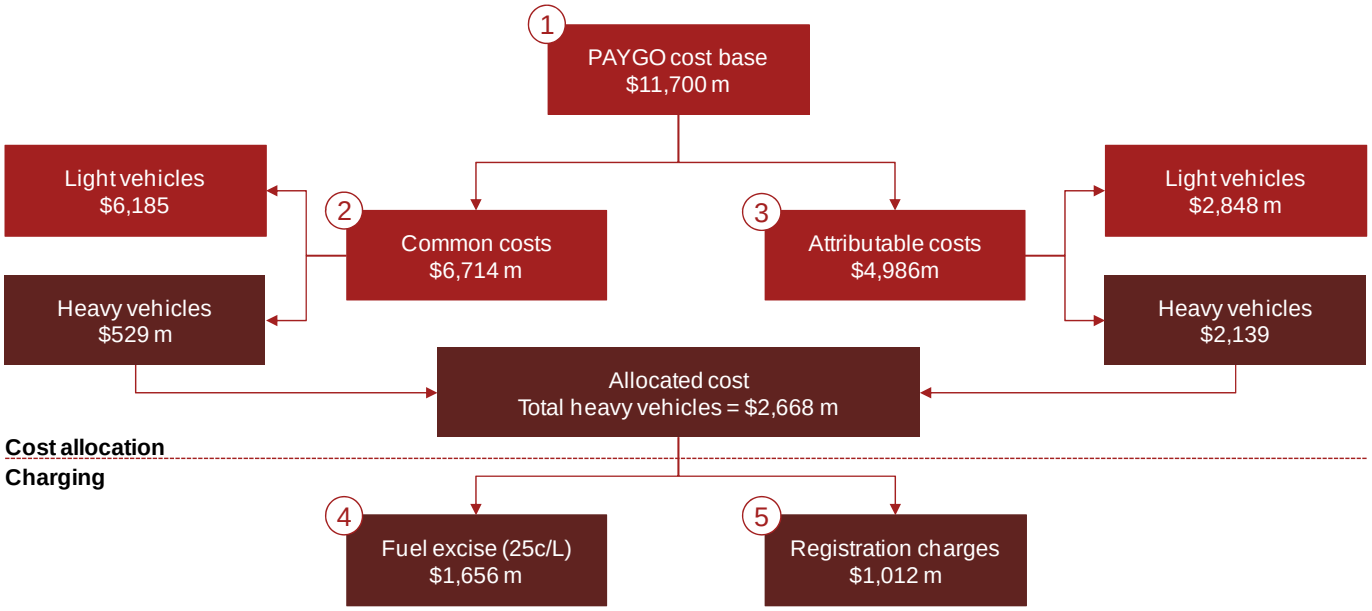
Australia's PAYGO road user charging system was established by the NTC in 1995 to recover road-related expenditure by all levels of government from heavy vehicles.[69] PAYGO is a combination of variable fuel user charges and a fixed registration charge.

The portion of road-related expenditure that is recovered from the heavy vehicle industry is determined annually by the NTC (Figure 19).

68 Adapted from Transport Research Board (2010)

69 Excluding a portion of local government expenditure which is recovered through commercial and residential rates

Figure 19: Allocation of costs to heavy vehicles (FY2012)



Source: Adapted from Productivity Commission (2006) using data from National Transport Commission (2012c)

1 The total PAYGO cost base comprises a seven-year average of historical state and local government road-related expenditure on public roads (net of amount recovered through municipal rates, tolls and incremental pricing charges) indexed to FY2012 dollars. The costs are then split into common costs and attributable costs.

2 **Common costs** are road-related costs that are not variable by use, for example flood damage, natural pavement wear, initial earthworks and corporate services. These are allocated to light vehicles and heavy vehicles based on their vehicle kilometres travelled.

3 **Attributable costs** are variable costs which are directly attributable to heavy vehicles (such as road wear) and light vehicles (such as additional lanes). The allocation of these costs is based on a mixture of vehicle kilometres travelled, average gross mass carried and passenger car equivalent units (PCUs).

Common and **attributable** costs allocated to heavy vehicles are collected each year through a **fuel-based road user charge** and a **registration charge**.

The flat fuel charge per litre is calculated first based on forecast road use such that 62 per cent of the allocated costs are recovered through fuel. The remainder (38 per cent) is distributed via registration charges which are calculated such that the revenue collected from each class of heavy vehicle aligns with its allocated costs.

4 **A fuel-based road user charge** (currently 25 cents per litre) is collected by the Australian Government. All motor vehicles pay a fuel excise of 38.143 cents per litre of diesel or petrol purchased. Businesses using heavy vehicles over 4.5 tonnes as an input to production receive a fuel tax credit (ie a rebate) for the portion of business travel on public roads when filing their Business Activity Statements to the Australian Taxation Office. The road user charge is collected by *reducing* the fuel tax credit for fuel used by heavy vehicles travelling on a public road by the amount of the charge.[70] As the road user charge increases, the fuel tax credit decreases and industry has sometimes found it difficult to communicate the impacts of the diminishing rebate to their customers.

5 **Registration charges** are collected by the states and territories. The NTC sets a recommended registration charge for each type of heavy vehicle which ranges from $542 for a two-axle rigid to $17,707 for a B-triple but jurisdictions are free to determine their own levels of charges.[71]

70 Heavy vehicle operators paid a partial excise on fuel used in heavy vehicles which was formally converted into a road user charge from 1 July 2006. This reform changed the treatment of heavy vehicle fuel excise contributions from a partial excise on fuel to a full fuel excise reduced by tax credits which are considered to be taxable income. Source: Australian Government (2004).

71 National Transport Commission (2012c)

The theoretical basis of PAYGO is guided by a number of principles:

- Full recovery of allocated infrastructure costs while minimising both the over- and under-recovery from any class of vehicle
- Cost effectiveness of pricing instruments
- Transparency
- The need to balance administrative simplicity, efficiency and equity
- The need to have regard to other pricing applications such as light vehicle charges, tolling and congestion.[72]

A fuel and registration based charge is not intended, nor able, to provide finely disaggregated pricing signals by mass, distance, location or time. It was designed primarily to recover network or aggregate costs and as a secondary goal, provide a blunt mechanism to replicate the long term costs of road use. In this respect, the fuel and registration based charge performs well and overseas experiences have not identified clear, preferred charging solutions to PAYGO without moving to a more administratively costly system.

A fuel and registration based charge is simple to administer, compliance is easy to monitor, and the system is reasonably well understood by industry. It enables road suppliers to broadly recover their historical costs from road users, including heavy vehicles. Furthermore, the backwards-looking charging mechanism assures road users that the money raised from road user charges has been spent, as opposed to forward-looking charges which do not provide the same certainty.

However, the Productivity Commission raised a number of shortcomings of fuel and registration based charges in its 2006 Inquiry. Many of these shortcomings have been addressed in the NTC's Third Heavy Vehicle Charges Determination in 2007 but a number still remain:

- Cost base and subsequent heavy vehicle charges are not related to the efficient costs of road use
- Averaging within vehicles classes and across time.

CRRP's analysis reaffirmed the issues raised above and raised an additional issue that fuel and registration based charges create some pricing anomalies which encourage less efficient vehicle combinations and fewer axles on a vehicle. More recently, HVCI has observed there is also a practical issue with the current charging arrangements whereby the fuel charge is limited by the size of the fuel excise.

72 National Transport Commission (2007a)

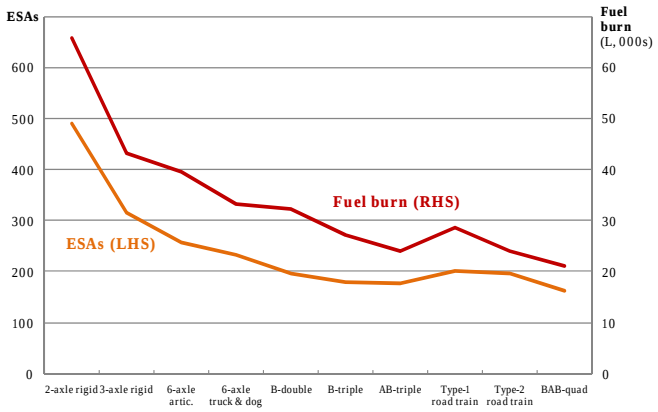
These issues are explored below.

4.3 Road user charges do not reflect costs of use

The trucking industry, like any other commercial industry, makes decisions based on *private* costs – eg costs of operating their vehicle, journey time and road tolls. Without a direct relationship between road charges (which ideally account for both private *and* 'external' costs that accrue to others) and road use, heavy vehicles generate a socially inefficient quantity of environmental pollution, pavement wear and congestion.[73]

The relationships between heavy vehicle use, road wear and costs are not straightforward (see Box 9). Work undertaken to examine the relationship between fuel use and ESAs as part of the CRRP process found that fuel usage does not sufficiently reflect the exponential cost relationship between axle weight and road wear on a per-trip basis.[74] The ATA has undertaken similar analysis on a freight-task basis and reached the opposite conclusion. The ATA analysis suggests that fuel burn mirrors road wear across the different vehicle classes for the end-to-end journeys required for a given freight task (Figure 20).[75]

Figure 20: ESAs against fuel burn for a given freight task*



* Task is moving 1000 tonnes 1000 kilometres, with loads at General Mass Limit (GML) in the laden direction and zero in the unladen direction.

Source: ATA (2011)

73 Ultimately, some level of congestion, pavement wear is environmental pollution would be socially optimal because, at some point, the costs of abatement would outweigh the benefits.

74 ACIL Tasman (2011), p 9

75 D. Simon (letter to N. Aplin, 20 September 2011)

Box 9: Drivers and costs of road wear

Heavy vehicles incur costs on the road network through their contribution to road wear. Other contributors include the condition of the road, rainfall and temperature. The relationships between heavy vehicle use, road wear and costs are not straightforward.

The primary driver of use-related wear for a given road type is the mass loaded onto each axle group (and the configuration of these axle groups). Different vehicle combinations carry loads under different configurations of axle groups, which in turn can affect the pressure of that load on the road in a non-linear fashion. Vehicle suspension systems also influence road wear. 'Road friendly suspension' (RFS) systems have lower impacts.

The unit of measurement of the force imparted on the road by an axle group is 'equivalent standard axles' (ESAs); a higher number of ESAs will have greater road wear. For instance, in Figure 21 a six-axle articulated truck has higher total ESAs for a given carried mass compared with the B-double, which has a greater number of axles. Therefore while the gross mass of the B-double is greater, it has a lower road wear impact in transporting the same freight task. Road wear impacts for a given task are further reduced by operating B-doubles at HML under an RFS system.

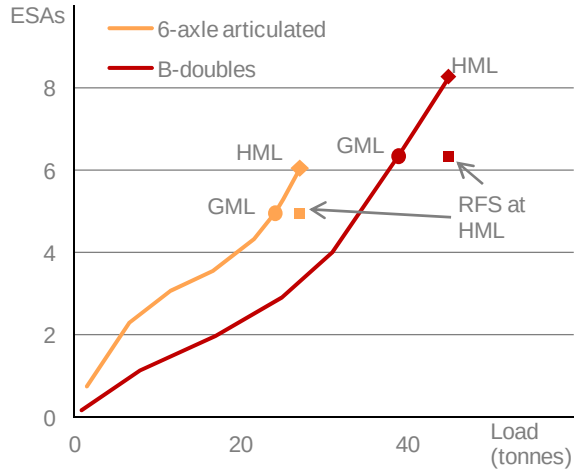
However, the increase in road wear also does not increase in a simple linear fashion with ESAs. At high axle loadings the incremental wear associated with a small increment in mass can be significant. Further, across road types and road conditions the relationship varies significantly (Figure 22).

The marginal cost of a heavy vehicle's road wear is defined as the cost incurred by the vehicle taking a single trip on a given road. These costs are in terms of the extra maintenance cost required to return a road to its original standard before the trip was taken.

The current PAYGO system seeks to reflect marginal costs when it allocates costs among vehicle classes, with vehicles that typically do more damage per trip (under average loads) allocated higher registration charges as well as incurring greater fuel charge (more fuel used).

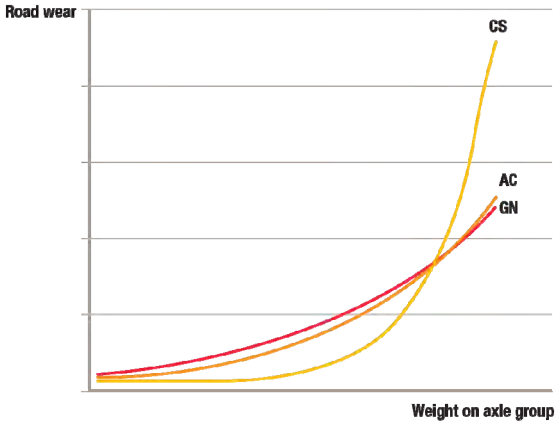
The mass-distance-location charging approach proposed by the Productivity Commission, and subsequently investigated by CRRP and HVCI, seeks to make heavy vehicle charges reflective of the marginal cost wear done by a given vehicle on a given road (type) under a specific mass. This will require very good road cost and road use data to estimate marginal costs that are both reliable and highly disaggregated. Current estimates suggest there is enormous variation in marginal costs across vehicle configurations and road categories.

Figure 21: Relationship between load and equivalent standard axles



*Note: GML is general mass limits, HML is higher mass limits and RFS is road friendly suspension (see Box 3)
Source: PwC calculations based on National Transport Commission (2005) and Australian Trucking Association and Barkwood Consulting (2011)

Figure 22: Relationship between weight on axle group and road wear



* Note: pavement types are cement stabilised (CS), ashphaltic concrete (AC), and granular (GN)
Source: National Transport Commission (2011), p 9

Regardless of which viewpoint is correct, fuel use appears to approximate road wear well *across vehicle classes*, but road and bridge wear tends to increase more steeply than fuel use at higher loadings *within a vehicle class*. This suggests that the current fuel and registration based charging system has only a moderate relationship between charges and infrastructure wear costs. The registration component broadly recovers more costs from heavier vehicles that on average contribute more road wear, but provides no further price signal to operators once they have made a vehicle purchase decision. The fuel charge provides a partial price incentive to operators to choose appropriate loadings and routes.

A closer link between road charges and the costs of road use would help road users to make the most socially efficient decisions on their optimal mass, vehicle choice and route choice. For instance, in the absence of pricing or regulation, a freight operator may prefer to travel on a direct but low pavement strength road, when the more socially desirable outcome would be for the operator to use the high strength road that is a slightly less direct connection.

However, a study into the potential response of road freight operators to a change in the road charging system found that even with a more cost-reflective charging system:

- Operators will not change their behaviour dramatically because of current operational limits and the incentives operators already have to use the most efficient route and the most productive vehicle combination
- Only 25 per cent of current freight trips have realistic alternative routes
- Only 11 per cent of operators stated they would have an alternative to the local roads on which they travel.[76]

There is also a need to consider whether industry should pay for their marginal road wear costs regardless of the current condition of the road network and historical maintenance practices. The short run marginal costs of road use are highly dependent on the quality of the legacy infrastructure. If an existing road is built to a low standard – either as a CSO or because of under-spending – a cost-reflective charge could be substantial and have significant adverse consequences, particularly in remote areas.

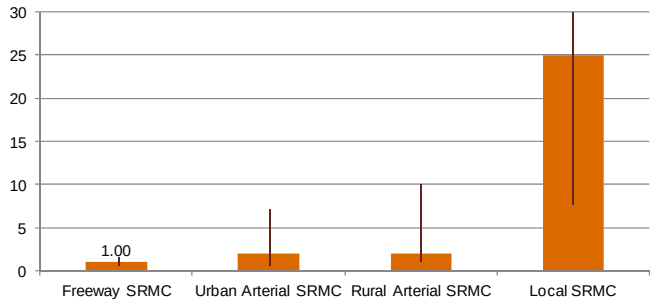
4.4 Cross-subsidisation within vehicle classes and across time

Cross-subsidisation within vehicle classes: As fuel and registration based charges are determined by the average mass of each vehicle type and average marginal cost of road use, heavy vehicles which carry higher than average masses or travel on roads with higher than average marginal costs underpay.

For example, a B-Double that typically operates on local roads or at higher mass limits pays the same registration fee as a B-Double that usually operates at general mass limits on interstate highways. While the incremental road damage caused by the former is significantly higher due to the relatively thinner pavement depth of local roads or higher than average masses, the cost of road maintenance is recouped relatively equally from both operators, leading to questions about equity in cost recovery.

Figure 23 shows that even with the same mass carried, the short run marginal cost (ie maintenance costs only) of travelling on local roads is in the order of 25 times higher than travel on the freeway. With averaging of costs across all vehicles of the same class, at least some vehicles are not paying their short run marginal costs when travelling across local roads.

Figure 23: Short run marginal cost relativities on various roads



Source: NTC (2011b)

Cross subsidisation across time periods: Roads are designed for a life of 20-40 years while bridges are designed for a life of 100 years or more, yet the full cost of their construction is recovered in 7 years. This would not be an issue if expenditure was constant each year. Indeed, this is a key assumption of PAYGO, ie that 'current expenditure provides a reasonable proxy for the annualised cost of providing and maintaining for the current vehicle fleet'.[77] The reality is that as the size of the network has expanded to meet the demands of the future, extra costs are paid for by road users today.

76 GHD (2011b)

77 National Transport Commission (2012b)

4.5 Over-recovery and distortions

One of the principles of PAYGO is to recover the exact amount of expenditure attributed to heavy vehicles each year. However PwC's analysis of the PAYGO models finds several issues which are contributing to over-recovery of revenues from heavy vehicles and some anomalies that affect vehicle choices:

- **Theoretical mismatch between expenditure data and vehicle use data.** The PAYGO cost base comprises an average of expenditure (in *real* terms) over the last seven years which is then allocated using the heavy vehicle fleet size and characteristics at the *mid-point* of the trend of the previous seven years. This process aims to match the methodology of averaging expenditure with fleet numbers. However as expenditure is indexed to real values before it is averaged, using a trended mid-point for vehicle numbers is theoretically mismatched.

  In practice, charges are paid by the actual fleet, which has grown considerably compared to the trended mid-point, and total revenues exceed what was intended to be recovered.

  A further issue is that PAYGO's charges are estimated based on sampled estimates of the current vehicle fleet (through the ABS survey of motor vehicle usage). The ATA has calculated the PAYGO charges based on actual registration data from state and territory road agencies. The analysis found that heavy vehicles will pay $400 million more in registration fees in FY2013 than calculated through PAYGO as a result of the mismatch between the SMVU and actual registrations.[78]

- **PAYGO does not adequately adjust for incremental pricing schemes leading to double counting of costs.** The PAYGO cost base is allocated to heavy vehicles based on a number of variables, including vehicle mass. Some heavy vehicles pay to carry masses above general limits (Box 10). The actual mass carried is then reflected in a higher distribution of the PAYGO cost base to all heavy vehicles within that class. However the extra damage done by these vehicles has already been recovered through the incremental charge. Failing to quarantine the incremental masses carried by these vehicles leads to double-charging of heavy vehicles. Though the over-recovery may be negligible in the short term, a potential expansion of incremental pricing schemes means that this adjustment may be important in the future.

- **Partially offsetting these forces is the nature of the NTC's determinations, which are recommendations.** In recent years, some jurisdictions have not passed on recommended increases in registration charges to users. For example, Northern Territory charges an $8,247 annual registration fee for a multi-combination prime mover with 2-3 axles compared to the NTC's determination of $9,457.[79]

- **The PAYGO model is subject to a number of constraints which introduce some pricing anomalies.** For example, some trailers can be shared between different truck combinations such as the second B-double trailer and a semi-truck trailer. As the B-double travels greater tkms, has higher ESAs and is longer (as measured by Passenger Car Units), the lead trailer of the B-double (known as the A-trailer) must be charged higher to maintain consistency of its second shared combination trailer.[80]

  The issue was previously dealt with through an intentional cross-subsidy to B-doubles and B-triples from all other vehicle classes as well as to encourage their adoption. However following the 2006 Productivity Commission *Inquiry*, the Australian Transport Council directed the NTC remove this cross subsidy in the charging model. An unintended consequence was a quadrupling in the A-trailer charge.[81] An NTC review of A-trailer charges found anecdotal evidence that new charges significantly affected the viability of B-double operators and in particular B-triple operators who were significantly disadvantaged by the two A-trailers used in the configuration.[82] A-trailer charges were subsequently reduced but are still at a level that disadvantages B-triple and B-double operators over their comparable road-train counterparts,[83] which each have higher road wear impacts.

78 Australian Trucking Association (2012a). Industry has also raised issues with respect to the use of an assumed spare trailer ratio when actual trailer data is available.

79 Northern Territory Government (2012)

80 National Transport Commission (2010a), p 13

81 Australian Trucking Association (2012b)

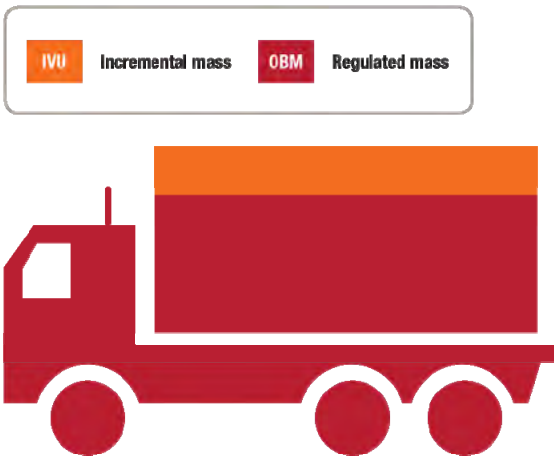
82 National Transport Commission (2012e), p 2

83 Based on PwC analysis of average fuel and registration charges for each vehicle type per net tonne-kilometre with data from National Transport Commission (2012c) and ATA and Barkwood Consulting (2011)

Box 10: Incremental pricing schemes

Incremental pricing is a mechanism that allows access by oversized and higher mass limit heavy vehicles to certain sections of the road network for operators willing to pay to the road owner (eg local council or road agency) for their incremental damage on the road. The incremental charge is set to cover the avoidable cost of maintenance due to their use.

Figure 24: Incremental charges are paid for the additional mass carried



Most recently, incremental pricing trials have been commissioned by COAG as part of the CRRP process to test the potential to use incremental pricing for more productive heavy vehicle access. Assessment of these trials has shown that they have, on the whole, failed to produce benefits to industry and to road suppliers. The major obstacles to their success were the burden of compliance and administration, and the non-commercially oriented structure of Australia's road agencies which make it difficult for agencies to respond to market incentives.

HPV access on Hume Highway is currently being considered by the NSW Government to improve freight productivity. The NSW Government will explore the possibility of direct charges to fund additional driver rest areas and other works that will enable HPV access.

The Hume Highway trial is expected to be cost neutral to the government and demonstrate that HPV access can be provided without negative road funding ramifications as long as the right roads with sufficient demand are selected.

Source: GHD (2011a), Juturna (2011), NSW Government (2012a), p 59 and National Transport Commission (2007b)

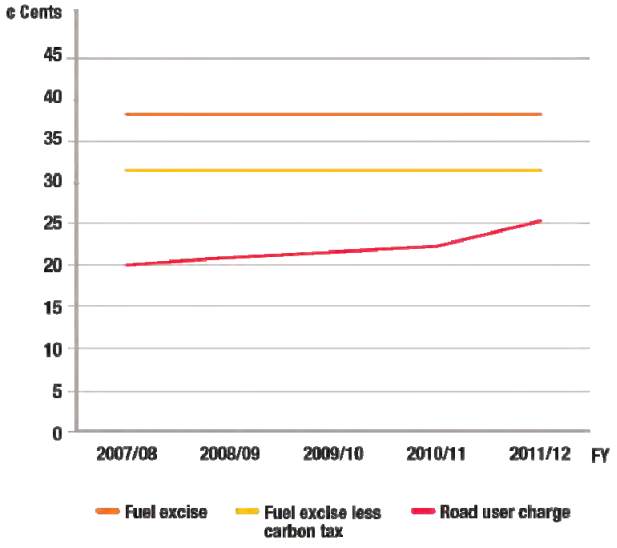
4.6 Practical constraints on charging revenues

Historically fuel excise was indexed six-monthly by movements in the Consumer Price Index to maintain the real value of fuel excise receipts. In 2001, the indexation in the excise was abolished as part of a package of fuel tax reforms, in part to soften the impact of high petrol prices and partly to counteract the effect of the introduction of the Goods and Services Tax.[84]

As such, the fuel excise is currently fixed in 'nominal' terms at 38 cents per litre. In contrast, the fuel component of the road user charge rises in nominal terms with each new determination. There is therefore currently a practical cap on the size of this charge before the mechanism of collection of the road user charge would need to change.

Further, the carbon price is proposed to be applied to heavy vehicle fuel in a similar manner to the road user charge. From July 2014, approximately 7 cents per litre will be deducted from the fuel excise rebates of heavy vehicle operators. This will further constrain the ability of current fixed excise to cover future road user charge increases (Figure 25).

Figure 25: Convergence of the road user charge and the fuel excise cap



Source: HVCI (2012a)

84 Treasury (2001)

4.7 Recommended action: more equitable charging in the short term

PwC proposes short term recommendations to reduce some of the current weaknesses of the fuel and registration based PAYGO charging model for heavy vehicles.

Short term recommendation 4

Within three years, improve the cost reflectivity of road charges by adjusting the existing PAYGO scheme to be more reflective of road use as well as a third-party review of PAYGO inputs.

The NTC should look to improve the PAYGO model by:

- Fully accounting for tolls and incremental pricing schemes to eliminate double-counting in the setting of charges
- Applying the PAYGO model to actual vehicle and trailer numbers in the current year rather than the mid-point of the trend of the previous seven years
- Commissioning an independent review of PAYGO methodology, data and inputs

Medium and long term recommendation 3

In the medium term (3-6 years), further improve the cost reflectivity of road charges by adopting a majority fuel-based charge and reducing the role of registration charges.

The NTC should pursue and implement structural changes to the charging model, with consideration of:

- The potential need for differentiated fuel charge rates for different parts of the heavy vehicle fleet to more closely align charges with road wear
- In conjunction with the Indirect, Philanthropy and Resource Tax Division of Treasury, developing a practical approach to collecting heavy vehicle fuel charges that are likely to exceed the fuel excise (eg through Business Activity Statements).

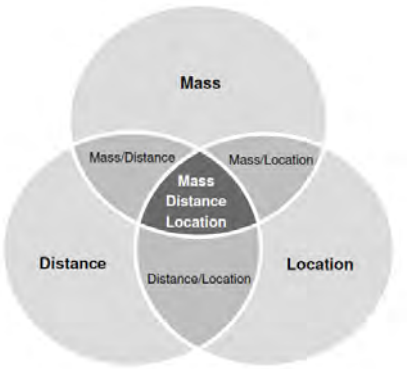
4.8 Recommended action: variable pricing in a practical timeframe

A wide range of long term road charging options has been raised and considered in Australia recently, ranging from the fuel-based charge proposed by the ATA to the detailed mass, distance and location-based charge originally proposed by the Productivity Commission and the subject of further consideration by CRRP and HVCI.

Most road charging options considered are formed by varying user charge levels by a combination of:

- **Distance**: the distance travelled by the vehicle measured by odometers, hubometers, toll stations, in-vehicle telematics or operator declarations. Charges would increase proportionally with distance
- **Mass**: the mass of the vehicle measured by WIM stations, airway gauges, in-vehicle telematics, or operator declarations. Charges would increase (potentially non-linearly) with higher masses carried
- **Location**: where (or on which road type) the vehicle is travelling on the road network measured by GPS, tolling stations, driver logs or in-vehicle telematics. Charges would be higher on roads with lower pavement and bridge strengths.

Figure 26: Charging combinations



Source: COAG Road Reform Plan (2011c)

An improved PAYGO is also considered as a potential long term road charging option. An **improved PAYGO system** would retain the same principles and cost allocation model, albeit with the short term improvements as outlined in Short term recommendation 4.

A **fuel-based charge** has been proposed by the ATA and is widely supported by industry. The ATA proposes that heavy vehicles pay lower registration charges to cover the heavy vehicle share of 'common' costs and administration costs (approximately 9 per cent of total road user charges), with less variation in charges between vehicle classes. The current fuel charge is then increased to cover the remaining 91 per cent of road user charges and differentiated by two broad vehicle groups: two axle rigid vehicles, special purpose vehicles and buses (Class A) and three axle rigid and articulated trucks (Class B). The annual cost would decrease by $1,269 for the average B-double / B-triple and $4,473 for the average triple road train.[85]

85 Australian Trucking Association (2012c)

CRRP analysed the **fuel-based charge** along with:

- A **distance-based charge**, where the road use charge paid by trucks depends on its kilometres travelled, regardless of location and the mass it carries.
- A **distance, location-based charge (DL)**, where the road use charge paid by trucks depends on its kilometres travelled in different locations, regardless of the mass it carries.
- A **mass, distance-based charge (MD)**, where the road use charge paid by trucks depends on its kilometres travelled and mass carried, regardless of location.
- A **mass, distance and location-based charge (MDL)**, where the road use charge paid by trucks depends on the marginal short run costs of travel on different roads, in different locations and carrying different masses.

The benefits and shortcomings of each road charging model is summarised in Table 3, with CRRP's findings summarised in Box 11.

Box 11: CRRP feasibility study findings

At the outset of the CRRP process, COAG anticipated that direct pricing in the immediate term would yield large economic benefits to industry, government and the community. However the feasibility study concluded that the benefits of implementing major pricing reform alone in the near term is low and in some cases negative. The poor predicted economic outcomes forecast by CRRP are due to the high expected costs of technology, administration and compliance, and because operators are by and large already choosing reasonably low-cost routes and vehicles for the freight task.

The gross benefits of MDL are the highest followed by DL charges. However gross costs of MD and MDL are the highest due to the requirement for in-vehicle telematics. On the whole, MD presents the biggest net cost, closely followed by MDL due to the significant cost of technology which is not outweighed by the estimated efficiency benefits of behavioural changes.

The ideal long term reform scenario may well be that heavy vehicle users pay the exact costs directly incurred from use of specific roads, and roads are provided that minimise these incremental costs users. Among other things, the current state of technology and uncertainty about the efficient costs of road wear imposed by heavy vehicle use makes this outcome challenging without an outlay of costs that CRRP found are likely to outweigh potential benefits.

Source: CRRP (2011c)

Table 3: Benefits and shortcomings of road charging models

Charging model	*Benefits*	*Shortcomings*
Improved PAYGO (fuel and registration based charge)	• Retains administrative simplicity and ease of compliance • Removes double counting for road use that has already been paid for • Improve theoretical match between expenditure data and vehicle use data	• Retains the shortcoming that the link between heavy vehicle road use and subsequent charges is only supported at the broad level but not at the individual heavy vehicle level
Fuel-based charge	• Simple to collect, and easy to administer and comply with • Some incentive for road transport operators to use HPVs on roads of higher standards with less congestion, which is more fuel efficient on a tkm basis • More closely aligned to a 'user pays' system • Evasion is difficult	• Although heavier vehicles consume more fuel than lighter vehicles, the increase in fuel use is not proportional to the higher wear imposed on roads by heavy vehicles within the same vehicle class • The flat fuel-based charge required will exceed the capped fuel excise net of the carbon tax and alternative revenue collection arrangements will need to be legislated.
Distance-based charge	• Charge can be varied by vehicle type to reflect the road damage of different vehicle configurations • Could be simply administered through annual odometer / hubometer inspections	• No real improvements from fuel and registration based charges because fuel use is already a proxy for distance travelled but the distance-based charge loses some of the approximation of mass carried • Assumptions must still be made about the mass of the vehicle which is then applied across all vehicles of the same vehicle type – this leads to the same problem of cross-subsidisation within vehicle classes • Charge still averages whole-of-network costs rather than the damage on a particular road • Enforcement and compliance costs could be high
Distance, location-based charge	• Charge can be varied by vehicle type – allowing charges to reflect the cost of road use on various pavement depths • Data on heavy vehicle demand for each route • Incentive for freight operators to make more socially efficient decisions about mode choice and route choice	• Creates significant uncertainty for heavy vehicle operators about the total costs of their use on a journey through a number of locations where charges could be extremely variable • High upfront costs of installing technology and ongoing administrative, enforcement and compliance costs. Current technology does not provide the accuracy or coverage required for location-based charging. Alternative approaches such as operator declarations would have high compliance risks or enforcement costs

Charging model	Benefits	Shortcomings
Mass, distance-based charge	• Incentive for freight operators to make more socially efficient decisions about mode choice, mass carried and fleet choice	• High upfront costs of installing technology and ongoing administrative, enforcement and compliance costs. Current technology does not provide the accuracy or coverage required for mass and distance-based charging. Alternative approaches such as operator declarations would have high compliance risks or enforcement costs as found in the New Zealand experience with declared mass
Mass, distance, location-based charge	• Incentive for freight operators to make socially efficient decisions about route choice, mode choice, mass carried and fleet • Removal of cross-subsidisation between vehicles within the same vehicle class and across time • Significant volumes of data on heavy vehicle demand for each route to inform more efficient road supply decisions • Potential to accurately price externalities such as environmental pollution, noise pollution and congestion	• Tuning the charging mechanism to such a fine level detail may not necessarily change operator behaviour. In many cases, heavy vehicles only have one viable route and already use the most productive vehicle combinations to reduce their operating costs per unit of freight moved[86] • The marginal costs of road use are highly dependent on the quality of the legacy infrastructure. MDL charges in rural locations could be substantial and have significant unintended consequences • Creates significant complexity for heavy vehicle operators pricing a journey on a diverse range of roads from variability in charges • Potentially high upfront costs of installing technology and ongoing administrative, enforcement and compliance costs. Current technology does not provide the accuracy or coverage required for mass-distance-location charging. Alternative approaches such as operator declarations would have high compliance risks or enforcement costs • Short run marginal cost charging which leads to the most efficient use of roads is unlikely to recover the full capital costs of provision. Efficiently recovering full capital costs of provision through the use of Ramsey pricing* is complex and unlikely to be implemented

Source: Adapted from Australian Transport Council (2009), COAG Road Reform Plan (2011a), COAG Road Reform Plan (2011c), National Transport Commission (2009a), National Transport Commission (2010a), Productivity Commission (2006)

* Ramsey pricing requires that charges are composed of the marginal cost for each user group and a mark-up to cover fixed costs. The mark-up that minimises the loss to society is such that it is largest for the least responsive to price changes.

86 GHD (2011b)

Fuel-based charges cannot fully align with road wear costs. At higher axle loadings road and bridge wear increases more steeply than fuel use within a vehicle class. Similarly, different road and bridge types will have different costs of use for the same fuel usage (for example, a high pavement strength Tier 1 interstate highway versus a basic Tier 3 regional road).

PwC therefore believes there is merit in pursuing variable charging over the longer term once a strong business case for its use is made. PwC suggests charges be set according to a designated *mass* which can be carried per axle group at GML, *distance* travelled, and the *tier* of the road network. Ideally real-time mass would be measured; however, at this time, this appears cost-prohibitive. Consultation with suppliers suggests that initial installation costs can be around $9,000 to retro-fit a nine-axle B-double[87] with on-going management costs of around $1,000.[88]

Reported mass may also be an option where the costs of technology are high. However experience from New Zealand, where the road user charge was recently changed from an operator declared mass to a permanent vehicle mass, found that there was a significant amount of road user charge evasion under the system.[89] Hence PwC has suggested a charge based on the designated mass per axle group until more accurate measures of vehicle mass are viable. Designated axle masses should be informed by network tier averages collected from WIM stations and other sources.

Aside from the costs, feedback on the Intelligent Access Program during consultation suggests that there are also technological hurdles to real-time mass, distance and location measurement (eg inaccurate location data).[90]

Medium and long term recommendation 4

Continue with a fuel and registration based charge until a strong business case for variable charging emerges.

Over the short term, PwC recommends several actions to support the decision on, and ultimate feasibility of, variable charging.

Variable charging should only be implemented if the government can demonstrate that the detailed data obtained through variable charging can, and will, be used to improve road investment decision making such that the added cost, time and complexity is warranted.

The transition to variable charging will need to be carefully designed to minimise costs and complexity for industry and government.

One of the suggested initiatives is to better understand the efficient road use and road wear cost relationships. Initial work has focused on preliminary marginal cost estimates of pavement wear but work on bridge wear relationships has not yet been completed.[91] This can build on improved unit cost data reported by jurisdictions suggested in Short term recommendation 2.

PwC's proposed approach to variable charging would require operators to report on their vehicle configurations and distance travelled by road tier. The method of reporting is an area that a future RIS would need to consider in detail.

There are two broad approaches to reporting – self-reporting by the operator or real time data collection through in-vehicle telematics.

Self-reporting is currently allowed by the ATO in calculating fuel tax credit claims. Various forms of substantiation of on- and off-network travel are accepted by the ATO, with compliance achieved through spot checks of operators.

For the more precise and expensive *in-vehicle telematics* option, there are ways in which costs can be minimised. For example, some of the information required for charging is already being collected as part of other emerging government data requirements such as work diaries and ABS freight data. Low cost approaches to data collection that harness existing business systems should also be explored. Further, experience from other countries such as Sweden and the United States suggests that any requirements should support the take up of technology (rather than mandating the use of a certain piece of technology).[92] The NTC's *National in-vehicle telematics strategy* also recognises these needs.[93]

87 ATA communication with suppliers of on-board diagnostic equipment

88 CRRP (2011a), p 35

89 Road User Charges Review Group (2009), p 59

90 The Intelligent Access Program provides improved HML access to the Australian road network. As a condition of participation, operators must install telematics technology which remotely transmits the time, location and mass of heavy vehicles for safety and compliance purposes.

91 National Transport Commission (2011b)

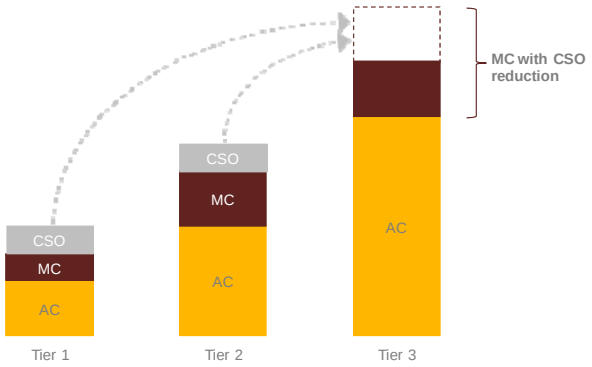
92 Gustafsson, I (2004), p vii

93 National Transport Commission (2011c)

The reporting system could allow both approaches. As far as the technology-based approach is concerned, the technology outputs required should be specified and aligned with other government data requirements. An 'open standards' approach to technology would help reduce the burden on operators and promote technological innovation by allowing operators to provide this output with their choice of technology. A precondition of this occurring is for industry and government to collaborate to ensure that the government charging requirements can be met by the emerging technology, and that industry takes account of government requirements when making its investment decisions.

The national road fund (when established) and other road governance organisations will need to determine an appropriate framework for variable charging. PwC recommends that variable charges be set to recover (forward-looking) investment and maintenance plans of the national road fund for both top tiers of the freight road network plus a contribution to cover costs of low-volume roads. A hypothetical variable charge for a given vehicle with a given mass across different road types is given in Figure 27.

Figure 27: Potential indicative variable charges for a given vehicle for a given vehicle combination



Note: AC = average costs (eg fixed costs), MC = short run marginal costs (eg road wear), CSO = *CSO contribution*

One aspect of the proposed variable charging is that there is no *necessary* nexus between charges and investment / maintenance decisions. Even with a national road fund, we do not suggest that revenue raised on a particular section must only be spent on that road – that is, the money would not necessarily follow the truck. Investment and maintenance decisions are different from charging regimes and variable charging will not automatically make location-specific investment and maintenance decisions.

A national fund provides a better institutional arrangement to improve decision making and distance and location data will inform decision making.


FLOODWAY

5 Conclusion

5.1 The way forward

The long term vision proposed in this report is an integrated road supply and charging system whereby a national heavy vehicle road fund is the single point for demand-driven road supply decisions and heavy vehicle charges are aligned with use (Figure 28).

We recognise that this considerably departs from the status quo and may present significant practical, technical and political challenges in implementation. Our short and medium term recommendations provide small step changes to bridge the gap between the current paradigm and the proposed future state (Figure 28).

Within three years, our recommendations are intended to result in road supply arrangements being more nationally cohesive and transparent, and align road supply decisions with road user's needs.

- **On the supply side**, a defined three-tier freight network and aspirational access levels for each tier will guide road investment, maintenance and access decisions by existing road owners on the supply side. Road owners will be incentivised to meet the aspirational levels of access at efficient costs as they will be required to publicly report this data.
- **On the charging side**, road user charges will continue to be collected by the Australian Government and the states under the current fuel and registration based model with improvements to the underlying data inputs.

Over the medium to long term, elements of the short term model can be extended further if the benefits of these reforms are considered to exceed their implementation and operating costs.

Within six years, our recommendations are intended to result in road supply and road charging being more integrated, with greater feedback between granting of access, funding, efficient costs of investment and maintenance, and charging.

- **On the supply side**, a transparent funding formula based on use, the length of the network and levels of access on Tier 1 and Tier 2 will be established to allocate road-related revenue collected through the fuel and registration based charge. Tier 3 roads should continue to be provided largely as CSOs funded through a combination of local government rates, national general revenue grants and a small explicit cross-subsidy from users of Tier 1 and Tier 2 roads. Freight movement data and NHVR's local access applications database will help to review candidate roads for movement up or down the tiers.
- **On the charging side**, as access levels at each tier of the network are increasingly met and the efficient costs of investment and maintenance to meet levels of access is better understood from road owners' reporting, the fuel and registration charge cost base (ie road owners' expenditures that could be recovered from heavy vehicle operators) could be adjusted to reflect the 'efficient' costs of road investment and maintenance. While adjustments may need to be made for differences in factor costs such as labour, ultimately expenditure too far in excess of benchmarked rates should not be charged to road users.
- Establishing a nexus between road supply and charging will generate a more conducive environment for private sector involvement in the provision of road investment and maintenance. Greater contestability between private and road owner provision will help drive cost efficiencies, innovation and customer-focused service provision.

In making these recommendations, PwC has been particularly mindful of the fact that more targeted heavy vehicle investment, more direct heavy vehicle charging and a greater link between road supply and road funding should not come at the expense creating unwarranted complexity for industry, neglecting CSOs or data collection and administration costs for governments.

Furthermore, a number of threshold issues will still need to be resolved before a decision about the long term option is made, such as:

- The framework for integrating heavy vehicle road investment and planning decisions with the light vehicle supply network
- The feasibility of a national body given the scale, geographical spread and variety of Australia's roads, as well as the political challenges it would present
- If and how real-time road use data will be used to ensure that the cost, time and added complexity required to implement variable charges is warranted.

The potential long term picture could look like a national road fund which makes three to five year forward-looking investment and maintenance decisions across the Tier 1 and Tier 2 freight road network – regulated by a third party – and contributions to the funding of Tier 3 roads. The national road fund's forward-looking plans would translate into variable charges differentiated by the combination's designated *mass*, *distance* travelled and the *tier* of the road

network (*location*). Variable charging data could be collected from open standard in-vehicle technology which aligns with other emerging private and government data requirements. This data could also be used to review the three-tier network to ensure that investment is targeted at the roads that industry wants and is prepared to pay for.

These recommendations will help to set up an environment in which current road ownership can be retained and which, combined with variable road user charges that are returned to the road owners, enable efficient and transparent road infrastructure maintenance and investment.

5.2 Concluding remarks

Road supply and charging is currently high on the reform agenda. This focus is long overdue as Australia faces a range of related challenges: slowing productivity gains in the road freight sector, increasing cross border freight movements and a rapidly growing freight task.

This report has proposed a number of short, medium and long term recommendations to address these challenges in a nationally cohesive and practical way over the coming years. These reform proposals provide a step change for road supply institutions in Australia. If significant progress is not made in the short term to improve the transparency, accountability and cost reflectivity of the road supply and charging arrangements in Australia, an integrated road fund and variable charging will be required in the longer term.

While the pathway to road reform is challenging, the dividends extend beyond the freight industry and reach every individual, business and community – by lowering the cost of living, the cost of doing business and the impact on the environment.

In recent years, various levels of government and industry have demonstrated a willingness to pursue meaningful road reform through the work undertaken as part of CRRP and HVCI. With greater collaboration and a practical approach, beneficial reforms can be achieved – putting Australia back on the road to tackle the challenges of the decades ahead.

Figure 28: Recommended road supply and charging model

		Short term (ST) (0-3 years)	Medium term (MT) (3-6 years)	Potential long term (LT) (7+ years)
Supply	Network	• Define initial 3-tier network and agree aspirational access levels for each tier **(ST Recommendation 1)** • Road owners to report investment and maintenance on each tier of the network **(ST Recommendation 2)**	• Update 3-tier network periodically • Access levels are increasingly met	• Update 3-tier network periodically • Original access levels are met • Access levels evolve with technology and freight task requirements
	Investment & maintenance decisions	• Road owners / road agencies make decisions based on industry consultation, cost and network hierarchy		• National road fund for state roads • Local government retains control of local roads **(MT/LT Recommendation 2)**
	Access	• Guided by 3-tier network, but ultimately determined by road owners • Industry makes applications to NHVR who collates and pursues (with road owners) potential ad hoc improvements (local roads) or movement of roads up tiers (state roads)		• National road fund direction for state roads **(MT/LT Recommendation 2)**
	Funding	• Commonwealth collects road user charge and states collect registration charges • Funds directed to road owners based on road costs, heavy vehicle usage and access upgrades **(ST Recommendation 3)**	• Commonwealth collects road user charge and states collect registration charges • Funds more explicitly linked to independent assessments of efficient road investment and maintenance costs **(MT/LT Recommendation 1)**	• Central collection of MDL charge • National road fund **(MT/LT Recommendation 2)**
	Investment & maintenance provision	• Mix of private and road owner provision	• Full contestability between private and road owner provision	
Charging	Charging mechanism	• Registration (relatively large) • Fuel charge (single rate)	• Registration (small) • Fuel charge (single rate or tiered by vehicle class) **(MT/LT Recommendation 3)**	• Variable charging (potentially mass-capability, distance, network tier) **(MT/LT Recommendation 4)**
	Charging principles	• Some averaging of charges across vehicle classes • Some sensitivity through higher fuel charges with heavier loads • Cross subsidies across road types		• Reduce cross subsidies across vehicle classes and across tiers • Some explicit cross subsidisation of low volume roads (and potentially low mass carriers)
	Cost base	• Backward-looking actual expenditure	• Backward-looking 'efficient' expenditure (i.e. in line with efficient cost benchmarks) **(MT/LT Recommendation 1)**	• Forward-looking (proposed) expenditure within each tier • Dollar matched grants to local govt
	Charge setting	• NTC determinations (implemented by state governments)		• Economic regulator (cost recovery within tiers)
	Charging & cost oversight	• Improved PAYGO **(ST Recommendation 4)** • Third party review of PAYGO formulas and inputs **(ST Recommendation 4)**	• Reject costs too far in excess of benchmarked rates **(MT/LT Recommendation 1)**	• Economic regulator approves / rejects proposed expenditure plans

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Consultations undertaken as part of this review

PwC spoke to road freight operators and industry experts to understand real road freight industry challenges and develop case studies for the purpose of preparing this report, including:

- Bob McMillan Haulage

  Owner-driver based in Cardwell and operating a prime mover with a refrigerated trailer carrying general freight and produce from northern Queensland to Melbourne and Adelaide.

- Bureau of Infrastructure, Transport and Regional Economics – Infrastructure and Transport Research
- Department of Infrastructure and Transport – Heavy Vehicle Productivity and Pricing
- Fraser's Livestock Transport

  Based in Warwick, Queensland, Fraser's Livestock Transport fleet of over 5o prime movers travels over 7 million km on highways, rural roads, and rural properties annually. Frasers operate single, B-Double, B-Triple and type I and II road trains.

- Gilberts Transport Services

  Gilberts Transport Services have been operating dry and refrigerated road trains between Adelaide and Darwin for close to 30 years. Gilberts operate a fleet of approximately 30 heavy vehicles.

- New Zealand Transport Agency – Freight, Strategy and Performance
- Shaw's Darwin Transport

  Shaw's are a Sydney based carrier who operate double and triple road trains to Darwin and Perth, with associated feeder routes to Dubbo and other points where road trains are assembled

- South Australian Road Transport Association

Thank you for sharing your knowledge with PwC and contributing to our report.

Appendix A – Literature Review

Summary	Charging					Supply			
	Charging model	Cost allocation	Road wear	User response / benefits	Charging technology	Funding	Delivery model	Access	Alternative Models
Productivity Commission (2006), *Road and rail freight infrastructure pricing*, Productivity Commission Inquiry Report no.41, 22 December 2006 The Productivity Commission Inquiry (the Inquiry) was initiated to assist the Council of Australian Governments to implement efficient road and rail freight infrastructure pricing through consistent and competitively neutral pricing regimes. Some of the key findings included: • *Are heavy trucks paying their way?* The Inquiry found that as a group, heavy vehicles were paying more than the network-wide costs attributed to them. There was some variation by vehicle class, with semi-trailers and rigid trucks covering more than their attributable network costs and B-doubles covering less of their attributable network costs. Cross subsidisation across vehicle types (eg B-doubles and rigids) has been addressed in the NTC's Third Heavy Vehicle Charges Determination in 2007. • *Is rail freight paying its way?* The Inquiry found that charges for many rail services were below long-run cost and that this amounted to implicit subsidisation if government owners continued to tolerate low rates of return in the long run. Furthermore, there have been significant government contributions to rail infrastructure that help keep lines open that otherwise would not have been commercially viable. • *What are the implications for competitive neutrality?* The Inquiry found that it was difficult to assess the relative price distortions as many regional rail networks were subsidised while cost recovery for different roads could not be accurately measured. However the Inquiry emphasised that collecting such data would not be particularly fruitful and competitive neutrality could be addressed instead by progressing road pricing reform. • *There are good reasons for reforming road pricing.* The Inquiry found that current charging arrangements had some shortcomings: averaging charges under PAYGO does not convey pricing signals to road users about the costs of using particular roads or to infrastructure providers about demand, the disconnect between road charges and road investment can lead to inefficient decisions, and government provision of road infrastructure is unlikely to be efficient. The Inquiry suggested that a way forward for road reform would look like road user pricing differentiated by location and a more commercial model for the supply of road infrastructure. The Inquiry identified a	✓	✓	✓	✓	✓	✓	✓		✓

Summary	Charging					Supply			
	Charging model	Cost allocation	Road wear	User response / benefits	Charging technology	Funding	Delivery model	Access	Alternative Models
number of policy actions that could be implemented to build a base for change including: • improvements to PAYGO such as a new determination method (some minor changes have been made in the NTC's Third Heavy Vehicle Charges Determination in 2007); • increased transparency of Community Service Obligations to exclude these costs from being recovered through heavy vehicle charges; • improved regulation of heavy vehicles such as replacing prescriptive regulations with a performance-based approach to encourage innovation; and • better investment decision-making processes. The next step in this process is road pricing reform. The Inquiry's view was that location-based charges made more sense than mass-distance-location based charges given the significant costs and complexity of implementation.									
CRRP (NTC) (2010), *Heavy Vehicle Pricing Options: Development and Assessment Framework Discussion Paper* This discussion paper set the analytical framework for CRRP's investigations into pricing options released for public consultation. The Discussion Paper looked at: • estimating marginal road costs; • approaches to heavy vehicle charging (including overseas approaches); • the methodology for how heavy vehicle charging will be developed; and • economic framework for comparing options. The discussion paper set out five pricing (charging) options for consideration: • Option 1: Fuel-based pricing: charge is based on fuel used which is a proxy for distance travelled and the mass carried • Option 2: Kilometre-based distance pricing: charge is based on actual distance travelled • Option 3: Distance-location-based pricing: charge is based on distance travelled in different locations • Option 4: Mass-distance-based pricing: charge is based on distance travelled taking into account vehicle mass • Option 5: Mass-distance-location-based pricing: charge is based on distance travelled in different locations taking into account vehicle mass	✓	✓	✓	✓		✓			✓

Summary	Charging					Supply			
	Charging model	Cost allocation	Road wear	User response / benefits	Charging technology	Funding	Delivery model	Access	Alternative Models
A number of submissions were received during the public consultation process from industry including the ATA and the Australian Logistics Council (ALC). **Australian Trucking Association (2010), *Submission: CRRP Heavy Vehicle Pricing Options Paper*** The ATA agreed with what CRRP is setting out to do in principle. However, the ATA was concerned that the following issues had not been addressed in the paper: • the need to quantify the inefficiencies of the current system before embarking on alternative charging options; • the need for funding and infrastructure supply reform to enable benefits of road charging reform to be realised; and • the uncertainty around the accuracy of mass-distance-location data given the large number of variables which are changing throughout the course of a trip. Overall, the ATA supported the fuel-based charging option as fuel consumption is influenced by vehicle type, mass and road type. While fuel consumption may be seen as a blunt proxy for actual mass, distance and location travelled, its merits are that the charge adjusts automatically based on these variables, is simple and has low compliance and administration costs. **Australian Logistics Council (2010), *Submission: CRRP Heavy Vehicle Pricing Options Paper*** The ALC's submission raised a number of important issues to be addressed including: • the need to examine whether the ARRB model best reflects the marginal cost of road wear; • the demand elasticity study must be sufficiently robust to allow governments to make an informed decision; and • the need to consider practicality of charging models by clearly identifying compliance costs imposed on industry by the preferred charging model, proper costing of technology roll-out costs and assuring that technology adequately supports the charging model.									

Summary	Charging					Supply			
	Charging model	Cost allocation	Road wear	User response / benefits	Charging technology	Funding	Delivery model	Access	Alternative Models
CRRP (NTC, GHD) (2011), *National Road Freight Study - Road Freight Demand Elasticities* The study assessed a variety of alternative heavy vehicle pricing models in terms of road users' stated responses to each: changing routes, changing vehicles and changing modes. The study found statistically significant evidence that freight operators would respond to price differentials by making such changes, though often there are limited alternatives (eg no alternative local roads). The study also surveyed operator opinions on different charging models. Fuel-based charges were most popular with industry as it performed best on key indicators: simplicity, compliance costs, cost pass-through, and ability to change behaviour.	✓	✓		✓					
CRRP (GHD, Meyrick) (2008), *Alternative Approaches to Estimating the Road Cost Base* This report from 2008 examined four approaches to estimating the 'cost base' that is to be recovered from road users: • the current 'actual expenditure'; • discounted future cashflows; • building blocks, where capital and operating costs treated separately; and • benchmark costing. The report recommended an improved version of the current approach be adopted, ie moving to a partly forward-looking estimate of expenditure, disaggregating expenditure in more detail, and periodic expenditure efficiency reviews.						✓			
CRRP (GHD) (2011), *Review of Incremental Pricing Trials* This report reviewed the experience of jurisdictions in operating higher mass limit trials (eg Intelligent Access Program) to draw any lessons for broader application of targeted charging. The main lessons included: • there are large productivity possibilities for operators with higher access limits; • trial administration costs were high and still were not coordinated with broader charging / pricing approach; and • charging trials were successful where their basis was transparent to operators.	✓				✓			✓	

Summary	Charging					Supply			
	Charging model	Cost allocation	Road wear	User response / benefits	Charging technology	Funding	Delivery model	Access	Alternative Models
CRRP (ACIL Tasman) (2011), *Assessment of fuel charging options* This report assessed the strengths and weaknesses of implementing a fuel based charging scheme for heavy vehicles. A flat fuel charge per litre for all heavy vehicles and a two-tiered fuel charge per litre differentiated by vehicle type were assessed against three reform principles: efficiency, implementation issues and the ability to support future reforms. Fuel based charges were found to: • not deliver efficient price signals regarding road wear (road choice, vehicle choice, etc.); • have low compliance costs compared to other charging options, in particular for a flat fuel charge; and • not deliver location data considered necessary for improving road supply decisions.	✓	✓	✓	✓					
CRRP (2011), *Community Service Obligations Working Paper* This report considered the application of community service obligations (CSOs) in road supply. The report found that top down approaches (removing CSO expenses from the cost base) are difficult to implement, and that bottom up approaches (recovering marginal cost of road wear) may not be acceptable on low-standard roads. Where feasible the CSO component of a road should be estimated separately and recovered outside any marginal cost recovery process. The report also found that using location as a charging parameter is a concern for two reasons: • costs to use certain road network segments would increase overall costs for some users relative to the costs that they currently incur. This could flow on into price of goods and hence the cost of living for parts of the community such that overt subsidies and other transitional arrangements may need to be considered; and • linking revenue to roads through heavy vehicle charges means that low volume roads may not receive sufficient expenditure required to maintain their current services levels. The paper found that the impact on low use roads could be limited if the overall level of funding to roads is maintained through CSOs.		✓							
CRRP (2011), *Evaluation of Options* This report assessed all of the pricing and supply options to establish which, if any, options are likely to be economically worth implementing. A high-level cost-benefit framework was applied, using various streams of work as input to the estimation of benefits and costs. Results did not support the implementation of mass-distance-location pricing, though left open the possibility of commencing reforms for larger vehicle classes.	✓	✓	✓	✓	✓	✓	✓	✓	✓

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CRRP (2011), *Business Systems to Support Heavy Vehicle Charging* This report consolidated CRRP research on business systems required to support the implementation of heavy vehicle charges. The report acknowledged that the current approach to recovering road user charges as an embedded component of the fuel tax credit scheme is administratively efficient. However the report found there are limitations in the availability of data to support charging. The report considered in vehicle telematics as the most appropriate way to collect road use data for marginal cost charging purposes. However, a range of interoperability and other implementation issues were identified and these require focussed attention should in-vehicle telematics be used for data collection.					✓				
CRRP (2011), *Funding and Expenditure Analysis* This report examined the supply side of the CRRP agenda. It first considered if a lack of certainty of funding acted as a constraint on optimal lifecycle expenditure on roads. Several alternative road funding and delivery models were considered to address perceived shortcomings of the current departmental model, including a public utility model and a dedicated road fund. Productivity benefits from allowing higher mass limits were also considered. Conclusions were conservatively drawn from a limited number of jurisdictional case studies, including that a 5 per cent productivity gain was possible from expenditure with more funding certainty, and that 4 per cent per net tkm savings were possible with greater mass limit access.						✓	✓	✓	✓
CRRP (2012), *Feasibility Study – Final Report to COAG* This paper was the final report of the CRRP Project to the COAG. The study anticipated that introduction of more direct heavy vehicle charging would yield significant economic benefits to the industry, government and the community. However, the principal conclusion of the study was that more direct charging alone would yield negative net benefits due to the significant costs of technology and industry adoption. The study found that benefits of more direct charging could only be realised if it was integrated with funding and expenditure reforms.	✓	✓	✓	✓	✓	✓	✓	✓	✓
Infrastructure Australia (2011), *National Land Freight Strategy, Discussion Paper* This discussion paper set out Infrastructure Australia's preliminary views about a national land freight network strategy and an indicative list of projects and programs for potential inclusion in a long term national land freight network plan. From a road freight perspective, more seamless HPV access to a national road network and intermodal terminal capacity are important themes. The paper identifies a potential freight network that investment should	✓							✓	

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be directed towards in terms of upgrading capabilities and harmonising regulations / charging. It is unclear how the freight strategy will assist in a) getting road upgrades onto the Infrastructure Australia priority list as the Infrastructure Australia templates do not require proponents to align with national strategies per se, and b) gain Commonwealth funding once on the Infrastructure Australia list. **Infrastructure Australia (2011), *National Land Freight Strategy Update*** Infrastructure Australia received more than 70 formal submissions from industry, community, local and state governments in response to the *National Land Freight Strategy* discussion paper. This report updated the discussion paper and responded to key issues raised during the consultation process such as: • The need for improved and long-term planning • The need for consistency across the three levels of government • Modifications to the national land freight network identified in the discussion paper. After considering the matter in consultation, Infrastructure Australia recommended that government and industry formally agree to the *National Land Freight Strategy*; consider road governance reform within national competition policy themes; and work on mechanisms to achieve greater private sector involvement.									
Infrastructure Finance Working Group (2012), *Infrastructure finance and funding reform* This paper identified opportunities to increase the capacity for infrastructure investment, in particular through the facilitation of greater private sector involvement. Its final recommendations centred on three key themes of reforming funding, better investment planning and developing a more efficient market. *Reforming funding* includes: • targeted measures such as user charges to enhance price signals; • identifying and monetising suitable public assets; and • greater use of alternative funding models (eg co-funding but not through grant-based model). *Better investment planning* includes clearer, funded and national pipeline to drive a more efficient infrastructure market. *Developing a more efficient market* includes: • a flexible approach to allocation of risk and refinancing risks, along with diversification of sources of debt; and • Australian Government examination of taxation on financial institutions to reduce the impact on demand for long term						✓	✓		✓

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investments.									
Small, Evans and Winston (1989), *Road work: a new highway pricing and investment policy*, The Brookings Institution, Washington, DC Small et al investigated highway pricing and investment policies which could meet the policy goals of efficiency, equity and financial stability. Their policy design is based around two economic principles: • efficient pricing to manage demand for highways; and • efficient supply (ie investment) to minimise the total cost of providing highways. For example, they found that pavement designs were not optimal and pavement damage costs attributed to trucks could be significantly decreased if initial roads had a more durable design. As the two principles are closely related, they should be analysed as an integrated package. The authors' final policy recommendations include: • a set of road wear charges for heavy vehicles based on axle loads rather than total vehicle weight –axle-based charges are already possible through weigh in motion technology and electronic identification. This is to be combined with investment in pavement durability which will lower heavy vehicle charges in the long run; and • a set of congestion charges for all vehicles – congestion costs dwarf the costs of pavement wear and as such, there potential to moderate demand through charges specific to those times and places where congestion is the most severe. This is to be combined with investment in capacity; and • a plan to manage the transition to road charges and congestion pricing. While the policies are discussed in the context of the US Interstate Highway system, they could be applied in other road supply and charging frameworks. Furthermore, all of the above policy recommendations could be implemented with practical, tested procedures and current technologies.	✓	✓	✓	✓	✓	✓			
Heggie (1999), *Commercially managed road funds: managing roads like a business not like a bureaucracy* This paper describes a road funding model which brings road funding into a marketplace and manages it like a business. The funding is received from a fee-for-service basis which is different from the user-pays principle. The key principles of such a model are that: • only road user charges go into the road fund (ie no hypothecation); • the fund is managed by a board; • money is not diverted from other sectors; and						✓	✓		✓

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• funds are channelled to all roads. The trend for road funds around the world has been to move towards a more autonomous, arms length agency which focuses on road fund administration. Furthermore, road funds are increasingly established as a road public utility under legislation, giving them power to set their own tariffs.									
Bureau of Infrastructure, Transport and Regional Economics (2009), *Road and rail freight: competitors or complements?* Information sheet 34 This information sheet found that rail is in most cases not substitutable for road freight, largely due to: • freight transport service requirements (eg time, reliability, frequency); and • freight transport costs and service attributes (road is less expensive over short distances, faster, more reliable) Aggregate freight elasticity implies that road freight demand is relatively unresponsive to variations in road freight rates as well as rail freight rates (in the short run). The same is found for aggregate rail freight demand - hence supporting the view that road and rail are not sufficiently substitutable.				✓					
Australian Government (2009), *Australia's Future Tax System*, Report to the Treasurer, December 2009 The Australia's Future Tax System report indicates that as a principle, targeted road pricing should be imposed only where the benefits of improved resource allocation outweigh the additional admin and compliance costs. This trade off is changing as the cost of road pricing technology falls. In relation to heavy vehicle road wear, current fuel based road user charging over recovers costs from some heavy vehicles (those travelling fewer annual km, more lightly laden or less fuel efficient) and under recovery from others (those travelling further, more heavily laden, more fuel efficient). The report recommended that COAG accelerate the development of mass-distance-location pricing for heavy vehicles with revenue allocated to the owner of the affected road. However the report emphasises the need to balance the benefits with the costs of administration and compliance.	✓	✓	✓	✓		✓	✓	✓	✓
Juturna (2011), *Worth feeding: case studies of rural local road efficiency and reform of Australia's road pricing and investment systems*, prepared for the Australian Rural Roads Group, October 2011 This report challenges the assumption by governments and policy makers that rural local roads are provided at a loss and depend on government subsidies to survive. A detailed case study of four rural local						✓			

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roads reveals that two of these roads fully cover their long-term maintenance costs through road user fees associated with these stretches of roads with current traffic levels. The Australian Rural Roads Group is concerned that: • the Productivity Commission's Inquiry into *Road and rail freight infrastructure pricing* did not place sufficient importance on understanding the road asset itself; and • the COAG Road Reform Program also ignores the importance of accurate road asset reporting for efficient road supply and charging. Road supply and charging, such as the PAYGO system, is based around complex mathematical models without consideration of the actual road condition and maintenance needs. This report emphasised the need to better use this type of information which is readily available from local councils. The report also recommended that more visible reports on the condition of the road asset and maintenance costs can incentivise greater private sector investment in roads, hence reducing their reliance on public sector funding.									

Data

Source	Summary
Bureau of Infrastructure, Transport and Regional Economics (2008), *Freight rates in Australia 1964-65 to 2007-08*	Data on indexed trends in average interstate non-bulk freight rates from 1964-65 to 2007-08.
Bureau of Infrastructure, Transport and Regional Economics (2008), *Public road-related expenditure and revenue in Australia*	Data on amount of funding for road-related expenditure by federal, state, territory and local governments as well as non-public sector donations of road assets, motor vehicle taxes and charges.
Bureau of Infrastructure, Transport and Regional Economics (2010), *Road freight estimates and forecasts in Australia*	Time series estimates (1972 - 2007) and forecasts (2008 - 2030) of road freight in Australia including freight moving between states and territories, within the eight capital cities and within the states and territories.
Bureau of Infrastructure, Transport and Regional Economics (2011), *Truck productivity - sources, trends and future prospects*	Time series analysis of trends in road freight productivity growth, its major sources and future prospects. BITRE also modelled the impacts of increasing access for heavy vehicles (eg increasing mass limits or extending the Intelligent Access Program network) on average loads and heavy vehicle shares.
Bureau of Infrastructure, Transport and Regional Economics (2012), *Australian infrastructure statistics*, Yearbook 2012	Time series estimates relating to transport, energy, communications and water infrastructure. For transport infrastructure, data included gross value added, total road expenditure, total road length, freight task moved by different modes, number of vehicles and more.
Australian Bureau of Statistics (2011), ABS Cat. No. 9309.0 - *Motor vehicle census, Australia, 31 January 2012*	Statistics relating to vehicles which were registered at 31 January 2011 including total number of vehicles on register (absolute and per 1,000 population), gross vehicle mass, gross combination mass and average age.
Australian Bureau of Statistics (2012f), *Business Transport Activity, 2010-11*, ABS Cat. No. 9269.0	Statistics relating to the profile of income and expenditure of the transport industry including road, rail, water and warehousing.
Australian Bureau of Statistics (2010), ABS Cat. No. 9208.0 - *Survey of motor vehicle use, Australia, 12 months ended 31 October 2010*	Statistics relating to tkms travelled, origin-destination and commodities carried. The survey covered all vehicles that were registered with a motor vehicle authority for road use during the 12 months ended 31 October 2010. However the data excluded trailers and tractors.