Towards a fairer fuel tax policy

Australian Automobile Association submission to the

Fuel Taxation Inquiry Committee

October 2001

The AAA has prepared this submission with the assistance of the Centre for International Economics.

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Summary

This inquiry is about the structure of existing Commonwealth and State taxation of petroleum based fuels. This cannot be separated from a wider consideration of how road use should be charged and how a road network to the standards required by the Australian economy and community should be provided. These issues are closely linked by:

- a history of fuel excises and hypothecation for road spending dating back to the 1920s (see Treasury 2001); and
- a requirement in the inquiry to analyse the effects of fuel taxation on the efficient allocation of resources and environmental and other externalities associated with fuel use.

In terms of their effects on economic efficiency, equity, the environment and revenue raising, existing fuel taxation arrangements have many shortcomings. In particular they confuse revenue raising objectives with objectives of efficient resource allocation.

The current level of fuel taxation cannot be justified on revenue raising grounds

With the introduction of a broadly based GST, the government has accepted the proposition that the least distorting way to raise revenue is through a uniform tax on all goods and services. But under the current excise structure, tax rates on petrol are more than ten times tax rates on most other goods and services including some fuels such as LPG. This causes inefficiencies by distorting production and consumption choices.

Resource allocation inefficiencies abound

These occur when taxes distort relative prices and provide incentives for substitution.

- Fuels that are close substitutes in a particular use are taxed at different rates.
- Fuels used in different transport modes are taxed differently encouraging intermodal substitution.

- Rebates, subsidies and grant schemes, some of which vary between States, introduce other distortions providing further incentives for substitution.
- They also incur considerable administrative costs.
- With one-third of petrol and almost all diesel used as an input to business production, excises are a tax on production. They reduce the international competitiveness of those industries with intensive direct and indirect use of fuel.

Current arrangements fail to achieve an efficient use of roads

Roads are an essential and expensive part of community infrastructure — it is important that they be used efficiently. Efficient road use is achieved when motorists pay the full social cost of their road use — costs of road wear, environmental damage, congestion and vehicle crashes. With the exception of road tolls in limited areas and heavy vehicle road use charges, road users do not currently pay directly for their use of roads. A part of the fuel excise has historically been envisaged as acting as a surrogate for charging for road use and is specified as such in the Australian Land Transport Development Act (1988). But it is an inaccurate and inefficient means of road use charging as the amount of excise a user pays does not reflect the social costs imposed by that person's road use.

Excises are regressive and inequitable

They place a disproportionately high burden on low income households. And, to the extent they can be envisaged as being in part charges for road use they penalise regional motorists relative to urban motorists.

Charges for light vehicles are excessive

Currently, charges levied by the NRTC on heavy vehicles (including 20 cents per litre (cpl) fuel excise net of rebates paid by these vehicles) recover $1283 million of the $4570 million of annual expenditure on roads. A fuel charge of only 7 cpl on light vehicles (18 per cent of the current excise) would be needed to recover the remaining expenditure. This is considerably lower than the current tax of 38.1 cpl.

Heavy vehicles do not pay their costs

On a cost recovery basis (including costs for pollution, noise pollution, crashes and road use) heavy vehicles should pay an average of 42.9 cpl. This is well above the amounts heavy vehicles currently pay.

Excise exemptions highlight policy confusion and are costly to administer

The various schemes providing rebates and grants highlight the confusion over the role of excises to raise revenue and as a proxy charge for road use. They appear to reflect government concerns about taxes on business inputs, the need to offset perceived disadvantages of regional road users, some environmental subsidies and, in the case of diesel (but not petrol), that if the tax is a charge for road use it should not be levied on off-road use. They provide further incentives for substitution and incur considerable administrative costs to prevent fraudulent use of these schemes.

What level of fuel taxation is justified?

The appropriate tax on fuel for revenue raising is:

- 10 per cent GST on *all* fuels (no exemptions)
- no indexation (GST is an ad valorem tax)
- no on-road/off-road distinction.

Road users should also pay for the social cost of their road use

Road users impose four broad social costs — road wear, environmental harm, congestion and crashes. To achieve an efficient use of roads they should be charged for these costs according to the marginal cost their travel decision imposes.

- Charges on fuel should be used to cover these costs only if there are no other more direct and practical ways of charging for each component of social cost, or of reducing the social cost.

How road user charges should be set

An ideal road user charge would have two components — an access charge and a user charge.

- The access charge would cover the cost of vehicle registration to enable monitoring for security and other reasons.
- The user charge would have four components.
  - A road wear charge levied according to a proxy for the damage done — vehicle mass, axle load and distance travelled.
  - An environment charge levied according to engine type and fuel type.
  - A congestion charge collected directly according to road location, time of day and type of vehicle.
  - A charge to help fund the external cost of vehicle crashes.
- But such a system cannot yet be installed — the technology, institutional and regulatory arrangements for charging directly for road use are not yet in place. A practical system at this point in time will have to rely more heavily on charges on fuel use as an indirect way of charging for road use, though not for congestion.

The concept of marginal cost

To achieve efficient use of existing roads, users should be charged the full marginal social cost they impose when using the road. Marginal social cost measures the resource cost to society of the road user's decision to make the journey.

A practical system for the transition

While the ideal system cannot yet be implemented, it is clear that the current system is highly distorted compared with the ideal. Keeping the long term goal in mind, we can specify a transitional set of charges for a fuel based charging system.

These charges include components for air pollution, noise pollution, vehicle crashes and road use costs. These charges would be based on the marginal cost of these components and should be updated regularly to reflect changes in cost components. The system should not become entrenched, however, as it is designed to be transitional. Technological change in engines, fuels, vehicle and road safety as well as traffic management may substantially alter these externalities.

Under our proposed system, charges for light vehicles in both urban and rural areas would drop significantly. For heavy vehicles in urban areas, charges would rise substantially.

The proposed charges will:

- improve resource allocation.
- enhance international competitiveness.
- be more equitable for industry and consumers.
- go some way toward addressing externalities from road transport.
- mean reduced government revenue in first round, but expansion in tax base from more efficient resource allocation will claw some back.

Charges on road users and road supply decisions need to be linked

There are big payoffs to the economy from additional investment in roads. But expenditure on roads is falling behind what is needed to accommodate the demands of a steadily growing economy.

Fuel excises are unrelated to road funding. At the start of the 1980s Commonwealth funds for roads represented around 75 per cent of excise revenue. This share has now declined to 15 per cent. And the gap between State government revenues from charges on motorists and State expenditures on roads is also widening.

Revenues collected from road user charges and expenditures on roads need to be linked. With a link in place and charges set to recover the marginal social cost of road use, important signals on the need for and location of new roads, and the use of roads, will emerge.

Improving road funding arrangements

A new institutional framework is needed to coordinate charges on road users and their expenditure on roads. This institution should provide guidance on the appropriate level of road user charges — based on the charging principles set out in this report — and the best instruments for collecting them at any point in time. Because roads provide national economic benefits not all of which are captured by road users, there is a strong case for this institution to receive funds from consolidated revenue as well as road user charges — to ensure a socially and economic optimum supply of roads.

The will to reform

The inefficiencies in the current system are well known. They have been analysed and exposed in numerous official inquiries and gatherings of experts. Yet governments have shown little interest in reform. This is partly due to the divisions in responsibilities between Commonwealth and State governments. And no doubt the reluctance of treasuries to relinquish a source of revenue has played a part.

Creating political will to reform means demonstrating to the community that there are benefits from change. This report has demonstrated many of these. It also means setting out a clear pathway to achieve the needed change. As part of this, one option would be to start with a summit to put in place plans for removing fuel excises, installing road user charging systems and establishing an ongoing framework for funding and maintaining roads.

1 Background

This inquiry is examining the structure of Commonwealth and State taxation of petroleum products and the options for improving that structure. The government's desired outcome is for a fuel taxation regime which better meets government objectives for economic efficiency, equity, the environment and revenue. In particular, an improved regime should:

- provide for an efficient allocation of resources;
- enhance domestic competition and international competitiveness;
- give due recognition to the welfare of regional and remote communities;
- involve less costly and more effective arrangements;
- be more equitable for industry and consumers;
- address the externalities associated with transport;
- deliver better air quality and contribute to greenhouse objectives;
- not compromise the flexibility and sustainability of government revenue; and
- be administratively simple and efficient.

What this inquiry must achieve

At a budgeted cost of $4 million to the taxpayer the Fuel Taxation Inquiry represents yet another substantial investigation into Australia's fuel taxation arrangements. Indeed, there have been around 40 such inquiries over the past 20 years, each of which has imposed considerable cost on participants and the wider community.

A common feature of previous inquiries is their failure to bring about substantive reform. Yet reform is long overdue. The current system is unsustainable. Years of tinkering with fuel taxation arrangements, driven mainly by government revenue considerations but also justified from time to time as a means of charging for road use and offsetting perceived disadvantages of regional motorists and truckers, have resulted in a complex system riddled with anomalies, inefficiencies and inequities.

The analysis in this report highlights the shortcomings of current arrangements measured against the government's stated objectives for fuel taxation. We set out the dimensions of a revised fuel taxation regime which will improve allocative efficiency, enhance the international competitiveness of fuel using industries, reduce the inequities between urban and regional motorists, deliver better environmental outcomes and provide a sustainable basis for charging for road use and funding the provision of roads.

With a broadly based consumption tax now in place, the traditional argument of government that fuel taxation is a convenient and efficient means of raising revenue is significantly weakened. And continuing advancements in electronic technologies for charging for road use raise the prospect of being able to price the use of road infrastructure directly and efficiently as is now done for many other types of publicly provided infrastructure. This technology already exists and is being used in a number of cities around the world. The key issue now is how to introduce it in Australia and its cost. We argue that these developments should greatly facilitate the introduction of the fuel taxation system we propose. All that is lacking is the political will to act.

2 Shortcomings in the current system of fuel taxation

Current fuel taxation arrangements have serious shortcomings. In particular:

- they confuse revenue raising objectives with objectives of efficient resource allocation;
- they encourage resource allocation inefficiencies in the use of fuel and reduce the international competitiveness of industries intensive in their direct and indirect use of fuel;
- they fail to achieve an efficient use of roads;
- they are regressive and penalise regional relative to urban road users; and
- they are costly to administer.

As a result Australia's national income and community living standards are reduced.

Current arrangements

Commonwealth excise rates (before rebates and grants) on fuel used in road vehicles is shown in table 2.1. Since part of the excise is justified by the government as a charge for road use it is important to note also the direct charges levied by State and Territory governments on motorists as registration fees, stamp duties, licence fees and so on. Although not under reference in this inquiry some part of these fees is sometimes viewed as a charge on road use.

2.1 Commonwealth fuel excises As at 1 August 2001

Product	Commonwealth excise	Estimated revenue (2001-02)
	Cents per litre	Million dollars
Petrol		
Leaded	40.516	2[a]
Unleaded	38.143	7 025
Diesel	38.143	5 035
Aviation fuel		
Petrol	2.808	
Kerosene	2.845	58
Other fuels	38.143 or 40.516	70
Liquid Petroleum Gas	0	0
Ethanol	0	0
Total estimated revenue		**12 190**

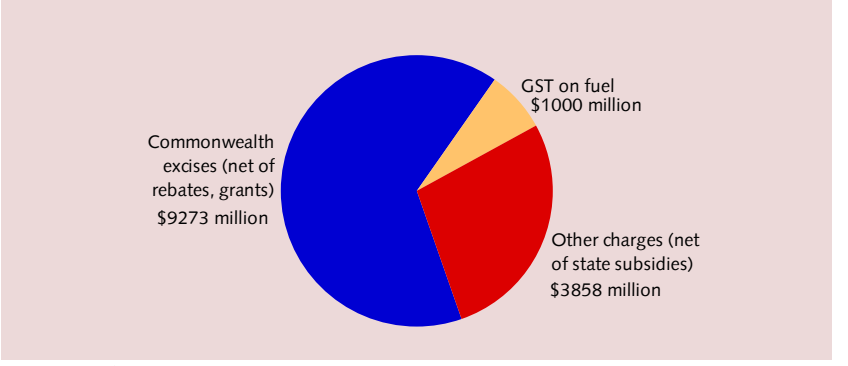
[a] Leaded petrol will be phased out nationally by January 2002.

Source: Treasury (2001), p. 22 and DOTRS (2001).

The latest complete collation of motor vehicle taxes and charges across all levels of government is for 1997-98. Chart 2.2 contains our estimates of these taxes and charges for 2001-02 based on our updates of the 1997-98 figures. These estimates exclude the aviation fuel component of the fuel excise and rebates and grants. They also exclude taxes on motor vehicle purchases and tariffs on motor vehicle imports. State fuel subsidies of $539.3 million for 2001-02 have also been deducted.

The total burden is around $14 billion.

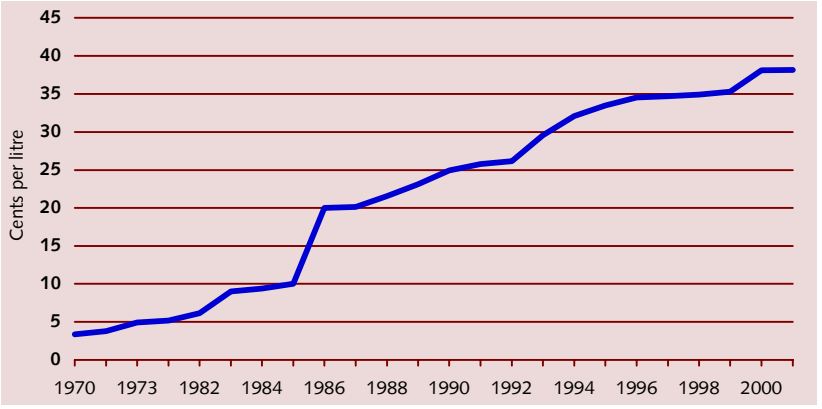
2.2 Estimates of taxes and charges on motor vehicle use $million 2001-02



Data source: CIE estimates.

Governments have progressively raised fuel excises to generate more and more revenue (chart 2.3).

2.3 Fuel excises keep on rising[a]



[a] Commonwealth excise on petrol (unleaded since August 1993). Excludes excise of 8.1 cpl collected by the Commonwealth on behalf of the States between August 1993 and July 2000 following the High Court ruling on business franchise fees.

Data source: Australian Automobile Association (AAA) database.

2.4 Implicit tax rates on unleaded petrol As at July 2001

Capital city	Fuel cost	Excise	Subsidies and grants[a]	GST	Pump price	Implicit tax rates (% of fuel cost)	
						Excise	All taxes
	cpl	cpl	cpl	cpl	cpl	%	%
Sydney	40.1	38.143	0.0	7.8	86.1	95	115
Melbourne	36.5	38.143	0.4	7.4	81.6	105	124
Brisbane	40.1	38.143	8.4	7.0	76.9	95	92
Adelaide	41.6	38.143	0.0	8.0	87.7	92	111
Perth	39.2	38.143	0.0	7.7	85.1	97	117
Hobart	49.3	38.143	2.9	8.5	93.0	77	89
Darwin	51.2	38.143	2.1	8.7	96.0	74	87
Canberra	42.6	38.143	0.0	8.1	88.8	90	109

[a] Comprises State subsidies and Commonwealth grants such as the Fuel Sales Grant for regional and rural Australia.

Source: Australian Automobile Association and CIE calculations.

With the advent of the GST, the Commonwealth fuel taxation component (fuel excise plus GST) now represents from 87 to 124 per cent of the fuel cost in the pump price of unleaded petrol in capital cities (table 2.4). Rates of tax as high as this stand out dramatically when compared with the 10 per cent GST on most goods and services. They are obviously affecting consumption and production decisions of fuel purchasers.

Use of revenue raised through fuel excises

Of the $12 190 million estimated to be raised through Commonwealth fuel excises in 2001-02, over 99.5 per cent — some $12 132 million — will be paid into consolidated revenue. The difference is accounted for by the excise collected on aviation fuel, estimated to be $58 million in 2001-02. This is hypothecated to the Civil Aviation Safety Authority and Airservices Australia for provision of aviation services such as traffic control, navigation and air safety regulation (Treasury 2001). Of the $12 132 million going to consolidated revenue, around 23.6 per cent is allocated to fuel rebates, subsidies and grants; 15.0 per cent is allocated to road construction and maintenance activities; and the remaining 61.4 per cent contributes to the funding of other government activities. (Note that these calculations do not include the subsidy to LPG use).

The *Australian Land Transport Development Act 1988* (ALTD Act) provides the legislative framework for the Commonwealth's development and management of a national road system. Provisions still legally exist under the ALTD Act for hypothecating a portion of fuel excises to road funding. The ALTD Act establishes a Special Account, and specifies that amounts equal to the 'road user charge' received by the Commonwealth are credited into that account. The road user charge is a portion of the excise levied on petrol and diesel. If the Minister for Transport and Regional Services does not make a determination as to what the road user charge is, a default rate of 4.95 cpl applies.

The Australian National Audit Office (ANAO) recently conducted a performance audit of Management of the National Highways Systems Program. The report (ANAO 2001) noted that the amount available for expenditure from the ALTD Account if the provisions of the Act had been followed would be $2.9 billion greater than that acknowledged by the

Department of Transport and Regional Services. That is, the government has been in contravention of the provisions of the Act by not making available the required amounts to the Special Account for potential expenditure on roads.

The Department has performance agreements with the States to ensure that the Commonwealth's road maintenance funding is effectively used to produce the required outcomes.

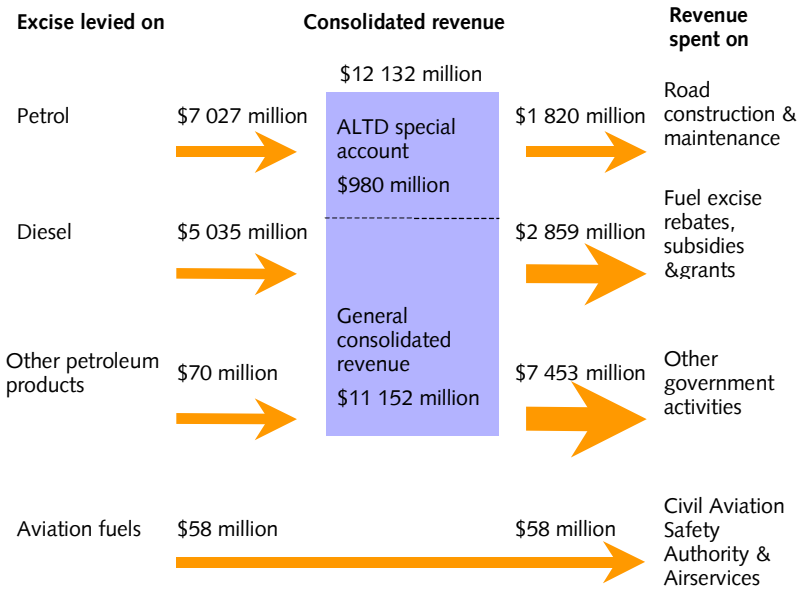
The ANAO could find no correlation between the performance indicators, the agreed road conditions to be achieved by the States and the annual funding allocation to be provided by the Commonwealth.

The government has recently made a retrospective determination of 3.1 cpl as the road user charge for 1999-2000 and further retrospective determinations for other years since 1994-95. If this determination is also made for 2001-02 we estimate that in 2001-02 around $980 million will be paid into the Special Account. Funds in the Special Account can be directed towards activities authorised under the ALTD Act, which include the National Highway, Roads of National Importance, local roads, Black Spots, mainline rail projects, urban public transport projects and other activities (Webb 2001). However, the government has chosen only to fund Roads of National Importance, the national highway and Black Spots from the fund. Importantly, the ALTD Act does not require the Commonwealth to spend monies available in the Special Account — the Commonwealth can spend more or less if it so chooses. In practice the amount of fuel excise hypothecated to roads is calculated retrospectively according to federal budget spending on roads which has effectively broken any link between excises and road expenditures.

Chart 2.5 shows how revenue raised through fuel excises is accounted for.

Since 1992, Federal Governments have specified road funding in the budget process (Treasury 2001). The House of Representatives Standing Committee on Communications, Transport and Microeconomic reform has recommended that the hypothecation provisions within the ALTD Act be removed to end the notion of a link between fuel excises and road funding (Webb 2001). The government has agreed with this in principle, but is yet to implement the recommendation.

2.5 Use of revenue raised through fuel excises

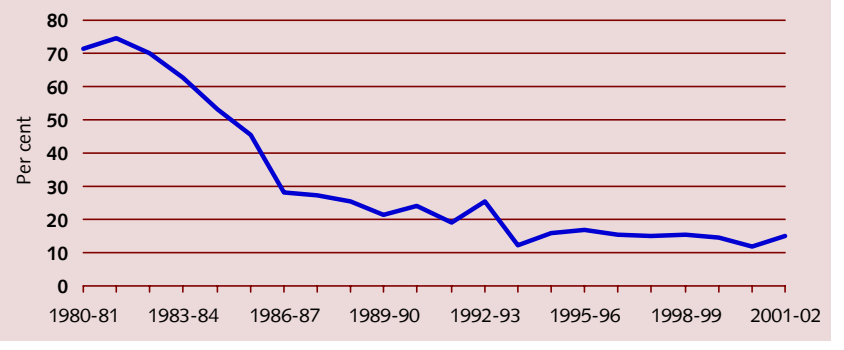


Data sources: Treasury (2001); DOTRS (2001); Webb (2001); and CIE calculations.

Fuel excises and road user charges are unrelated to expenditure on roads

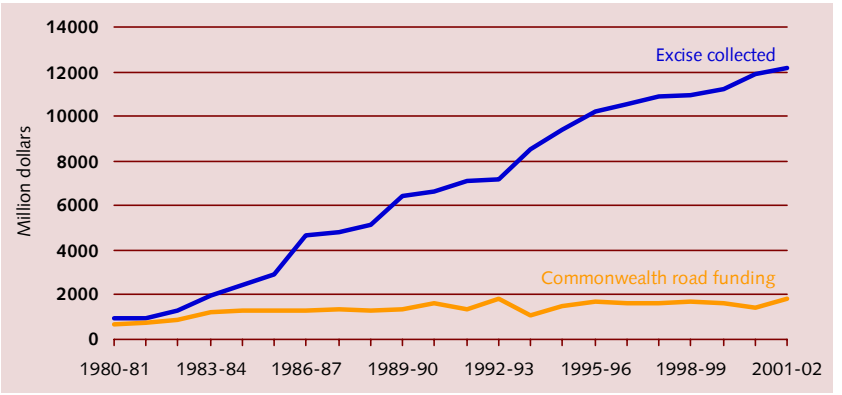
Charts 2.6 and 2.7 highlight the lack of a relationship between Commonwealth excise collections and Commonwealth road funding.

2.6 A declining share of excise revenue collected by the Commonwealth is spent on roads



Data source: AAA and CIE calculations.

2.7 Commonwealth excise collections are unrelated to Commonwealth road funding

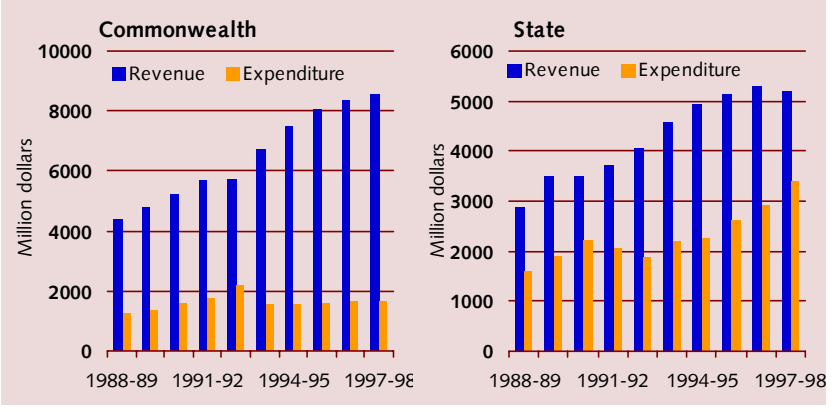


Data source: BTE (1999).

Chart 2.8 provides a broader picture by comparing both Commonwealth and State taxes and charges on motorists with Commonwealth and State expenditures on roads. The surplus of revenues from motorists over expenditure on roads has grown steadily over time for each level of government.

A further $2 billion was spent on roads by local government in 1997-98. The BTE has estimated that around 70 per cent of local government road expenditure is from council funds (mainly rates).

2.8 Comparison of Commonwealth and State revenues from motorists and expenditures on roads



Data source: BTE (1999).

Inefficiencies in fuel use

The confusion inherent in current arrangements between revenue, environmental and road use charging objectives results in numerous inefficiencies in fuel use.

Fuels that are close substitutes in a particular use are taxed at different rates. LPG and CNG, for example, are not taxed. The different tax treatments of LPG and petrol provide incentives for motorists to convert their engines to LPG. The rationale for LPG's preferential treatment is unclear. While combustion of LPG is 'cleaner' than that of petrol, it still releases pollutants. To the extent that a fuel excise is argued on revenue and road use charging grounds, current arrangements imply that LPG users have no obligation to contribute to consolidated revenue or pay for their use of roads. The zero excise on ethanol, considered by some to have considerable prospects as a blended fuel with petrol, is presumably to encourage the development of renewable fuels. If such encouragement is warranted, it should be done by direct subsidy rather than through distorting the fuel price to users. It is essential to have transparency in the use of subsidies.

Fuels used in different transport modes are taxed at different rates. Aviation fuels are taxed very lightly and diesel fuel used in rail transport is not taxed. This encourages intermodal substitution. The rationale appears to be concerned with the pricing of infrastructure use, particularly roads. But as argued in chapter 3, fuel excises are a poor instrument for charging for most categories of road use.

Rebates, subsidies and grant schemes provide further incentives for substitution and incur considerable administrative costs to prevent fraudulent use of these schemes.

The Diesel Fuel Rebate Scheme (DFRS) offsets excise on diesel used off-road. Its rationale appears to be related to the excise as a charge for road use (in the case of diesel but not petrol) and dates back to when the excise was hypothecated to fund road construction.

Off-road use of petrol receives no rebate, implying that for petrol users the excise is a revenue tax. The diesel and alternative fuel grants scheme (DAFGS) provides a grant of 18.5 cpl for on-road use of diesel and alternative fuels in vehicles over 20 tonnes gross vehicle mass. Eligibility for vehicles between 4.5 and 20 tonnes depends on where the journeys are undertaken and the type of transport service provided. This scheme appears to be designed to incorporate a road user charge (of about 20 cpl) for heavy vehicles and ensure that heavy vehicles do not contribute otherwise to

consolidated revenue through the fuel excise. To the extent that the 20 cpl of remaining excise does not price road use correctly, inefficiencies are introduced.

The Fuel Sales Grants Scheme (FSGS) which was introduced to maintain urban and rural price relativities after the introduction of the GST, provides rural road users with a rebate of 2 cpl and regional road users with a rebate of 1 cpl, reducing their effective excise to 36.1 cpl and 37.1 cpl respectively. In rural and regional areas the combined effects of the DAFGS rebate and FSGS rebate means that heavy vehicles using diesel (both over and under 20 tonnes) have a net excise rate of 17.6 cpl and 18.6 cpl respectively.

The fuel sales grants scheme and diesel and alternative fuel grants scheme are designed to reduce fuel costs in non-metropolitan and remote zones relative to metropolitan zones. These represent inefficient ways of addressing equity concerns.

Failure to achieve an efficient use of roads

As noted in chapter 3, efficient road use is achieved when motorists pay the full social cost of their road use. These include the private costs (vehicle running costs) and the external costs of road wear and tear, environmental damage, congestion and vehicle crashes. If external costs are not fully priced, allocative inefficiencies occur as too much road use is demanded by motorists.

With the exception of road tolls and heavy vehicle road use charges (set by the NRTC), road users do not pay directly for their use of roads. The BTCE noted the principal determinants of pavement damage (that is, road wear and tear) as being the axle loads of vehicles, the distance travelled by those vehicles and the quality of the road; with the pavement damage increasing dramatically with axle load (BTCE 1988).

It is estimated that in 1996, 22 billion kilometres were travelled on the National Highway System, of which cars accounted for 82 per cent and heavy vehicles 18 per cent (6 per cent rigid trucks and coaches, and 12 per cent articulated trucks). However, in contrast to distance travelled, heavy vehicles accounted for the vast majority of total pavement loading — 99.97 per cent (Austroads 2000). Cars are responsible for negligible road wear. The BTCE has estimated the pavement damage per car to be in the order of $1 per year (IC 1994). Efficient road user charges would reflect this.

The current arrangements also fail to charge for congestion costs and vehicle crashes. They make some attempt to incorporate environmental charges in that there is an additional 2.373 cpl excise applied to leaded petrol and the government has guaranteed to maintain the excise free status of LPG and

natural gas to encourage the use of less polluting fuels — though these exemptions in themselves involve distortions in resource use.

Charges for light vehicles are also excessive if full cost recovery of annual road expenditures is the goal

If the fuel excise were viewed solely as a charge to achieve full recovery of road expenditures by motorists, and the GST on fuel as the revenue component, then (ignoring registration fees) under current arrangements heavy vehicles are paying a road user charge of 20 cpl, while light vehicles are paying 38.1 cpl.

What level of fuel charges can be justified on a full cost recovery basis? The work of the NRTC on heavy vehicle charges provides some guidance on this. The NRTC methodology adopts a full cost recovery approach rather than the more appropriate economic efficiency objective of recovering the full marginal social costs of road use (see chapters 3 and 4). The NRTC methodology is based on allocation to vehicle classes of road expenditures to be recovered from road users (see MM Starrs Pty Ltd 2001). Costs to be recovered are construction and maintenance expenditure on arterial roads (which include national roads) and local roads. An average of three years of expenditure is used (the budget year and two previous years) to smooth out fluctuations. Cost attribution to vehicle class is based on estimates of how specific expenditures vary with road use of each class. Expenditures that cannot be allocated on this basis are allocated arbitrarily.

A charging regime has been determined for each vehicle class. The charge contains three components:

- an annual access charge;
- a mass-distance charge (collected as a fixed annual charge); and
- a road use charge which is expressed as a notional share of the fuel excise needed to achieve cost recovery after the access charge and mass-distance charge have been deducted. The notional component of fuel excise is 20 cpl. Achieving the right split between access and user charge is difficult and the end result is somewhat arbitrary — it needs to minimise inconsistencies between charges for vehicles just below and just above 4.5 tonnes gross vehicle mass, which is the threshold for heavy vehicle charges.

Of the $4570 million of average annual expenditures on roads to be recovered, heavy vehicle charges by the NRTC recover $1283 million (27 per cent) of these expenditures.

MM Starrs Pty Ltd 2001 has extended the NRTC's cost allocation method to examine the implications for light vehicle charges on the basis that to achieve full cost recovery, a further $3288 million of road expenditures need to be recovered. The results show that:

- assuming a 'notional' fuel charge component of the excise of 20 cpl, $3735 million would be covered from light vehicles — which is $447 million in excess of what is needed.

But existing registration fees on light vehicles (which raise about $1.6 billion from passenger vehicles) are not taken into account in this calculation. In the case of passenger motor vehicles, if existing registration fees were assumed to remain, then a fuel charge of only 7 cpl (compared with the current excise of 38 cpl) would be needed to achieve full cost recovery. While these calculations do not lead us to a first best efficient charging regime for road use, they clearly indicate that to the extent that fuel excises can be envisaged as including a charge for road use, passenger motor vehicle drivers are being charged far too much for their road use.

This sees passenger motor vehicles cross subsidising the road wear caused by heavier vehicles, which leads to inefficiencies and distortions in the economy. It may also give a competitive advantage to road freight. The current arrangements are also inequitable in the sense that those who do the most damage do not pay for it.

Fuel excises are regressive and inequitable

Fuel excises place a disproportionately high burden on low income households. This is because the price elasticity of demand for fuel used in cars is low. In a large country with sometimes limited public transport, private vehicles are an essential mode of transport for many citizens. This is reflected by Australia having, appropriately, one of the highest rates of vehicle ownership in the world — 505 registered passenger motor vehicles per thousand population.

Table 2.9 shows how the fuel excise paid varies by income quintile. Estimated excise payments as a share of household income for the lowest income quintile is over three times that of the highest income quintile. Clearly, the highly regressive nature of fuel excises is inequitable as households least able to afford higher taxes allocate a greater share of their income to those taxes. This runs counter to government objectives of vertical equity, as instanced by Australia's current system of progressive income taxation.

And to the extent that fuel excises can be envisaged as being in part charges for road use, they penalise regional motorists relative to urban motorists. This comes about because of the failure to charge for congestion and environmental damage most of which occurs in urban areas.

2.9 Fuel excises are regressive[a]

Income quintile	Average household income	Total expenditure on fuel	Excise	Excise as share of income
	Dollars	Dollars	Dollars	Per cent
Lowest 20 per cent	8 300	538	345	4.2
Second quintile	21 526	908	583	2.7
Third quintile	37 040	1 241	797	2.2
Fourth quintile	58 019	1 547	993	1.7
Highest 20 per cent	103 807	1 905	1 223	1.2
Average	45 719	1 227	788	1.7

[a] Figures refer to year 1998-99.

Source: ABS (2000) and CIE calculations.

Administrative costs of current arrangements are high

While administrative costs of collecting the excise are small relative to revenue collected, the various schemes providing rebates and grants are costly to administer and protect from fraudulent claims. They also impose significant record keeping costs on participants (box 2.10, box 2.11).

2.10 Administration of the Diesel Fuel Rebate Scheme (DFRS)

The DFRS was introduced in 1982 (a similar scheme had been in place since 1957). The Scheme was significantly amended with the introduction of *The New Tax System* on 1 July 2000. Under the amended Scheme businesses that used diesel or 'like fuels' off-road are to be provided with a 100 per cent rebate on the customs or excise duty paid on diesel or like fuels. Like fuels include light and heavy fuel oil and all fuels that attract the same rate of duty as diesel (excluding gasoline, coal, tar and coke oven distillates).

The objective of the DFRS is to provide businesses with cheaper production inputs (fuel) and to enhance competitiveness in key primary export industries. Rebates are restricted to fuel used by businesses engaged in certain activities, namely mining; agriculture; forestry; fishing; residential premises; hospitals, aged persons and nursing homes and other medical institutions; rail transport; and marine transport. Extending the DFRS to rail and marine transport was a feature of the July 2000 reforms.

The ATO is responsible for administering the DFRS. In 2000-01 over $1.9 billion was paid out under this scheme, with over 213 000 claims made. Rebates available under the DFRS total around $2 billion. in 2001-02 based on around 5200 million litres of diesel being subject to excise rebate (around 40 per cent of all diesel estimated to be sold in 2001-02).

Administering and implementing a rebate scheme of this scale is likely to impose large costs on the ATO. On questioning by the CIE on behalf of the AAA, the ATO would not divulge information on the administrative costs associated with the scheme, nor the number of staff involved. Treasury — which funds the ATO — were not able to provide an estimate of the cost of administering the DFRS.

The DFRS also imposes a large administration cost on the businesses wishing to access rebates. Compliance costs are high as claims are based on self-assessment. Claimants need to lodge application and registration forms, and must keep records for at least five years on:receipts for fuel purchases:

- type of fuel purchased, supplier's contact details, price (per litre); quantity delivered and location to which fuel was delivered;
- activities fuel used for;
- calculations underlying the quantity of fuel claimed for (for example, keeping records of equipment use and fuel consumption rates);
- whether fuel was stored before use (if so, how and where); and
- whether fuel was lost, sold or otherwise disposed of.

As the DFRS is open to abuse — for example, claiming rebates for fuel used on-road or in ineligible activities — the ATO Compliance Section undertakes audits of claimants. The ATO was unable to report how many audits are undertaken, or at what cost.

2.11 The Diesel and Alternative Fuels Grants Scheme

The Diesel and Alternative Fuels Grants Scheme (DAFGS) was introduced in July 2000 as part of *The New Tax System* changes. Under the Scheme a grant of around 18.5 cpl is provided to on-road diesel users. Users of alternative fuels such as ethanol (20.8 cpl), compressed natural gas (12.6 cents per m^3) and LPG (11.9 cpl) also benefit as the Scheme seeks to maintain previous price relativities with diesel. In the sense that the DAFGS targets on-road use of diesel and alternative fuels, it counterparts the Diesel Fuel Rebate Scheme which provides excise exemption for certain off-road diesel using activities (see box 2.10).

The objective of the DAFGS is to lower transport and production costs for businesses, especially those in regional or rural Australia. The grant is available to all business related on-road use of diesel and alternative fuels in vehicles that have a gross vehicle mass (GVM) of at least 4.5 tonnes and are registered for use on public roads. Vehicles that have a GVM of between 4.5 and 20 tonnes are not eligible for the DFAGS if trips are conducted solely within defined metropolitan areas. Areas defined as 'metropolitan areas' include Newcastle–Sydney–Wollongong, Melbourne–Geelong, Sunshine Coast–Brisbane–Gold Coast, Perth, Canberra, and Adelaide. However, journey restrictions do not apply to vehicles transporting passengers or goods solely on behalf of primary producers, buses using alternative fuels or emergency vehicles.

As with the Diesel Fuel Rebate Scheme, the ATO administers the DAFGS. Rebates available under the DAFGS in 2001-02 total $665 million. In 2000-01 $558 million was paid out under this scheme to over 77 000 claimants lodging 241 000 claims. The average claim was $2316.

Access to the DAFGS is based on self-assessment, with applicants assessing their own eligibility for the Scheme, registering and lodging claim forms, and keeping detailed records for a period of 5 years that substantiate their claim(s). Record keeping can be particularly burdensome for those claimants operating smaller vehicles (less than 20 tonnes) and who cross metropolitan boundaries. Records must be kept on:

- odometer readings to record distances travelled;
- accounting and activity records to show purpose of trip;
- vehicle features so that vehicle GVM can be verified;
- type of fuel purchased, supplier's contact details, price and quantity of fuel purchased, and date of fuel purchase;
- calculations underlying claim(s) and fuel reconciliation records;
- allocation of distance travelled between metropolitan and rural use.

It is hard to imagine a more messy or onerous (in terms of record keeping) scheme than this.

What do current arrangements cost the economy?

Current arrangements impose costs on the economy in two ways:

- through the economy raising too much of its revenue from fuel excises relative to other taxation instruments; and
- through inefficiencies in fuel use and road use because of excise induced distortions in the price of fuel and failure to charge for road use correctly.

To provide an indication of this inefficiency, we need to establish the extent of excessive charging measured against the charges to users that could reasonably be justified through a charge on fuel.

A road use fuel charge for full cost recovery

Analysis by Cox (presented in the annex to this report) presents some calculations on the fuel charge that would be appropriate for full cost recovery. Cox uses the NRTC cost recovery methodology for heavy vehicles to determine a road use fuel charge for light vehicles. Unlike the NRTC methodology, his methodology also determines the external costs from road transport of air pollution, noise pollution and road crashes and adds these costs to both heavy and light vehicle fuel charges. Costs are also divided into capital city and regional. Congestion charges are excluded on the grounds that congestion should be charged for directly rather than through a fuel charge.

Results are shown in table 2.12.

The results show that, on a full cost recovery basis and with all external costs (other than congestion costs) included, the light vehicle fuel charges that could be justified are considerably below the present excise. While light vehicles are overcharged, heavy vehicles are considerably undercharged in capital cities.

The point of these calculations is to illustrate that to the extent that fuel excises can be envisaged as including a charge for recovery of road expenditures and other externalities, passenger motor vehicle drivers should be charged around 26 cpl, considerably less than the current excise.

It is important to note, however, that full cost recovery will not generate the first best economically efficient charging regime for roads. As argued further in chapter 3, the efficient use of roads is achieved when road users pay the full *marginal* social cost of their road use.

2.12 Fuel charges needed to achieve full cost recovery of road expenditures and externalities of road use

	Units	Light vehicles			Heavy vehicles			All vehicles		
		Capital city	Regional	Total	Capital city	Regional	Total	Capital city	Regional	Total
Costs (1999-2000)	$ million									
Air pollution		663	0	663	421	0	421	1 084	0	1 084
Noise		148	37	184	246	81	326	393	117	511
Crash		1 447	1 232	2 679	118	287	405	1 565	1 520	3 085
Road expenditures (less registration)		592	655	1 247	314	705	1 020	907	1 360	2 266
Total		*2 850*	*1 924*	*4 774*	*1 099*	*1 073*	*2 172*	*3 949*	*2 997*	*6 946*
Fuel consumption	million litres	11 613	7 859	19 472	2 053	3 008	5 061	13 666	10 867	24 533
Fuel charge	cpl									
Air pollution		5.7	0.0	3.4	20.5	0.0	8.3	7.9	0.0	4.4
Noise		1.3	0.5	0.9	12.0	2.7	6.4	2.9	1.1	2.1
Crash		12.5	15.7	13.8	5.8	9.5	8.0	11.5	14.0	12.6
Road expenditures (less registration)		5.1	8.3	6.4	15.3	23.4	20.1	6.6	12.5	9.2
Total		*24.5*	*24.5*	*24.5*	*53.5*	*35.7*	*42.9*	*38.9*	*27.6*	*28.3*

Source: Cox (see annex).

3 What would an ideal fuel taxation system look like?

A tax on fuel has two important consequences.

- It raises government revenue, which in turn is used to support public expenditure.
- It changes the price of fuel to users, which in turn influences their behaviour and hence resource allocation in the economy.

Most fuel is used in transport. Fuel taxes are seen as a way of both raising revenue and charging for the use of transport infrastructure. And fuel is widely used as an input to production as well as being consumed by households. Fuel taxes therefore affect the costs and, hence, international competitiveness of industries throughout the economy and the spending decisions of households.

- Fuel taxation and road user charging are separate concepts.
- They need to be treated as such.

An ideal fuel tax system would separate its revenue raising role from its role in infrastructure charging. It would also avoid the taxation of inputs to production. In addition it would be administratively simple, transparent to all users and have wide community support such that it would not be subject to abuse and evasion. The current fuel excise falls well short of these requirements.

The community supports the need of governments to raise revenue so that services such as education, health and defence can be provided and welfare payments made. There is also increasing appreciation of the concepts of user pays and polluter pays in the case of transport infrastructure and the need to achieve an efficient allocation of the nation's resources to deliver high living standards. The issue is one of how best to achieve these outcomes. Are fuel taxes an efficient way of achieving so many objectives?

The justification for fuel taxes to raise revenue

Good taxation instruments are those which minimise the incentives for substitution to avoid the tax (and hence minimise allocative inefficiencies), involve low collection costs on the part of government and taxpayer, and whose workings are easy to comprehend.

Fuels are currently subject to a Commonwealth excise (with a customs duty on similar imported products) and a 10 per cent GST. There is also a 'tax on tax' in that the excise incurs GST. The excise and customs duty is estimated to raise around $12.2 billion in 2001-02. This represents 7.5 per cent of total Commonwealth taxation revenue. In addition to revenue from fuel excises, we estimate that GST revenue from fuel taxes, which is rebated to the States, will raise a further $1 billion in 2001-02. About $2.8 billion is returned to vehicle operators through excise rebates, subsidies and grants (see chapter 2).

Governments have traditionally viewed fuel excises as primarily a revenue tax. The decision in 1983 to index fuel excises to movements in the consumer price index to maintain the real value of excise collections is acknowledgment of this, as road funding was not similarly indexed. Indexation was removed in March 2001, partly in recognition of the fact it could no longer be justified.

Are fuel excises an efficient way to raise revenue?

The fuel excise has often been viewed as an efficient instrument for raising revenue. The issues paper for this inquiry also promotes fuel excises on this basis. Two reasons are generally advanced to support this position.

- Fuels are widely used throughout the economy and their demand is relatively insensitive to their price. Estimates of price elasticities of demand for travel with respect to the price of fuel lie between –0.1 (short run) and –0.3 (long run). One strand of optimal tax theory suggests that commodities for which the price elasticity of demand is relatively low should be taxed more heavily than commodities for which the price elasticity of demand is relatively high. In this way scope for substitution is minimised and a given amount of revenue can be raised with a less distorting impact on resource allocation.

  A significant problem with this argument in the case of fuels is their extensive use as inputs to production. Around one-third of petrol and almost all diesel is used as an input to the production of other goods and services. Excises on fuel 'cascade' throughout the economy to impose highly differential taxes on individual industries according to their direct

and indirect use of fuel. If an industry is unable to recoup, through higher selling prices, the additional production costs imposed by the fuel excise, as is the case with industries exporting or facing strong competition from imports, then industry competitiveness and profitability are reduced. These allocative inefficiencies from the tax on tax effect can be large for some industries.

- Because only a few establishments are involved in collecting excises, monitoring problems are reduced. A large volume of revenue can be collected for very low administrative costs. The many exceptions and rebates, however, increase these costs.

But with the GST fuel excises are no longer justifiable to raise revenue

A second approach to optimal tax theory is to tax final consumption of all goods and services at the same rate. This would be achieved with a uniform GST on all goods and services with no exemptions. It is argued that such a system is broadly based, transparent, avoids taxation of intermediate inputs, does not distort relative prices between goods and services and hence does not encourage substitution between them. With the introduction of a 10 per cent GST in July 2000, the Commonwealth government has emphatically endorsed this approach. In fact, one of the claims made to justify the introduction of a broadly based GST to replace the old narrowly based and uneven wholesale sales tax system was that it would avoid the need to rely on taxing heavily a narrow range of commodities.

Introducing the GST has involved a substantial investment by both government and businesses. This investment is sunk and cannot be retrieved. With the GST and the systems to support it now in place, there is no longer any justification on revenue raising grounds to tax fuel any differently from the tax treatment of other goods or services.

The appropriate tax on fuel for revenue raising is therefore

- 10 per cent GST on *all* fuels (no exceptions)
- No indexation (GST is an ad valorem tax)
- No on-road/off road distinction

This treatment of fuel taxation avoids the taxation of intermediate inputs still present to some degree in current arrangements. It would also be neutral with respect to transport fuels as well as being neutral with respect to transport modes.

With the advent of the GST, the view expressed in the issues paper for this inquiry about the special merits of a fuel excise as a revenue raising measure cannot be sustained. By maintaining both a GST on fuel and a fuel excise, the government is seeking to have it both ways (as well as levying a tax on a tax). Fuel charges should not be about raising revenue, but should be designed to cover appropriate costs of road use and related externalities.

The concept of marginal cost pricing

Economic theory suggests that to achieve an efficient use of existing roads, road users should be charged according to the full marginal social cost they impose through using the road — the so-called short run marginal cost pricing rule. Marginal social cost measures the resource cost to society of the road user's decision to make the journey. The cost of the original investment in the road is sunk and plays no role in the efficient pricing rule.

How to achieve cost recovery for investments in new roads is a separate issue from achieving an efficient use of roads. If economies of scale are important then there is no guarantee that revenues collected under efficient pricing will achieve full cost recovery — though if congestion is priced realistically on urban roads more than full cost recovery may eventuate. If charges in excess of marginal social costs are levied on road users to, say, achieve full cost recovery, then this is no different — from a resource efficiency viewpoint — to a revenue raising tax. The key point is that road users should pay the appropriate cost of their use of roads. This will ensure that the value they derive from road use will at least cover the costs to society of their use. Unlike other forms of national infrastructure such as electricity, telecommunications, gas, water, railways and ports, roads stand out as for the most part not being subject to user pays pricing rules.

Paying for the social cost of using roads

Road users impose four components of social costs:

- road use and wear
- environmental harm
- congestion costs
- crashes and injury/death.

To achieve an efficient use of roads, motorists should be charged for these costs according to the marginal cost their travel decision imposes. How best to charge for each category of cost is the key issue.

Charges on fuel may have a role in charging for these costs if, and only if, there is no other more direct, efficient and practical way of charging for each component of the social cost of using roads.

Charging for road use and wear

Road users 'use' infrastructure in that they wear and damage it. Pavement damage depends on the technical characteristics of the road, the axle configuration of vehicles and load per axle as well as distance travelled. In principle, charges can be set to match these costs — charges based on mass/axle weight and distance travelled.

Heavy vehicles cause considerable pavement wear. Ideally this should be charged for directly. The National Road Transport Commission (NRTC), which is responsible for heavy vehicle charges, has undertaken considerable analysis on appropriate road user charges for these vehicles. The objective followed by the NRTC (which is specified in the Heavy Vehicles agreement between Commonwealth and States) is a budgetary one — full cost recovery — rather than the desired economic efficiency objective of marginal cost pricing of road use. There is no direct link between revenue collected from the charges and spending on roads.

By contrast, cars and light commercial vehicles cause negligible wear to most roads. An infrastructure use charging system operating through a charge on fuel used in road transport should reflect this by having only a very small charge for cars and light commercial vehicles and a much larger charge for heavy vehicles.

Charging infrastructure use through a uniform charge on all fuels will result in gross overcharging of light vehicles and undercharging of heavy vehicles. Fuels used off road should not incur the infrastructure use charge.

Charging for environmental damage

The use of vehicles can cause damage to the environment — through noise and emissions. Fuel combustion releases an array of pollutants including organic compounds, nitrogen oxides, carbon gases and particulates. These can be harmful to human health through exacerbating respiratory problems,

although technical change in engines and fuels is bringing about dramatic changes in emissions levels and the air quality in Australian cities is improving. The environmental risks of greenhouse gases are well documented. Vehicle noise can also be regarded as a cost imposed by road users on others. Its cost is traditionally measured in terms of the reduction in house prices in affected areas.

It is appropriate that vehicle users be charged for the damage they do to the environment to internalise these costs. This will provide incentives for environmental damage to be reduced. It also provides funds to compensate the losers.

The amount of environmental damage from emissions will vary according to the type of vehicle (particularly engine size and efficiency), the type and cleanliness of the fuel and where the vehicle is used. Charging directly and accurately for environmental damage is therefore difficult. A compromise is needed between the efficiency gains from a highly differentiated set of charges to reflect actual environmental damage in a particular situation and the administrative cost of greater complexity in the charging system.

It would make sense to impose some of the environmental charge through registration fees — which could reflect, for example, engine size and efficiency. There is also an important role for different registration charges based on the fuel used in road vehicles. These charges should vary according to the cleanliness of the fuel.

Determining the appropriate fuel charge component to account for vehicle emissions is difficult. Estimates for Australia by Cox (reported in table 2.12 and presented in detail in the annex) range from 3.6 cpl (light vehicles) to 21.6 cpl (heavy vehicles) in capital cities. It is assumed in these calculations that rural travel will not cause health effects from emissions. Motor vehicle emissions and hence health costs have fallen sharply since the introduction of catalytic converters and other devices and improved fuel quality. This emphasises that a charge for environmental damage would need to be regularly reviewed and adjusted as new engine technologies and emissions standards are introduced. The regime should not be an impediment to the introduction of new technologies and should be considered as a tool for encouragement.

Emissions of carbon dioxide from motor vehicles could also have an impact on the future global climate in the 'greenhouse effect'. Road transport accounts for around 20 per cent of Australia's net carbon dioxide emissions and only 15 per cent of Australia's total greenhouse gas emissions. This equates to 67 million tonnes of emissions each year (AGO 2001).

Cars and wagons account for 63 per cent of road transport emissions and light commercial vehicles and trucks account for 35 per cent — the remainder comes from buses and motorbikes.

Road transport emissions grew by 2.2 per cent a year between 1990 and 1999. It is estimated that without reduction measures, emissions from the transport sector will rise by 38 per cent between 1990 and 2010 (AGO 2001). The growth in emissions from trucks will greatly exceed those from cars (at least double the rate based on historical trends).

Greenhouse gas emissions are related to the fuel used, the amount of travel and the technical efficiency of the vehicle using the fuel. For carbon dioxide, emissions solely depend on the amount of fuel used. For other greenhouse gases, emissions depend on the technology installed in the car. For example, emissions of methane are 45 per cent lower in cars made after 1985 than in cars made before 1985. Carbon monoxide emissions are 60 per cent lower in cars made after 1985 (AGO 2001).

Given that emissions depend on fuel use, a fuel charge may be an appropriate means of reducing emissions. The appropriate rate of the charge, however, depends on the overall policy framework Australia adopts in order to reduce greenhouse gas emissions.

It is a well established principle that the optimal approach to greenhouse gas abatement is to find a policy framework that equates the marginal cost of abatement for *all* emitting sectors. The key features of this principle are that:

- it is not appropriate for any single sector to bear the full burden of abatement; and
- abatement should take place where it is least costly to do so.

It is inappropriate for the transport (or any other sector) to go it alone in emissions reductions. Rather, any policy should have the broadest possible coverage. There are two broad categories of policy that satisfy this principle: a uniform carbon (or carbon equivalent) tax, or some form of emissions trading scheme.

A uniform carbon tax automatically equates the marginal cost of abatement for all sectors. This approach has the advantage that the rate of tax is known in advance. Its disadvantage is that the amount of abatement is not known in advance. Under emissions trading, the permit price that emerges in the

emissions market is the means by which marginal abatement costs are equated. With trading, the total amount of abatement is specified (and known) in advance, but the permit price is not.

What carbon tax, or permit price, would lead to Australia satisfying its international obligations? A large number of studies have attempted to estimate this. Three broad sets of results have emerged.

- If Australia were to undertake abatement independently (without any sort of international trading scheme) the resulting permit price, or carbon tax, would be between $40 and $190 per tonne of carbon dioxide (AGO 1999).
- If Australia were to engage in a developed country trading scheme, the resulting permit price would be between $8 and $50 per tonne of carbon dioxide.
- If Australia were to engage in a global trading scheme, the resulting permit price would be between $5 and $34 per tonne of carbon dioxide.

What does this mean for fuel prices? Using average fuel emission coefficients this full range ($5 to $190 per tonne of carbon dioxide) amounts to a fuel charge of between 1 cent and 37 cpl. This range is far too large to provide any useful guide to fuel charging policy.

In summary, a charge on fuel to reflect environmental damage from road users is justifiable on resource allocation grounds. But there is no one 'correct' charge. In the case of greenhouse gas emissions there is no justification for Australia implementing a charge unless the Kyoto protocol is implemented. And in the case of charging for other emissions it is important that whatever charge is adopted be subject to consistent review. Technical developments in engine design and efficiency and in the production of cleaner fuels are progressively being introduced, in part due to demands for them through environmental damage charging mechanisms. The appropriate environmental charges will need to be adjusted periodically to reflect this progress. To the extent that States introduce different fuel quality standards, charges should differ between States.

There are a number of other environmental impacts associated with motor vehicle transport, including:

- conversion of 'green' open space to roads and car parks;
- disposal of used tyres; and
- reduced visibility due to smog in densely populated urban areas (smog reduces the amenity value of the outdoor environment).

The size of these externalities is difficult to quantify in dollar terms and there are no recent estimates for Australia.

Charging for congestion

Roads with low volumes are viewed in economic jargon terms as pure public goods — their use by one motorist does not detract from their use by others. But many roads are becoming increasingly congested, particularly in urban areas. The number of vehicles using the road at a given point in time exceeds the ability of the road to carry them at generally acceptable service levels.

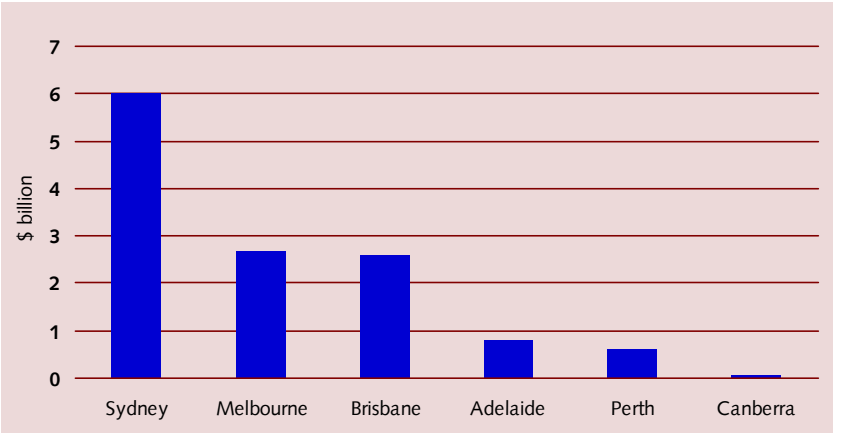
Congestion imposes costs on other road users, in the form of increased travel time and running costs, and on society through increased localised pollution. Typically, road users are not charged for these costs, and in the absence of a price mechanism to allocate a road to those motorists who most value it, many roads are overused (congested) at particular times. The result is inefficiencies in road use, in vehicle use and in the use of motorists' time. The existence of congestion may imply underinvestment in the road network.

Because of the complexity of urban travel behaviour, estimating congestion costs is not straightforward. Congestion costs are however, believed to be large. Congestion costs on roads in Australia's six major cities were estimated at $13 billion per year in 1995 (BTE 1999). Nearly half these costs were in Sydney (chart 3.1).

Urban parking charges can be set to be a surrogate for congestion charges, as without a place to stop there is little incentive to drive to a location. Already major urban authorities have used parking charges to discourage car travel.

Congestion pricing aims to charge road users for the costs they impose on other commuters. Prices should be set in accordance with the marginal congestion cost imposed by each additional vehicle on the road. Congestion charging is needed to send appropriate price signals to road users about the true cost of their trip, and as a result generate more 'efficient' traffic flows. Congestion charging provides an important marketed-based signal of the need for additional road investment as well as the timing of that investment. It has the potential to contribute much to fixing the road supply problem.

3.1 Congestion costs in Australian cities 1998



Data source: BTE (1999).

A first best congestion charging system involves charging according to location or trip route, time of day, number of vehicles on the road at the time and vehicle type. Ideally congestion charging should be introduced over as wide a network of roads as is practicable. If this does not occur spillover effects may be generated, as vehicles divert to other roads to avoid charges, causing congestion in areas or at times that were previously uncongested. Equity considerations would require that all vehicles be levied with congestion charges if they impose such costs on other motorists. A congestion pricing system must be cost effective to implement, be simple to administer and maintain, and be convenient for users.

To date there are only a few examples of congestion charging systems in operation. Singapore has attempted to control congestion through a number of pricing measures including cordon pricing for the CBD area and electronic road pricing for a number of expressways. These measures have resulted in a decrease in the proportion of solo drivers and a shift in vehicle use from peak to non peak periods. Trondheim, Norway provides a further example of a congestion pricing system. A cordon was erected around the city in 1991, with variable prices charged at tolls between 6.00 a.m. and 5.00 p.m. The impact of the toll ring was to decrease traffic in the CBD by 10 per cent during toll hours, increase it by 8 per cent outside toll hours, and decrease traffic overall by 4 per cent between 1990 and 1993 (ITS decisions 2001).

Until the introduction of Global Positioning System (GPS) satellite technology, direct road pricing options had a number of drawbacks (table 3.2). In principle, GPS technology will allow for most of the criteria of a first best congestion pricing system to be achieved — time specific, location specific, vehicle type specific, convenient for users. GPS systems will be able to track each vehicle's location, and charge accordingly. However, audit systems will be necessary to ensure accuracy as the GPS devices alone will not provide sufficient legal status for the necessary transactions.

Trials of electronic pricing systems based on an in-vehicle positioning capability, GPS or VPS (vehicle positioning systems), are flourishing in a number of European cities in Germany, Switzerland, the United Kingdom,

3.2 Direct road pricing options

Type of system	Description	Equipment costs	Operating costs	User inconven-ience	Price adjustability
Pass	Pass purchased to enter cordoned areas	Low	Low	Medium	Poor to medium
Toll booths	Motorists stop and pay at a booth	High	High	High	High
Electronic tolling	Electronic system bills as user passes point in the road	High	Medium	Low	High
Optical vehicle recognition	Optical system bills users as they pass a point in the road.	High	Medium	Low	High
GPS	Tracks vehicle location, with data automatically transmitted to central computer that bills user.	High	Medium	Low	High

Source: VTPI (2001).

Italy and Scandinavia and several Asian countries. The United Kingdom government has long ago (1993) signalled its intention to introduce electronic charging of its motorways when the technology is suitable. In Denmark a zone based pricing system based on GPS and digital maps is being tested. And the 1997 to 1999 Hong Kong electronic road pricing feasibility study (based on dedicated short-range communications rather than GPS) demonstrated its technical feasibility.

In Australia, the Tasmanian Department of Infrastructure, Energy and Resources is managing the national Intelligent Access Project. The focus of the Project is on demonstrating how certified service providers can deliver information services to industry and key road use data to road authorities. This would provide smart compliance opportunities for heavy vehicles that are subject to special access and operational arrangements. The project is based on vehicle positioning, data transmission and other in-vehicle and roadside technologies.

Currently, the main drawbacks of implementing GPS or VPS based systems include:

- privacy issues;
- costs of administration, including recouping charges from infrequent users and charge evaders; and
- the high cost of encompassing all roads and vehicles.

It appears reasonable to assume that these issues will be overcome in the near future, allowing the gradual adoption of such congestion charging mechanisms. However, until these issues have been resolved, especially concerns surrounding privacy and civil liberties, a second best charging scheme will need to be considered.

In the meantime, there is only a very weak justification for levying a charge on fuel to price congestion. Fuel purchases are largely unrelated to congestion. Fuel charges cannot distinguish between time of day, location of road and traffic density and vehicle type — they are paid by motorists on empty roads as well as those in traffic jams. In this context fuel charges are a cross subsidy from road users who drive on less congested roads to those who drive on more congested roads. And a proportion of motorists will respond to higher fuel prices by swapping to a more fuel-efficient car, which does nothing to relieve congestion. It is estimated that up to half the reduction in fuel consumption caused by a unit increase in fuel tax is due to reduced driving; the other half is due to people switching to more efficient vehicles (Parry 2001). On economic efficiency grounds it is better to leave congestion uncharged until the technology and systems for direct charging are in place.

Charging for vehicle crashes

Much of the potential costs of vehicle crashes are already internalised to the road user — through the purchase of 'safe' vehicles and various insurances. But there are also external costs that need to be charged back to road users to ensure that they face the full social costs of their road use. Intelligent use of third party insurance pricing should assist in costing crashes.

There were around 1 800 fatalities on Australian roads in 2000. Most of those killed (70 per cent) were males. Most of the deaths (60 per cent) were people under 40, with 17 to 25 year olds accounting for a quarter of deaths. Of those killed, half were drivers, 25 per cent were passengers and 16 per cent were pedestrians, (the remainder being either motor cyclists or cyclists). Around 40 per cent of fatal crashes involved a single vehicle, 20 per cent involved pedestrians with the remainder being multiple vehicle crashes.

There are many causes of road crashes including:

- the choice to drive a vehicle (or walk on the road) while under the influence of alcohol (for males, one-third of road deaths are caused by driving or riding with a blood alcohol content of greater than 0.05. For females the proportion is 11 per cent);
- speed (the risk of involvement in a serious injury crash, for sober drivers increases more than proportionately with speed); and
- road conditions, the safety of roads and the existence of roadside hazards (the latter are a major factor in 40 per cent of car occupant fatalities).

According to BTE (2000) the cost of road crashes in Australia in 1996 was $15 billion. At issue is how much of these costs are not internalised through third party and private property damage insurances and need to be charged for through some other mechanism. There is no consensus in the literature on this. One position is that all crash costs should be regarded as externalities, while others argue that all relevant costs are already internalised. The majority of analysts take a mid-point position.

Most of these crash and injury causes are unlikely to be influenced by the level of charges on fuel. Drink driving and speeding, for example, are behavioural choices that are unrelated to the price of fuel. Direct regulation and enforcement is likely to be a more appropriate policy measure than a fuel charge. Nevertheless, an argument can be made for a charge on road users to reflect some external crash costs. The issue is one of how best to levy the charge — through fuel, per vehicle, etc. There is no ideal base for the charge.

Bringing it all together

An ideal fuel charging system would be an integral part of a framework designed to achieve efficient use and provision of roads. It would contain an access charge which would give users the right to access the road system and a set of user charges based on actual road use. The access charge would, in principle, be small. It would be designed to cover the costs of registering and keeping track of vehicles. The user charges would be set to recover from individual users the full marginal social costs of their use of roads. They would contain a component to reflect the use of road infrastructure. Ideally this would be a mass/axle weight distance based charge rather than a fuel charge. This would be negligible for light vehicles, but considerable for heavy vehicles. There would also be a fuel based charge to reflect environmental costs of burning fossil fuels in road vehicles. The appropriate charge set for this would be revised periodically to take into account improvements in engine efficiency and fuel quality. Some part of the environmental charge could be built into the access charge to reflect the type of engine being used on the road. There would be no charge for greenhouse gas emissions in the absence of implementation of the Kyoto agreement. Congestion costs would be charged directly according to time of day (as parking charges are currently), location of road used and type of vehicle. In the absence of an effective direct charging mechanism there would be no charge on fuel designed to charge for congestion. Regulations and changes to insurance, rather than fuel charges, could be used to reflect the social costs of crashes.

4 A practical system of fuel taxation and road pricing

The analysis in chapters 2 and 3 highlighted the inefficiencies and inequities in current fuel taxation arrangements. Inefficiencies arise as the excise distorts consumption decisions with respect to choice of fuel, choice of transport mode and choice of vehicle within transport mode. And the failure to price road users for the full social costs of their use of roads causes inefficiencies in both the use and provision of roads.

Exempting some fuels from excise is horizontally inequitable and is currently not transparent. The excise is regressive. And regional road users (especially heavy vehicles) are paying more than they should for their use of roads compared with urban road users.

The multiple objectives advanced for the excise and its various exemptions — revenue raising, road infrastructure charging, charging to achieve environmental objectives — have resulted in an unnecessarily complex system which is vulnerable to manipulation by governments in response to pressures from interest groups. The lack of a relationship between revenue collected from motorists and expenditure on roads is also unpopular with the motoring public (see ANOP 1999 and ANOP 2000). While there are no compelling economic arguments for roads to be funded entirely by motorists there are strong economic arguments for governments making available sufficient funds to maintain an efficient road network with sufficient capacity to meet the demands placed on it.

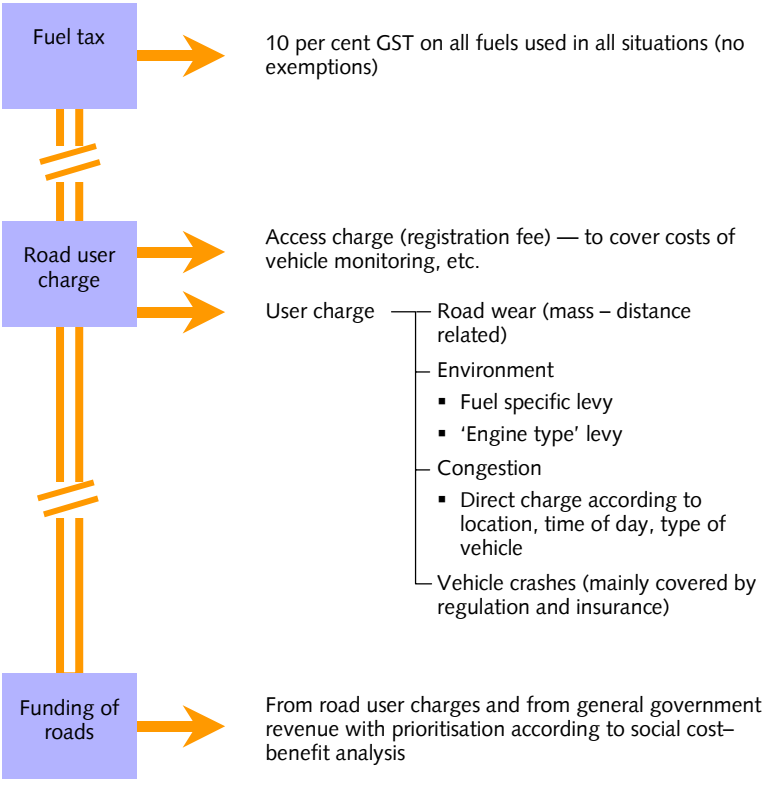
The inadequacies of current arrangements are becoming increasingly apparent with economic growth and the failure to expand road infrastructure sufficiently to match the increase in demand for it.

The stakes are high. BTE projections are for a 30 to 45 per cent increase in total road traffic between 1995 and 2015 (20–40 per cent for car traffic and 60–80 per cent for trucks) with 90 per cent of this on existing networks. Even after allowing for a 5 per cent increase in road network capacity, congestion costs could rise to $30 billion per year by 2015 (BTE 1999).

A first best option of fuel taxation and road user charges

This is set out in chart 4.1. It involves a complete separation between fuel taxation and charging for road use. Funding for the provision of roads comes from road user charges and from general government revenue.

4.1 Dimensions of an ideal fuel taxation, road use and road funding system



- The fuel tax is a GST on all fuels in all uses.
- The road user charge has two components — an access charge and a user charge.
- The access charge covers the cost of vehicle registration for monitoring purposes.

- The user charge has four components.
  - A road wear charge is levied based on vehicle mass/axle load and distance travelled. This will be negligible for light vehicles.
  - An environment charge is levied according to engine type and fuel type. The engine type levy could be collected through the access charge mechanism. The fuel type levy would be expressed in terms of cpl of fuel purchased.
  - A congestion charge is collected directly according to location of road, time of day and type of vehicle.
  - A charge is levied to help fund the external costs of vehicle crashes. It may also have a distance based charge. But a levy on fuel is unlikely to contribute to improving road safety.

All revenue from the road user charge is transferred to an appropriately structured road management authority (see chapter 5). This authority is responsible for overseeing the maintenance and expansion of the road network through the various agencies with responsibility for roads. In addition to the revenue it receives through road user charges, the authority would also be appropriately funded from consolidated revenue to ensure it had sufficient resources to maintain and expand the road network to the standards considered appropriate by the community. There is no necessary connection between the amount of money collected from the road user charge and the amount of money the community considers appropriate to spend on roads. The road management authority disperses the funds to the road authorities throughout Australia according to their needs and priorities for expanding the road network.

But this first best option for charging for road use is not yet possible. In particular, the technology for charging directly for road use and congestion, though available, is not yet in place. Until it is, a practical system of road user charging will need to rely on access charges and on an indirect system of road user charges through charges on fuel purchased for use on roads.

A practical system based on fuel charges

In the interim, the system we advocate has the following elements.

- The fuel excise is removed — it can no longer be justified.
- Existing registration fees remain — their reform and integration into a two part ideal charging scheme should await the introduction of direct charging instruments.

- A system of fuel based charges is introduced as an interim measure to charge for road use — road users should pay for their road use. At issue is how to set these charges. One approach, followed by the NRTC, is to base charges on achieving full cost recovery of road expenditures. While such a charging system has obvious appeal from a budgetary perspective, it contravenes the strong focus in this inquiry on achieving efficient resource allocation.
- Efficient use of roads is achieved when road users pay for the full marginal social cost of their road use. We therefore argue that fuel based charges should be set according to the principles of short run marginal cost. In this context we note the following statement (reported in Cox 1997, p. 1) by the then Minister of Transport, John Sharp.

  'There has also been an historic emphasis on cost recovery of government expenditures rather than pricing for economic efficiency.'
- The fuel based charges apply to all fuels used in on-road vehicles. A suitable rebate scheme will need to be introduced to exempt road use charges for fuels used off-road.
- In principle, fuel based charges should be differentiated according to location (rural/regional versus capital city/urban) and vehicle type (at least between light and heavy vehicles). A much greater differentiation of charges could be justified on the basis of differences in marginal cost of road use between different types of vehicles and between different locations (see Cox 1997). But to sustain a highly differentiated set of charges through one instrument (fuel) is virtually impossible and would result in a highly complex system open to significant abuse. This serves to highlight the urgency of moving to a more direct user pays charging system.
- Apart from applying as a fuel charge, the different costs could alternatively be implemented as differentials in registration fees. The numbers presented below could easily be recalculated to be placed on a registration basis. In doing this, however, the implications for State revenues and existing registration fees would need to be carefully considered.
- The revenue raised either from full cost recovery charges or from marginal cost charges could be allocated to road expenditure (in conjunction with funds from consolidated revenue to ensure a socially and economic optimum supply of roads).

Charges based on marginal cost pricing

Table 4.2 sets out an initial estimate for fuel charges based on achieving allocative efficiency through marginal cost pricing. These are derived from the charges set out in table 2.12, but the costs for road wear have been

adjusted to incorporate only the marginal costs. The charges include components for air pollution, noise pollution, vehicle crashes and road use (wear) costs. Charges for congestion are not levied at this stage as fuel charges cannot sensibly charge for congestion.

- The road wear marginal costs are derived from Cox (see annex) and Cox and Meyrick (1997). Here we have noted that the marginal costs for road wear is estimated to be $750 million, around one third of the total cost reported in table 2.12. We have derived the marginal costs by adjusting the corresponding costs by the same proportion.
- We have assumed the marginal costs for air pollution, noise pollution and vehicle crashes are the same as the average cost.
- The charges should be updated on a regular basis to reflect changes up and down in cost components. But we emphasise that a fuel based charging system should not become entrenched — it falls too far short of an ideal road use charging system.
- If third party insurance premiums and registration charges were to be revised, these fuel charges would be lower.
- Because the road wear charges in table 4.2 are based on marginal costs, they (and the totals) are lower than those presented in table 2.12 and in the annex.

4.2 Suggested initial charges for a fuel based charging system

	Cost component cpl				
	Air pollution	Noise	Crash	Road wear	Total
Light vehicles (less than 4.5 tonnes GVM)					
Capital city/urban	5.7	1.3	12.5	1.7	21.2
Regional/rural	0.0	0.5	15.7	2.8	19.0
Total	3.4	0.9	13.8	2.1	20.2
Heavy vehicles (greater than 4.5 tonnes GVM)					
Capital city/urban	20.5	12.0	5.8	5.1	43.4
Regional/rural	0.0	2.7	9.5	7.7	19.9
Total	8.3	6.4	8.0	6.7	29.4
All vehicles					
Capital city/urban	7.9	2.9	11.5	2.2	24.5
Regional/rural	0.0	1.1	14.0	4.1	19.2
Total	4.4	2.1	12.6	3.1	22.2

Source: Estimates derived from Cox (see annex) and Cox and Meyrick (1997)

Table 4.3 shows the change in fuel charge from current charges assuming that we interpret the current excises net of grants, rebates and subsidies as a road user charge. Key points to note are:

- for light vehicles in both rural and urban areas the fuel charge would drop significantly — light vehicles are paying far too much excise on a road user charge basis; and
- for heavy vehicles in urban areas the charges would rise substantially — air pollution and noise costs of heavy vehicles in urban areas are substantial.

Note that these numbers are an initial estimate only, and while they provide a useful indication of the relative costs of road use, more work needs to be done to refine them.

4.3 Implied change in fuel charge if existing excise (net of rebates, subsidies) is viewed as a road user charge

Vehicle	Capital city/urban		Rural/regional	
	Current net excise	Proposed charge	Current net excise	Proposed charge
	cpl	cpl	cpl	cpl
Light	38.1	21.2	37.1	19.0
Heavy (4.5–20 tonnes)	38.1	43.4	18.6	19.9
Heavy (greater than 20 tonnes)	19.6			

Source: Treasury (2001); Cox (2001).

As presented in tables 4.2 and 4.3, these estimates imply that the charge on LPG would increase substantially (to bring it in line with the price of petrol). While it is appropriate that LPG powered vehicles pay the same charge for noise, crash and road wear costs, it could be argued that the environmental costs of LPG vehicles should be lower. From table 4.2 they could be at most 6 cpl lower. In that case, the LPG charge would be 70 to 80 per cent of the charge for other fuels. As noted earlier, a lower registration fee could apply to LPG vehicles to reflect lower environmental costs. Given the potentially large changes in LPG prices implicit in this proposal, it is appropriate that consideration is given to having any changes phased in.

Gains from the proposed charges

As noted in chapter 1, the government has specified a number of desired features of an improved regime for taxation of petroleum products. We have

argued throughout this report for a distinction between a fuel tax (for revenue) and a fuel charge (charge for road use).

The fuel based charge proposed makes a positive contribution to economic efficiency, equity and environmental objectives — though this contribution is much less than would be forthcoming from our ideal system as set out in chart 4.1.

- Resource allocation efficiency is improved — by providing motorists with more meaningful signals of their marginal social costs of road use.
- Domestic competition and international competitiveness are improved — the business tax and tax on tax effects of current arrangements are eliminated.
- Regional outcomes are improved — regional charges for light vehicles are considerably reduced.
- Administrative costs could be expected to be lower — although still administratively messy the proposed arrangements are a good deal simpler than present arrangements.
- Equity is improved — the degree of cross subsidisation between different categories of users is reduced.
- Most (but not all) of the externalities associated with road transport are specifically addressed.
- Improved environmental outcomes would be encouraged.

The proposed changes would, however, mean a reduction in government revenue from motorists (by about $1.8 billion per year, compared with $300 million a year under full cost recovery) which would have to be made up by higher taxes elsewhere or reductions in government outlays. But a reduction in government revenue from motorists is an essential part of improved arrangements. It simply reflects that under current arrangements taxes on fuel are too high on economic efficiency grounds.

Of course, these initial revenue losses would be offset as a result of increased economic growth and welfare that would be expected from a more sensible fuel taxation system.

International comparisons of fuel taxation are of no policy relevance

The Inquiry intends to review overseas fuel taxation structures including objectives, mechanisms and levels. International comparisons of petrol prices and the taxation component are reported in the Inquiry issues paper. They

show that of the 17 countries compared Australia has the fourth lowest petrol prices and tax component.

While this observation is of interest, it tells us nothing about the appropriate level of taxation of fuel in Australia. As argued earlier, this should incorporate:

- a revenue raising component
- a road user charge component.

The revenue raising component will depend on how each country chooses to configure its taxation system and its commitment to, and hence funding needs for providing social welfare. The road user charging component should reflect how much of the social cost of using roads cannot be recovered by direct charging mechanisms and hence needs to be incorporated through an access charge and a cpl charge on fuel.

If each country were to follow first best taxation and road user charging principles we would expect to see quite different charges on fuel between countries. The challenge for Australia is to implement a fuel taxation and road user charging system that will achieve an efficient allocation of resources in Australia. This system may also need to make appropriate trade offs between efficiency and equity.

Achieving an adequate supply of roads

A nation that drives 178 billion km a year on 800 000 km of roads and loses around 1800 lives through road crashes, has little option but to build, maintain and improve the safety of its roads. But just as it would be foolish to spend too little on the road system, it would also be foolish to spend too much.

Collectively, Australians need to decide:

- who should pay for the road system
- how to make sure the right amount is spent in the right places.

While motorists should pay for the full social cost of their use of roads, there are no strong arguments for charging them the full cost of constructing new roads. This is because road construction produces externalities — roads are a major determinant of development patterns and provide numerous benefits to non-motorists (including cyclists and pedestrians). They also impose costs on some non-motorists. There is, therefore, a strong rationale for some general funding of roads.

Investment in roads yields high payoffs

The arguments for some general funding of roads are strongly supported by quantitative analysis of the contribution of road transport infrastructure to the economy's performance.

Better roads means savings in driver time, reduced vehicle operating costs and reduced crashes. This makes business more productive. Modelling work commissioned by the Australian Automobile Association shows large potential gains to the economy from investment in road infrastructure particularly in urban roads (table 4.4). The analysis also found that the expansion in the tax base from the higher economic activity associated with a more productive economy was more than sufficient to cover the annual financing and maintenance costs of the additional investment in roads.

4.4 There are big payoffs to national income from road investments

Road category	Estimated benefit–cost ratio for each $1 billion investment	Annual financing cost over 35 year life	Long run (year 10) annual net increase in GDP	
		1992-93 $m	Per cent of GDP	1992-93 $m
Rural national	2.1	70	0.07	270
Rural arterial	2.0	70	0.07	270
Rural local	1.0	70	0.03	120
Urban freeway	4.8	70	0.15	620
Urban arterial	6.0	70	0.20	810
Urban local	1.0	70	0.03	110

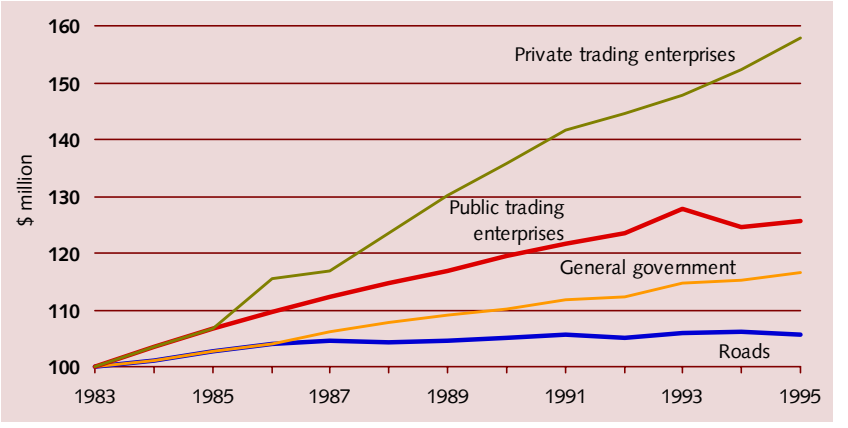
Source: The Allen Consulting Group (1993).

The same study also reported that for each one per cent increase in investment in road infrastructure total factor productivity in the private sector would increase by 0.27 per cent. Based on these findings, a $1 billion investment in roads would produce a benefit of over $900 million in the first year — a rate of return of over 90 per cent.

This extremely positive story on the payoffs from road investment is in stark contrast with what has been happening. Chart 4.5 shows that over the 1980s and 1990s investment in road infrastructure has barely kept up with the depreciation of the existing road network. As a result, the capital stock of roads has decline steadily relative to the capital stock in private and public trading enterprises and the general government sector. With the demand for urban road use, in particular, closely linked to per capita income growth and

the demand for transport growing in line with economic growth, it is not surprising that road congestion costs are escalating sharply.

4.5 The decline in road capital stocks

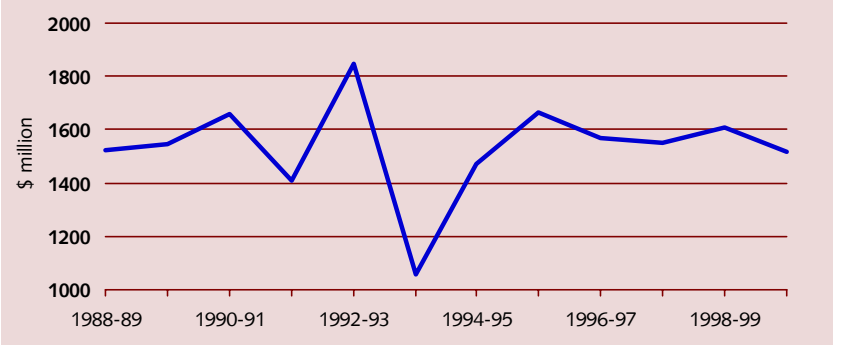


Source: AAA (1997).

Chart 4.6 shows that in real terms Commonwealth road related expenditure has declined steadily since 1992-93.

There are many other demands on government to fund public infrastructure investments which also may have high returns to the economy. But a study by Otto and Voss (1996) found that the returns from road investment are higher than for almost all other types of infrastructure investment. And a number of overseas studies have also highlighted the big payoffs to economic performance from investment in road infrastructure.

4.6 Commonwealth road expenditure is declining in real terms



Data source: Webb (2001).

The results of these studies emphasise the importance of having in place sound arrangements for funding on an ongoing basis, an appropriate level of investment in road infrastructure and for ensuring that such investments are directed to road infrastructure projects which yield the highest payoffs.

Determining which roads should be funded

Both the history and nature of Australia's road system means that there is currently no single or simple market place for roads. While the appropriate supply of a wide variety of goods and services is mediated through market interactions, several features of roads make this very difficult.

- **History**. The existing road network has been funded by a variety of levels of government over many years. Traditionally, governments have maintained control over the road system, and regulatory objectives (such as safety) have been combined with construction responsibilities.
- **Nature of the service**. This historical treatment of roads has arisen because of the public good nature of most roads. In practice it has been difficult to exclude and charge users (except for very specific toll roads) so a private provider has little incentive to build and maintain a road.

With new technical developments, suppliers may be able to appropriately charge users and so it may be possible to establish many more market mediated road networks. Policy toward the provision of roads should be receptive to this development. Policy developments in road infrastructure are, however, considerably behind policy developments in other areas of infrastructure where corporatised and privatised entities now provide services on a commercial basis that were once supplied by government instrumentalities.

Whether or not markets for roads are established, new technologies will mean that governments will be able to monitor and charge for road use. In many cases, this will provide the sort of information needed to evaluate demands for road infrastructure, at the same time as providing the funding mechanism for the infrastructure.

But these technologies will not solve all the problems, and for the foreseeable future there will be no substitute for systematic social cost benefit analysis of new roads and enhancement of existing roads. In formulating the social cost–benefit analysis it is important that governments do not 'double dip' by demanding both a commercial return on road investments and appropriating revenue from flow-on economic activity. Beneficial road projects should not be vetoed merely because they do not satisfy narrow commercial profitability tests (AAA 2000).

Institutional arrangements

Despite the strong evidence of the large payoffs to the economy from increased investment in roads and from a reallocation of the existing road investment budget to higher priority roads. Australia as a nation continues to under invest in roads. The evidence for this is strong — analytical studies, rapidly increasing congestion costs, the strong share price performance of private sector road toll operators and the large backlog of commercially viable road investment projects which remain unfunded. Current institutional arrangements for road provision and funding do not appear capable of delivering:

- an adequate overall investment in roads
- a strong prioritisation of that investment.

Current arrangements

Although all three tiers of government are involved, road funding is dominated by the Commonwealth. The degree of so-called vertical fiscal imbalance is large — the Commonwealth collects two-thirds of the revenue raised from all fuel taxes and registration charges (most of which goes into consolidated revenue), but takes responsibility for only a small part of the road network.

The Commonwealth provides road funds out of consolidated revenue on an annual basis according to budgetary (and political) considerations. The Commonwealth:

- funds its own programs on roads — National Highway System, Black Spot programs;
- funds Roads of National Importance jointly with the States; and
- provides grants to the States (now incorporated in GST revenues though untied from roads) and local governments for road funding. Funds to local government are via States under the local government financial assistance act and, although now untied, are spent on roads.

The States also fund roads (and some States fund Black Spots) out of their general revenue as do local governments (which look after 70 per cent of the network) out of their mainly rates based revenue. Some States have dedicated revenue from car registration and licence fees to their road authorities.

The current system has some key shortcomings.

- Unlike most other forms of productive infrastructure there is no link between revenues collected through taxes and charges on road users and expenditure on roads.
- Revenues available for expenditure on roads are unpredictable from year to year — which reduces the scope for forward planning of road construction and adds to construction costs.
- There is a strong political element in funding decisions.

Improving on current arrangements

A number of models have been advanced to overcome the deficiencies in current arrangements. In its submission to the 1997 inquiry into federal road funding, the AAA (1997) proposed the establishment of a Federal Roads Corporation to operate as a corporatised entity under a statement of intent from the federal government to direct road investment toward projects which satisfy explicit national economic and other objectives. The Corporation would establish road user charges that embodied a direct relationship to the cost of road use, and the revenue from the charges would be used to fund road infrastructure. If the Commonwealth required investment in non-commercial roads, these would be funded from general tax revenue. The States, which have constitutional ownership of the roads, would continue to manage the road system. The Australian Competition and Consumer Commission would regulate the Corporations' activities.

5 Implementation

The deficiencies in current arrangements for fuel taxation, the charging of road use and funding the provision of roads are longstanding. They have been analysed and exposed in numerous official inquiries and gatherings of experts in road transport matters.

As long ago as 1986, for example, the then Industries Assistance Commission in one of its inquiries into petroleum products taxation concluded that:

- petroleum excises are too high (they have risen substantially since then in both absolute and ad valorem terms);
- they involve significant economic costs, particularly through the taxation of intermediate inputs and through substantial differences in excise between substitute petroleum products;
- they are not an appropriate mechanism to charge for road use; and
- direct charging of road use should be pursued as soon as considered practical.

And a large body of analysis has been undertaken over many years of the relationship between vehicle and truck travel and pavement damage, vehicle emissions, the high and escalating costs of congestion, the cost of vehicle crashes, the increasing inadequacies in road funding arrangements, the necessity for a charging system for road use and the need for new institutional arrangements for significant reforms to occur.

Yet, by and large, governments have remained unmoved by this analysis and have shown little interest in taking on board the reforms needed. In its response to the report of the House of Representatives Standing Committee on Communications, Transport and Microeconomic Reform (Inquiry into Federal Road Funding) the federal government disagreed with the committee's recommendation that the states/territories examine the potential for alternative road user charges (Commonwealth Department of Transport and Regional Services 2000). No explanation for this rejection was given — which puts the Australian government's thinking on this matter out of step with a growing number of governments throughout the world.

Although under the constitution responsibility for roads rests with the States the Commonwealth has accepted significant financial responsibility for the road network through its funding arrangements with other levels of government. And the Commonwealth has a monopoly on fuel excise taxing powers. Other taxes and charges on motorists are levied from various sources and there are numerous road management authorities. No one body has overall responsibility for coordinating charges and road expenditures. This must be changed. State and local government geographic boundaries are of no consequence to road users who rightly view roads as part of a national network. Strong federal government leadership will be needed to put in place a coordinated national approach.

The need to increase the political will for reform

The first step to achieving the reforms is to create a situation in which governments recognise that it is in their own best interests to implement reforms. This requires convincing the community — both road users and others — of the benefits of reform.

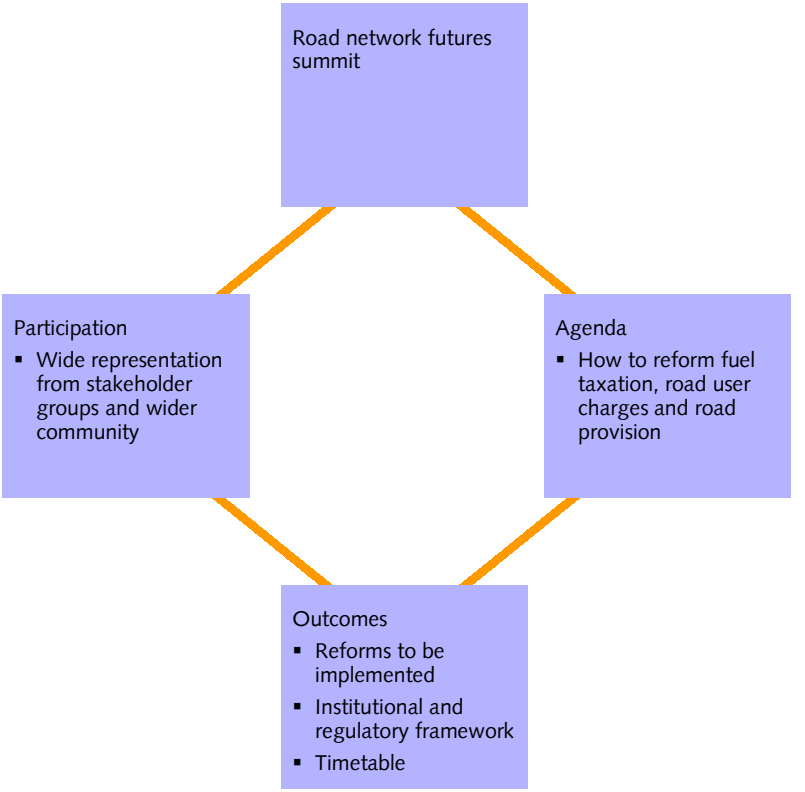
Traditionally, treasuries have been reluctant to forego the revenue from any tax — unless this can be coupled with revenue from other sources or savings on outlays — but with the implementation of *A New Tax System* and the increasing focus of treasuries on resource allocation as well as accounting ,there are reasons for optimism in this regard.

Creating political will to reform means convincing the general community that:

- there are substantial benefits to Australia's overall economic performance from investments in road infrastructure;
- a formal strategy and plan is needed for road network development;
- there will be significant gains to their lifestyles and living standards from the reforms — in terms of better roads, less congestion, less pollution and less crashes; and
- charges on road users to achieve better roads will be more than compensated for by reductions in existing fuel taxes.

The process we suggest for achieving this might begin with a summit (as one suggestion, under the leadership of the federal government) to put in place plans for removing fuel excises, installing a road user charging system and establishing an ongoing framework for funding the maintenance and provision of roads (chart 5.1).

5.1 A process for implementing reforms to road pricing



The AAA and State motoring Clubs are keen to assist with such a summit and have had experience in similar activities. The summit would have wide representation — politicians and officials from each level of government, industry leaders, road user groups, planners, environmentalists, etc. It would be widely publicised and be seen to provide a credible representation of community views. The summit's agenda might start with the following:

- consider the benefits of reform;
- appreciate the urgency of starting the process;
- agree on broad directions for reform;
- recognise that reforms will need to be ongoing;
- consider reform options;

- agree on a timetable with appropriate milestones;
- agree on an institutional and regulatory framework needed to deliver the reforms; and
- agree on responsibilities for making it happen.

As a first step along the way to achieving the desired system of fuel taxation and user charging the practical system we have advocated in chapter 4 could be tabled at such a summit. This could be fully implemented over three years by progressive reductions in excise and replaced by charges on fuel for road use. An ongoing and highly public debate should be orchestrated over this period to prepare the community for a continued evolution in charging arrangements toward the desired system. Electronic charging could be progressively phased in, starting with heavy vehicles. The in-vehicle technology to accommodate this is now being incorporated during manufacture of such vehicles.

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Annex

This annex was prepared for Econtech Pty Ltd on behalf of Australian Automobile Association by Dr John B Cox, Transport Consultant

A Determination of externality and road use charges for Australian road transport

Introduction

This study updates the externality and road user charges for Australian road transport that were made in Cox (1994) and Cox and Meyrick (1997) to the year 1998-99.

The 1999 Survey of Motor Vehicle Use travel data was used (ABS 2000) while an average of the National Road Transport Commission (NRTC) arterial road expenditures for the years 1997-98, 1998-99 and 1999-2000 were used to update the costs used in the second determination of road user charges (NRTC 1998). Local roads expenditure was also updated in accordance with new data in BTE (2001).

The study uses the NRTC cost recovery methodology for heavy vehicles to determine a road use fuel charge for light vehicles that corresponds to the heavy vehicle fuel charge of 20 cents per litre. Unlike the NRTC methodology it also determines the external costs from road transport of air pollution, noise pollution and road crashes and adds these costs to both the heavy and light vehicle fuel charges.

A further division of road supply, road safety, air pollution and noise pollution costs into urban and rural areas was made because some of these costs were more attributable to urban areas, such as air pollution, while others such as road supply costs derived from road expenditures were more attributable to rural areas. These urban and rural costs were then divided by an estimate of light and heavy vehicle fuel consumption in these two areas to come up with a fuel charge for light and heavy vehicles in both of these areas.

The latest available data was used to calculate a fuel charge in cents per litre for each cost component and then all costs were updated to 2000-01 values by employing appropriate inflation allowances.

These fuel charges do not include any allowance for congestion charges in urban areas where there is presently a very wide range of published congestion costs varying from about $5 billion (Luk and Hepburn 1995, Cox and Meyrick 1997) to $13 billion (BTE 2000). It is generally thought that these charges should be charged for directly rather than be attributed to a fuel charge as they are a function of particular roads and the time of day that they are being used.

It should be noted, though, that the road user costs taken in this study are based on full cost recovery that includes all capital costs used to reduce congestion and not the marginal costs of road use, such as the extra maintenance costs from additional traffic. There will therefore be a double counting of charges if congestion charges are applied on top of fuel charges based on full cost recovery.

Lastly, this analysis does not include allowance for positive externalities due to improved productivity in the economy and individual businesses from investment in the road transport sector.

Air pollution costs

Table A.1 gives the particulate emissions for all diesel vehicles in the year 2000 for all urban areas by vehicle type (Cox 2001). These emissions are based on emission tests of actual diesel vehicles in the Australian vehicle fleet (Parsons 2000). There are also particulate emissions from petrol powered light vehicles that were estimated by the Victorian EPA (EPA 1998) to be 27 per cent of the total particulate emissions (or 27/0.73 = 37 per cent of the diesel particulate emissions given for the urban areas in this table).

The NRTC in its Regulatory Impact Statement for a diesel National Environment Protection Measure assumed that the health costs of particulates amounted to $224 000 per tonne. This figure was based on the ExternE project in Europe (EC 1998) and comprised a cost of $129 300 per tonne for '*excess mortality*' and $95 000 per tonne for '*morbidity*' (sickness). These are considered to be conservative figures for Australia because they are based on willingness to pay criteria for human lives that have not been used in Australia to the present time (BTE 2000a) as the human capital approach has been used instead. Moreover, willingness to pay values have reduced significantly since 1998 (INFRAS 2000), and the dose response relationships have been halved to 0.5μg/m^3 after a major review of all previous studies (HEI 2001). Balancing these reductions is the fact that non-exhaust particulate emissions from motor vehicles are not included in the above figures.

A later, yet to be published Environment Australia report on the benefit cost ratio of reducing diesel emissions by testing and repairing is reported to use a lower figure of $130 000 per tonne. There are other minor costs from other pollutant such as oxides of nitrogen and volatile organic compounds leading to ozone formation but these are generally only costed at less than $1500 per tonne. The use of a conservative particulate figure of $220 000 per tonne is assumed to cover these minor pollution costs.

A.1 Tonnes of particulate emissions

	NSW	Vic	Qld	WA	SA	Tas	NT	ACT	Total
Passenger vehicle	128.4	445.2	130.0	148.0	59.7	6.2	6.2	12.3	936.2
Motor cycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LCVs	161.4	168.0	186.2	84.1	66.4	15.8	20.0	15.5	717.3
Light vehicles diesel	289.8	613.2	316.2	232.2	126.1	22.0	26.2	27.8	1653.5
Light vehicles petrol									1306.3
Rigid and other trucks	447.6	342.3	184.5	122.4	84.1	21.3	10.8	20.3	1233.3
Articulated trucks	119.4	151.3	53.9	36.7	17.3	8.4	2.9	1.9	391.8
Buses	90.4	45.4	39.6	27.3	27.3	6.8	7.9	8.7	253.4
Heavy vehicles diesel	657.4	539.0	277.9	186.3	128.7	36.6	21.6	30.9	1878.4
All vehicles	947.2	1152.3	594.1	418.5	254.8	58.6	47.8	58.7	4838.3

In table A.2, total air pollution cost are estimated at about $1,084 million. This total is significantly higher than the previous estimate of $545 million (Cox and Meyrick 1997) and $46 million (Segal 1995). It is, however, lower than European estimates for air pollution because Australia introduced catalytic converters 10 years before Europe and has only one third the vehicle travel per hectare as European cities.

A.2 Calculation of air pollution externality

	PM10 emissions	Unit rate	Cost
	tonnes	$/tonne	$ m
Light vehicles	2 960	224 000	663
Heavy vehicles	1 878	224 000	421
All vehicles	4 838		1 084

It should be noted that projections of particulate emissions from diesel vehicles, as well as all other air pollutants, would reduce significantly in the future and reduce this cost. Victorian particulate levels are high because of the larger number of four wheel diesel vehicles used in Melbourne.

No allowance for greenhouse gas emissions has been made in this charges study, as other sectors of the economy do not experience this charge. This is best taken into account with a separate carbon tax, which is applied to all sectors of the economy.

Noise pollution costs

The cost of traffic noise in Melbourne was estimated by Nairn et al (1994) as between $43 and $86 million. Segal (1995) extrapolated these figures to "a value for Australia of, at most, $200 to $400 million per year". These costs were based on the observed reduction in house prices in residential area and did not take into account the impacts of road transport noise on business and recreational areas. The upper limit would therefore seem to be closer to total road transport noise costs.

The Inter-State Commission estimated noise pollution costs in 1990 of $389 million for all urban areas in Australia (ISC 1990) that were based on the unit costs for various vehicle types given in table A.3. These unit costs were based on measured noise levels of actual vehicles and give total noise costs of $389 million, which is close to the upper limit estimated by Segal (1995) and therefore seems creditable. These unit costs were therefore adjusted by the CPI to 1999 costs and used with the 1999 SMVU travel data (ABS 2000) to give revised noise costs for both urban and other urban areas, as shown in table A.3.

The updated noise costs for Australian urban areas are estimated to be $393 million in urban areas and $117 million in other urban areas, giving a total cost of about $510 million, which is higher than the $450 million in the previous estimate of Cox and Meyrick (1997). A split between light and heavy vehicles has also been calculated for these two urban areas in table A.3.

A.3 Calculation of noise pollution externality

	Capital cities	Other urban	Total urban
	cost ($ m)	cost ($ m)	cost ($ m)
Passenger vehicles	129	30	159
Motor cycles	1	0	1
LCVs	18	6	24
Rigid and other trucks	77	22	99
Articulated trucks	93	33	125
Buses	76	26	102
Totals	393	117	511
Light vehicles	148	37	184
Heavy vehicles	246	81	326

A recent report on vehicle noise for NRTC (Close and Apelbaum 2001) did not come up with any new estimate for noise pollution costs but did review the decrease in house prices per unit increase in road noise (in dBA). These did not differ appreciably from those used in the original studies by Nairn and Segal.

Crash costs

A recent estimate of crash costs in Australia (BTE 2000) gave the costs shown in table A.4.

A.4 Australian crash costs 1996

			Comments
	$ b	$ b	
Human costs		6.56	
▪ Medical	1.73		
▪ Lost labour	1.92		$0.87 billion is for lost labour in households
▪ Quality of life	1.77		Pain and suffering
▪ Other	1.14		Legal, workplace disruption, funeral, etc.
Vehicle costs		4.11	Mainly vehicle repairs
General costs		2.49	
▪ Travel delays	1.45		
▪ Insurance admin	0.93		
▪ Other	0.11		Police, property, fire
Total		13.16	

Notes Willingness to pay not used in these crash cost determinations. This would raise crash costs by a further $9 billion. A discount rate of 7 per cent is used to discount future labour costs in the human capital method.

The travel delay costs of crashes in table A.4 are based on the length of traffic delays and queue lengths in urban areas.

Not all of these crash costs are road transport externalities as road users, both private and commercial, pay compulsory third party and vehicle damage insurance premiums amounting to $5.38 billion in 1996 (APRA 2000). If these transfers are deducted then this leaves $7.78 billion in uncompensated costs. There are other crash costs that are internalised to private motorists as a group, such as the $0.87 billion in lost labour within households and the $1.77 billion pain and suffering leading to a reduction in the quality of life. If these are subtracted from the uncompensated costs, then the external cost of road crashes becomes $5.14 billion, or 39 per cent of total crash costs.

Again, not all of these external crash costs should be attributed or charged to ordinary motorists but should be targeted, for maximum effect, on those that are causing many of these crashes, namely drunk and speeding drivers. Alcohol is a major factor in 30 per cent of all road fatalities (FORS 1996) and speeding is a major factor in 14 per cent of crashes (Fildes and Lee 1993). There may be some double counting in adding these two figures together and it will be assumed that 40 per cent of crash costs should be charged to these groups of drivers in the form of a charge on alcohol and in speeding fines. This leaves $3.08 billion to be charged to motorists through a fuel charge, or 24 per cent of total crash costs.

This is similar to the 25 per cent of total crash costs determined in Cox and Meyrick (1997) and an OECD figure of 30 per cent quoted in NZMOT (1996). The present externality cost of $3.08 billion is higher than the previous figure of $2.49 billion mainly because the latest BTE crash cost of $13.2 billion is higher than the $9.9 billion crash costs estimated in this previous study of Cox and Meyrick (1997).

Accident costs were allocated to vehicle types and both urban and rural areas in Cox and Meyrick (1997) and this distribution will be assumed in this project. All previous costs were multiplied by 3.08/2.49 = 1.24 and the results are given below.

The allocation of external crash costs to both light and heavy vehicles and to both urban and rural areas are given at the bottom of table A.5.

A.5 Distribution of external crash costs

	Units	NSW	VIC	QLD	WA	SA	TAS	NT	ACT	Australia
Total external cost by vehicle type	**$'000**									
Passenger vehicles		604.1	627.5	473.8	232.4	155.6	52.7	24.5	21.3	2 192.0
Motor cycles		4.4	4.5	3.4	1.7	1.1	0.4	0.2	0.2	15.8
Light commercial vehicles		126.8	121.3	124.6	58.4	30.7	14.2	12.1	3.1	491.3
Rigid and other trucks		33.8	28.2	24.0	11.9	6.3	2.4	1.9	0.7	109.2
Articulated trucks		69.0	81.5	55.1	29.4	17.7	7.8	6.7	0.8	267.9
Buses		6.7	6.0	5.8	3.4	1.9	0.8	1.7	0.3	26.5
Totals		844.9	869.0	686.7	337.1	213.3	78.3	47.1	26.3	3 102.6
External costs by metro and rural regions	**$'000**									
Metro										
Passenger vehicles		379.1	401.0	187.6	155.6	109.3	21.9	14.4	21.3	1 290.2
Motor cycles		2.7	2.9	1.4	1.1	0.8	0.2	0.1	0.2	9.3
Light commercial vehicles		57.6	69.5	43.5	30.8	16.8	5.0	5.8	3.1	232.0
Rigid and other trucks		20.8	19.5	10.6	7.1	4.1	1.1	1.1	0.7	64.8
Articulated trucks		32.4	41.8	18.9	11.1	5.1	2.2	1.4	0.8	113.7
Buses		3.8	3.6	1.9	1.8	1.2	0.4	0.4	0.3	13.3
Totals		496.3	538.3	263.9	207.5	137.3	30.6	23.2	26.3	1 723.3

(Continued on next page)

A.5 Distribution of external crash costs (continued)

	Units	NSW	VIC	QLD	WA	SA	TAS	NT	ACT	Australia
External costs by metro and rural regions (Continued)	**$'000**									
Rural										
Passenger vehicles		225.0	226.5	286.2	76.9	46.3	30.8	10.1	0.0	901.8
Motor cycles		1.6	1.6	2.1	0.6	0.3	0.2	0.1	0.0	6.5
Light commercial vehicles		69.3	51.8	81.1	27.6	13.9	9.3	6.3	0.0	259.2
Rigid and other trucks		13.1	8.6	13.4	4.8	2.2	1.3	0.9	0.0	44.4
Articulated trucks		36.6	39.7	36.1	18.3	12.6	5.6	5.3	0.0	154.2
Buses		2.9	2.4	3.9	1.6	0.7	0.4	1.3	0.0	13.2
Totals		348.6	330.7	422.8	129.7	76.0	47.7	23.9	0.0	1 379.3
		Metro	**Regional**	**Total**						
Light vehicles		1 446.8	1 232.4	2 679.3						
Heavy vehicles		118.2	287.1	405.3						
All vehicles		1 565.1	1 519.5	3 084.6						

Road use costs

The National Road Transport Commission carried out a second heavy vehicle charges determination in 1998 (NRTC 1998). They estimated the expenditures that were attributable to road use only and therefore subtracted items including expenditures on driver licenses and registration from arterial road expenditures ($580 million) and the costs of providing access to private homes from local roads ($1270 million), as shown in table A.6. If these unallocated costs are subtracted from total road expenditures then the costs needing to be recovered were found to amount to $4570 million.

The NRTC methodology also determined the costs which should be attributed to heavy vehicles and to light vehicles and came up with heavy vehicle costs that needed to be recovered through charges of $1390 million, or about 30 per cent of total costs to be recovered. These heavy vehicle costs were recovered through registration charges of $420 million per year and a fuel charge of about 20 cents per litre that raised about $970 million per year.

If the same methodology is used for light vehicles by taking the existing vehicle registration charges as given then the fuel charge can be estimated as only 7.4 cents per litre compared to the heavy vehicle charge of 20 cents per litre, as shown in table A.6.

A.6 Previous determination of heavy and light vehicle charges 1996-97

	Total expenditure	Unallocated	Costs to be recovered
	$m	$m	$m
Arterial roads	4 210	580	3 630
Local roads	2 210	1 270	940
Totals	6 420	1 850	4 570
Heavy vehicle allocation for vehicle use			1 690[a]
Light vehicle allocation for vehicle use			3 190

Determination of fuel charge after subtracting registration charges 1998

	Unit	Heavy vehicle	Light vehicle	Totals
NRTC allocated costs		1 390	3 190	4 580
Registration charges		420	1 865	2 285
Fuel charge	$m	970	1 325	2 295
Fuel consumed	ML	4 750	17 850	
Fuel charge	cpl	20.4	7.4	

Note Light vehicle fuel use from Cox and Meyrick (1997).

Arterial road expenditure figures, as determined by the NRTC, have increased significantly in the last two years, as shown in the following figure and will therefore affect the charges to be recovered at the present time. This increase will not be as dramatic as this figure indicates, though, as an average expenditure over the last three years is taken for the determination.

Local road expenditures have recently been thoroughly reviewed in BTE (2001) and these more accurate figures should be used. The total local road expenditure figure of $2.21 billion in the NRTC second charges determination (NRTC 1998) has risen to $2.71 billion for 1997-98 in BTE (2001) and will rise even higher in the future because of the governments Roads to Recovery programme, which focuses on local roads.

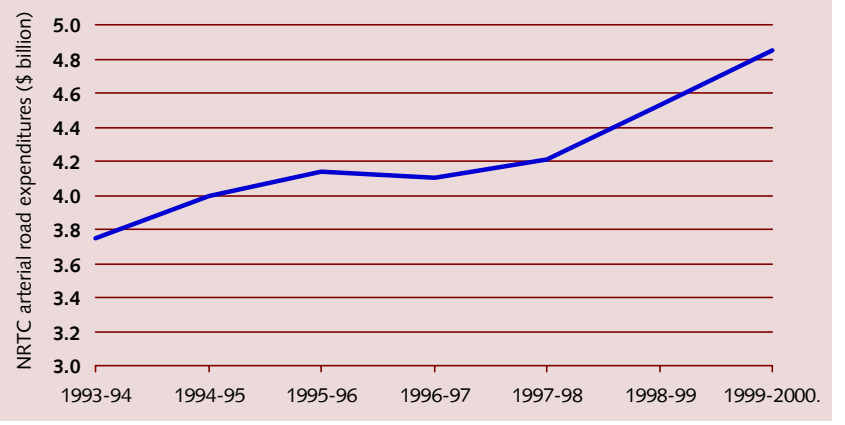
The figure that is used in the NRTC methodology is the expenditure allocated to arterial road use in the local road system (rather than travel to access homes) and in the previous determination this resulted in $950 million out of the $2.21 billion total road expenditure being recovered through the charges system. This was allocated $770 million to light vehicles and $280 million to heavy vehicles.

A different approach is taken in this report as the BTE report found that $1.93 billion of this $2.71 million local road expenditure came from the councils own funds, which are derived from rates on householders who are also users of the roads giving access to their homes. These local government charges/revenue are not considered in the NRTC methodology so that we need to net these charges out to find an uncompensated local roads expenditure of $780 million that needs to be recovered by a road supply user charge. This revised expenditure of $780 million is slightly lower than the $940 million used in the second heavy vehicle charges determination (as seen in table A.6)

There is no recent figure for State registration charges revenue but the trend in recent years is for an increase of about $100 million per year, as shown in chart A.8. The total registration revenue figure of $2285 million in 1997-98 will therefore be increased to $2485 million in 1999-2000.

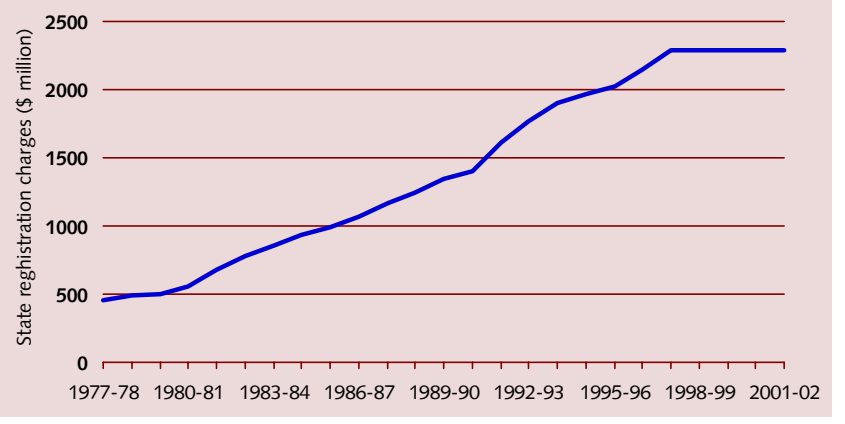
Updated figures for cost recovery in the year 1999-2000 are given in table A.9 where it is seen that the costs to be recovered rise from $4570 million in 1997-98 to $4750 million in 1999-2000. If the split to heavy vehicles remains at the same 30.3 per cent, as in 1997-98, and the revised registration charges are included, then the fuel charges to be recovered from heavy and light vehicles become $1020 million and $1247 million respectively.

A.7 Arterial road expenditures as collected by NRTC



Data source: NRTC (personal communication).

A.8 Trend in State registration charges



Data source: BTE (1999).

A.9 Revised determination of heavy and light vehicle charges 1998-99

Revised allocation in 1999-2000

	Total expenditure	Unallocated	Costs to be recovered	
	$m	$m	$m	
Arterial roads	4 531	559	3 971	New three year average to year 1999-2000
Local roads	2 710	1 930	780	New expenditure less rate revenue
Totals	7 241	2 489	4 751	
Heavy vehicle allocation			1 440	Assumed to be 30.3 per cent
Light vehicle allocation			3 312	

Determination of fuel charge after subtracting registration charges 1999-2000

	Heavy vehicle	Light vehicle	Totals	
NRTC allocated costs	1 440	3 312	4 751	
Registration charges	420	2 065	2 485	Assume $100 m/yr increase in registration revenue
Fuel charge ($ m)	1 020	1 247	2 266	

There is a lack of data about how road expenditures are split between urban and rural areas. Cox (1994) gave figures for the three years 1989-90 to 1991-92 based on the NRTC template of 65 per cent to rural areas while the Cox and Meyrick (1997) study gave a 67 per cent share to rural areas for the three years up to 1994-95. It is known that most of the increase in road expenditures since 1994-95 has gone to urban areas and a figure of 60: 40 for the split to rural and urban areas respectively has been assumed in the analysis.

A.10 Allocation of light and heavy vehicle charges 1998-99

	Urban areas	Rural Areas	Totals
Light vehicles	592	655	1 247
Heavy vehicles	314	705	1 020
All Vehicles	907	1 360	2 266

There is a difference in travel characteristics between light and heavy vehicles as there is more light vehicle travel in urban areas and more heavy vehicle travel in rural areas. The allocation of light and heavy vehicles to urban and rural areas on the basis of travel is given in table A.10.

Fuel consumption in urban and rural areas

The Australian Bureau of Statistics (ABS 2000) gives an estimate of fuel consumption in 1998-99 by vehicle type for each State but not by urban and rural areas. They do, however, give estimates of travel by vehicle type by these two geographical areas, as shown in the table below. Light vehicle travel figures are taken as the sum for cars, motor cycles and light commercial vehicles and heavy vehicle travel figures are taken as the sum of rigid trucks, other trucks, articulated trucks and buses.

A.11 Travel by light and heavy vehicles 1998-99

	Urban travel	Rural travel	Total travel	Fuel consumption
	billion km	billion km	billion km	ML
Light vehicles	90.80	73.08	163.7	19 472
Heavy vehicles	5.23	8.53	13.76	5 061
All vehicles	96.03	81.61	177.64	24 533

Source: ABS (2000).

The fuel consumed is divided into petrol, diesel and LPG/CNG but no distinction will be made in this study between fuel types. That is, any fuel charges determined in this study will be applicable to all fuel types.

To determine the fuel consumed in urban and rural areas from this disaggregated travel data and total fuel consumption data only, it is necessary to assume how much more fuel is consumed in urban areas because of stop-start driving than travelling at more or less constant speeds in rural areas. From a review of the literature (as discussed in Cox and Meyrick 1997) it will be assumed that light and heavy vehicles will consume 20 and 40 per cent more fuel respectively in urban areas. The heavier vehicles give a higher percentage increase for driving in urban areas because of the greater energy needed for stopping and starting.

A.12 Fuel consumption in urban and rural areas 1998-99

	Urban areas	Rural areas	Total
Light vehicles	11 613	7 859	19 472
Heavy vehicles	2 053	3 008	5 061
All vehicles	13 666	10 867	24 533

Summary of fuel charges

The distribution of road supply and externality costs is given in the top panel of table A.13 where costs amount to about $7.0 billion in the year 1998-99. This is significantly higher than the comparable figure in Cox and Meyrick (1997) mainly because full cost recovery, as for the NRTC methodology, has been taken for road expenditures ($4.75 billion) rather than the short term marginal costs of road use ($0.75 billion).

If the actual registration charges are taken as an offset to reduce road user charges and all costs are divided by the fuel consumed by light and heavy vehicles in both urban and rural areas then fuel charges for each of these costs can be estimated, as shown in the bottom panel of table A.13.

It should be noted that registration charges are based on the total of Australian registration charges that are uniform across all States for heavy vehicles but vary considerably for light vehicles. This is consistent with the remainder of the analysis where national figures for crash and road expenditures are taken.

These charges were updated to 2000-01 costs by applying various adjustment factors based on labour, housing and health CPI indices to the various cost components. The final costs are given below in table A.14.

A.13 Estimated allocated costs and road user charges 1998-99

	Units	Light vehicles			Heavy vehicles			All vehicles		
		Capitals	Regional	Totals	Capitals	Regional	Totals	Capitals	Regional	Totals
Allocated costs	$m									
▪ Air pollution		663	0	663	421	0	421	1 084	0	1 084
▪ Noise pollution		148	37	184	246	81	326	393	117	511
▪ Road safety		1 447	1 232	2 679	118	287	405	1 565	1 520	3 085
▪ Road support		592	655	1 247	314	705	1 020	907	1 360	2 266
▪ Totals		2 850	1 924	4 774	1 099	1 073	2 172	3 949	2 997	6 946
Fuel consumption	ML	11 613	7 859	19 472	2 053	3 008	5 061	13 666	10 867	24 533
Road user charges	cpl									
▪ Air pollution		5.7	0.0	3.4	20.5	0.0	8.3	7.9	0.0	4.4
▪ Noise pollution		1.3	0.5	0.9	12.0	2.7	6.4	2.9	1.1	2.1
▪ Road safety		12.5	15.7	13.8	5.8	9.5	8.0	11.5	14.0	12.6
▪ Road support		5.1	8.3	6.4	15.3	23.4	20.1	6.6	12.5	9.2
▪ Totals		24.5	24.5	24.5	53.5	35.7	42.9	28.9	27.6	28.3

A.14 Fuel charges by area and light and heavy vehicles 2000-01

	Light vehicles			Heavy vehicles			All vehicles		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Air pollution	6.0	0.0	3.6	21.4	0.0	8.7	8.3	0.0	4.6
Noise pollution	1.3	0.5	1.0	12.3	2.7	6.6	2.9	1.1	2.1
Road safety	13.8	17.4	15.2	6.4	10.6	8.9	12.7	15.5	13.9
Road support	5.2	8.4	6.5	15.5	23.8	20.4	6.7	12.7	9.4

The light vehicle fuel charge of about 26 cents per litre in both urban and rural areas can be compared with the present excise charge of 38.1 cents per litre. This shows that there is currently an overcharging of all light vehicles of 12 cents per litre. It should be noted that this charge includes allowance for capital expenditure recovery and therefore the application of a congestion charge would be a form of double counting. The alternative would be to only include marginal road use costs (the additional maintenance cost from road use) and to apply a congestion charge on top of these lower fuel charges.

The heavy vehicle fuel charge of 56 cents per litre in city areas and 37 cents per litre in rural areas can be compared with the present excise charge of 38.1 cents per litre for rigid trucks in urban areas and 38.14 – 18.51 diesel rebate = 19.6 cents per litre for rigid trucks in rural areas and articulated trucks in both urban and rural areas. It is seen that there is an undercharging of heavy vehicles of 37.1 – 19.6 = 17.5 cents per litre in urban areas and an undercharging of 55.7 – 19.6 = 36.1 cents per litre of trucks greater than 20 tonnes in urban areas.

The Terms of Reference for the Inquiry stress the effects of fuel prices on the efficient allocation of resources. The undercharging of heavy vehicles, particularly in urban areas, will lead to significant resource allocation decisions which will favour economic and transport growth in urban areas at the expense of rural areas.

Similarly the existence of no fuel charge on CNG and LPG, despite the contribution of these vehicles to road use, crash and noise costs will lead to an inefficient transfer of vehicles to these fuel types and an under recovery of costs. It would be better to keep a constant fuel charge and reduce registration fees to take account of the better environmental performance of these fuel types. Differential registration fees are very effective in moving vehicle fleets towards more fuel-efficient and environmentally friendly vehicle types (Cox 1994).

It should be noted that a significant fall in excise revenue is anticipated over the next 20 years because of the diffusion of excise free fuels (LPG, CNG, electricity, and fuel cells) into the present vehicle fleet. Removing the undercharging of heavy vehicles and excise free fuelled vehicles would help keep fuel charge revenue from falling and being insufficient to finance growing road expenditures (see chart A.7).

There could also be a reduction in costs and charges in the future due to better technology. This is occurring in the reduction of emissions and air pollution costs but could also occur with crash costs and road use costs. The Australian road transport sector is maturing as demand is slowing so that after several major urban road projects are completed there may be a slowing of increases in road expenditures also.

Finally, many economists have recommended that there be a connection between road user charges and road expenditures so that when the costs of air pollution, crashes or road congestion goes up then there will be revenue that can be used to reduce these costs. Conversely if road transport costs decline then there will be less need for this revenue.

This raises the question of where the revenue from these various road use, environment and crash costs should be directed. The present system of charges being directed to the Commonwealth government while the States have responsibility for road use and expenditure is contrary to microeconomic reform in other government utilities where there is a user charging linkage between revenue and responsibility. It is fairly clear that road use costs and some crash cost charges should be directed to road management agencies so as to reduce these road transport costs. Some crash and environmental charges should probably be directed to State health services.

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