INFOMETRICS

Economic Assessment of the Cost Allocation Model

prepared for

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1. Research Brief

This paper presents a summary of the various reviews of the Cost Allocation Model (CAM) that have occurred since 2001, in the context of the following two objectives:

- Assessment of the apportionment of road costs in the CAM, in terms of cost recovery, efficiency and equity.

- Identification of key areas of agreement and disagreement in the previous reviews, and a critical evaluation of any differing viewpoints.

The perspective is from economics, not engineering. Accordingly we start in the next section by outlining a number of premises and economic principles that underlie our assessment and evaluation. Our intention is that arguments and discussion follow logically from these principles so that there is less potential for misunderstanding.

Section 3 presents a brief outline of the CAM. Section 4 summarises the key points raised by previous reviews, with assessment and evaluation being given in Section 5. Overall conclusions and recommendations are presented in Section 6.

Apart from engineering and technical matters, there are a number of other issues that are beyond the ambit of this research:

- full hypothecation of fuel excise duty
- regional fuel taxes
- funding of local roads
- optimal treatment of congestion
- charging for road damage caused by electric cars.

At some stage though these issues will need to be explicitly addressed, whether in the CAM or outside it.

2. Economic Principles and Premises

A number of economic principles and premises form the basis of the review:

1. Road user charges (RUC) and fuel excise duties (FED) were never designed to provide price signals that are finely disaggregated by time and space. Their prime purpose is to recover costs and hopefully provide a reasonable price signal of the long term costs of road use.

2. Except for short term congestion, decisions around road use especially with respect to freight movement involve fairly long-life capital assets – the road network itself and the vehicles. Accordingly for the purpose of enhancing dynamic allocative economic efficiency, long run marginal cost (LRMC) is a more useful concept than short run marginal cost (SRMC or just MC).

SRMC is too time and place specific to send sufficiently consistent price signals about long term infrastructural costs.

3. If expenditure on roading is more or less equal to usage over space and time, if all roads are maintained to a consistent standard (with due regard to differences in use) and if externalities are incorporated, LRMC will provide a stable price signal regarding network economic costs.

4. A good charging system should not be discarded in the pursuit of a perfect system. The policy aim should be for a system that accomplishes as many and as much of the CAM objectives as possible at low cost and, from a dynamic perspective, is not so complicated that different parties are constantly tempted to chip away at various components and undermine it. A constantly changing model reduces confidence and leads to suboptimal investment.

5. The issue of equity with regard to those on lower incomes has no place in an analysis of road pricing. All users should face the correct price signals. If this is thought to lead to an inequitable distribution of purchasing power in the community it should be addressed via the tax and benefit system.

6. If a charge is levied to internalise a negative externality, the degree to which an individual changes behaviour versus just paying the charge is irrelevant.

3. The Cost Allocation Model

Road Costs

The use of a road generates costs in various ways:

- damage to the road (including maintenance and amortisation of initial construction costs)
- congestion
- air pollution (particulates and greenhouse gases)
- noise
- accidents (health, property damage, etc)

Ideally expenditure on roading should occur up to the point where the marginal social benefit equals the marginal social cost. The former concept would include a vast array of benefits such as employment effects,[1] social mobility, and increases in the standard of living that are facilitated by a more efficient transport network. It is doubtful whether an accurate model that captures all social costs and benefits can ever be developed. Any model is a condensed abstraction of reality. Its worth depends on its ability to capture the critical issues and yield insights that can be converted into policies which can be applied to the real world to generate the intended effects.

The CAM model does not deal specifically with the benefit side, although benefits are implicit in the projects approved for expenditure.

[1] See for example Infometrics and Firecone (2003): *An Analysis of the Link between Employment and Access to Transport,* report to Ministry of Social Development, which found that after allowing for reverse causation (from employment to vehicle ownership) household access to private transport has a strong effect on determining rates of employment.

All of the previous reviews agree that the CAM is primarily a cost recovery mechanism. Of interest is the degree to which it does this equitably and efficiently. This depends on two factors:

1. The theoretical structure of the model – what is included, what is excluded, how the variables affect each other and so on.

2. The actual parameter values and base data.

We do not address (2) as these are essentially technical or empirical issues. Thus we discuss the reviews against the background of (1), but before doing so we briefly consider the underlying structure of the CAM.

Allocation Variables

In the list of costs given above, congestion is unusual in that the other costs can occur at any point in space (as in location) and time, whereas congestion is totally defined by space and time. This means that an accurate marginal cost signal for congestion costs requires a very different type of charging system and charging infrastructure than a marginal cost signal for the other types of costs. We return to this point below in Section 5.2.

The fundamental principle of seeking to recover costs from those who generate them is operationally realised in the CAM through the use of four cost drivers:

1. whether a vehicle is powered (PV), that is whether it has a driver – used as an allocator for expenditure such as road markings and landscaping;

2. road space requirements, measured in terms of passenger car equivalents (PCE), but expressed as a function of weight;

3. gross vehicle weight (GVW), used to allocate expenditure relating to strength;

4. equivalent single axles (ESA), a durability parameter used to allocate expenditure relating to road wear and tear.

As far as possible each component of road construction and maintenance is mapped onto one or more of these variables, but there are some types of expenditure that are treated differently. We will address them later.

There is no explicit recognition in the CAM of externalities such as particulate emissions or noise. Insofar as these are well proxied by the above variables this may not be a severe shortcoming in terms of LRMC signalling. For example both particulate emissions and noise probably correlate well with a combination of distance travelled and weight. If so they should ideally be made explicit in the CAM, but developing such an extension of the CAM is beyond the ambit of this report. Accident costs are ostensibly covered in ACC levies and by private insurance.

Efficiency

Setting aside the issue of congestion, how well does the CAM lead to an efficient outcome?

The theory of the second best states that the absence of an efficient market in one area of the economy does not guarantee that pursuing efficiency in other parts of the

economy will be welfare maximising. In the context of the CAM this means, for example, that if local councils decide to adopt an inefficient form of charging for road use, the application a CAM founded on principles of economic efficiency may not lead to a first best outcome in terms of consumer welfare.

This situation might then be used as an argument to alter the CAM so as to compensate for inefficiencies elsewhere in the system. However, such action is usually unwise. Introducing distortions to correct other distortions will almost certainly reduce economic welfare.

Therefore, while we cannot ignore issues such as implicit subsidies to other modes of transport, inefficient charging by local authorities, the setting of MVR fees and so on – issues raised in most previous reviews – we should not let these problems drive an assessment (or indeed reform) of the core parts of the RUC system.

4. Previous Reviews

Since 2001 reviews of the CAM have been undertaken by the following:

- Working Group 2001: *Review of the Cost Allocation Model*.
- Maunselll McIntyre Pty Ltd: *Cost Allocation Model Review: Independent Check of Spreadsheet* (2001).
- NZIER: *Review of the Cost Allocation Model* (2006)[2] and *Literature Review: Road use charging and cost Allocation* (2008).
- Allan Kennaird Consulting: *Review of the Road User Charges Cost Allocation Model* (2007).
- Covec and TERNZ: *Heavy Vehicle Road ser Charges Investigation* (2008).
- McKenzie Podmore Ltd: *Efficiency and Equity Issues in the Funding of Roading Expenditures* (2008).
- Road Transport Forum New Zealand: *Submission to RUC Working Group* (2008).

The main recommendations and/or issues that relate to the economic aspects of the CAM are summarised below. Technical issues are mentioned to the extent that they have conceptual relevance, but they are not addressed in engineering detail.

<u>Axle weight</u>

1. Because of the fourth power rule the ESA dominates all other variables as far as determining RUC rates for heavy vehicles is concerned. A fourth power may not be accurate, with some reviewers recommending lower values, but all seem to agree that road damage is nonlinearly related to weight.

2. One reviewer noted that the fourth power rule makes little difference to RUC rates (contradicting the previous point).

[2] Most of this review was concerned with model technicalities.

3. The use of road friendly vehicle suspensions was suggested by the Working Group as worthy of more investigation before being included in the CAM, but subsequent reviewers have mostly recommended against explicitly including it in the model.

4. Large single tyres should not be included in the CAM.

5. The reference axle loads used in the ESA component should be appropriate to New Zealand roads and conditions.

6. The distribution of weights across axles is an important consideration for some types of vehicle.

7. Linear interpolation of RUC rates at the top end of the scale is distortionary.

8. Back loading is important and needs to be addressed in the CAM, but is probably difficult to accommodate.

9. Graduating the RUC scale in steps of 0.5 tonnes is not cost effective.

Residual costs

10. Residual costs – those not related to road use – are inefficiently funded.

11. Some residual costs should be allocated in proportion to vehicle kilometres and funded via fuel excise duty (FED) and RUC.

12. Deduction of MVR revenue from residual costs is not good practice.

13. The CAM is undermined as it does not provide good signalling of marginal costs, partly because of the way revenue from MVR and local authority rates is handled. Different treatment is recommended in most reviews.

Cross subsidisation

14. PCE km expenditure relates mostly to urban congestion in Auckland and should therefore not be a charge on heavy vehicles.

15. Cross-subsidisation within the CAM is rife – between light and heavy users, between spatial areas, and between transport modes.

16. Spatial use of the networks is unfairly calculated to the disadvantage of heavy users.

17. There is possible cross-subsidisation over long periods of time through the CAM being a Pay As You Go (PAYGO) system rather than being based on cost amortization.

CAM simplifications

18. The RUC system has very high transactions costs ($100m estimated by RTFNZ), so changes are recommended.

19. Locational charging would require electronic monitoring to avoid high transactions costs.

20. FED could be used for all RUC components except road wear (ESA) without significant distortion, but non-road use of diesel would need to be addressed.

21. The deadweight costs of aligning prices to marginal cost using current technology are likely to far exceed potential benefits.

22. Fuel excise duty and licence fees related to weight might be better (fairer and with lower transactions costs) than the current RUC system.

5.1 Discussion of Reviews – areas of general agreement

ESA

The core point about the ESA factor is that for heavy vehicles it dominates everything else in the allocation of costs. This follows unavoidably from the fourth power rule. A 40 tonne load causes over 4000 times more road damage than a five tonne load (other variables held constant). It is imperative therefore that the exponent is correct. While there is debate on what the value of the exponent should be, most technical experts seem to agree with the principle that road damage rises nonlinearly (if not always smoothly) with weight.

Related to ESA are six subsidiary points raised by various reviewers:

1. The linear interpolation of RUC at the top end of the scale is distortionary.
2. Axle weights are not evenly distributed.
3. RUC increments stipulated in steps of 0.5 tonnes.
4. Reference axle loads appropriate to New Zealand roads and conditions.
5. Air suspension could be separately included in the CAM.
6. Large single tyres could be separately included in the CAM.

Because of the fourth power rule, linear interpolation leads to incorrect pricing of RUC licences. For example, the road damage from a 45 tonne truck is less than the average of the damage caused by a 40 tonne truck and a 50 tonne truck (for a given number of axles). Linear interpolation means that the RUC licence for the 45 tonne truck is too high.

A similar effect occurs with regard to axle weights, where a 50/50 split of the load over say two axles causes a different amount of road damage than a 30/70 distribution of the same total load. The fourth power rule means that the axle that has 70% of the weight causes almost thirty times as much damage as the axle with 30% of the weight.

Although not many vehicles are affected by the linear interpolation of rates at the top of the RUC scale, removing the interpolation and changing the way average axle weights are calculated would seem to be straightforward amendments. Of course if the correct ESA exponent is close to unity these points become inconsequential. That is, if the exponent is unity the relationship between axle weight and road damage is linear, in which case linear interpolation between rates is exactly correct. Similarly with regard to axles weights; under an exponent of unity a truck with a 50/50 distribution of weight would generate the same damage as a truck with a 30/70 distribution of weight.

The fourth power effect has also led some reviewers to suggest that RUC licenses be defined in increments of 0.5 tonnes rather than whole tonnes. This would mean for example that a truck carrying 22.2 tonnes could purchase a licence for 22.5 tonnes rather than for 23 tonnes, which would be cheaper. While there is no denying the mathematics of rounding up to the nearest whole tonne, we agree with Covec that setting RUC rates in increments of 0.5 tonnes is spuriously accurate, given the errors associated with weight distribution across axles. Furthermore, as the total revenue collected from RUC is given, the purchase of marginally lower weight licences by most operators would necessitate a small increase in RUC rates, implying negligible cost savings for the majority of operators.

The CAM has a reference axle weight for each vehicle class, defined by the number of axles and the number of tyres. Thus if the reference axle weights are not correct, the relative RUC rates between vehicle classes will be incorrect. Defining the reference axle weights is a technical issue.

There seems to be general agreement that the other two issues, air suspension and large single tyres, do not markedly alter road damage. Furthermore, to the extent that hauliers progressively introduce these options into their fleet as (or if) they become cost-effective, any differences diminish over time. Thus we tend to agree that explicit allowance for air suspension and large single tyres in the CAM is probably not warranted.

Residual cost allocation

Residual costs are those that are essentially unrelated to road use. Examples include road repair related to weather damage and administration. They are often described as 'common and joint' costs. The subject of residual costs raises a bunch of related issues mentioned by various reviewers, particularly McKenzie Podmore Ltd (MPL), that straddle the periphery of the RUC system, such as local authority rates and MVR fees.

While varying from year to year, in broad terms the income and expenditure picture is as follows:

Approximate Current Mix of Income and Expenditure

	$m	$m
Expenditure related to road use		1900
Residual costs		
Not use related	600	
Passenger transport	400	
Other	300	
		1300
		3200
Income from:		
Rates	700	
MVR	200	
Other incl NLTA (-ve)	200	
(excl hypothecation)		1100
Net to fund from RUC & FED		2100
RUC income	1000	
FED income	1100	
		2100

Various reviewers recommend using Ramsey pricing to decide on the allocation of common and joint costs as this causes a lower deadweight loss by minimising the impact on road user behaviour at the margin – see box below. However, the 2001 Working Group, and subsequent reviewers too, sensibly recommended that costs not directly caused by road use be recovered from users on a vehicle kilometre basis, as the associated benefits are accrued in approximate proportion to road use.

Currently, however, these costs are combined with other categories of expenditure, and offset against income from property rates, the MVR and various other crown appropriations, before RUC and FED are determined. With the above numbers RUC and FED raise $200m more than is strictly required to cover expenditure related to road use. This would not happen if non-use related costs were allocated according to vehicle kilometres and properly incorporated into the CAM.[3]

Ramsey Pricing

There is much discussion in the reviews about the benefit of allocating residual costs according to the Ramsey principle – taxing goods and services with a low price elasticity of demand leads to a smaller deadweight losses than taxing those with a high price elasticity of demand.

This principle, however has its limits as deadweight loss rises nonlinearly with the size of the tax. Without wishing to get into a detailed discussion of optimal taxation, which is well beyond the scope of this exercise, general equilibrium theory argues strongly for low uniform taxes in preference to selective high taxes, once externalities have been addressed.

Even just from a practical perspective, relative price elasticity values can be very difficult to determine, making accurate Ramsey pricing difficult to implement.

Although certainly not treated as such in the CAM, one interpretation of the expenditure on public passenger transport is that it compensates for road use externalities such as congestion, noise and (non-GHG) air pollution.[4] Or, going a step further, perhaps the social benefits of public transport exceed the social costs, hence deserving of a subsidy that happens to be (sub-optimally) funded by charging for externalities related to road use.

Congestion presents an interesting 'externality' in that those who create the externality are also largely those on whom the cost initially falls. The aim of congestion charging is to find the balance between those who are prepared to pay for the use of the road at a particular time and place, and the cost of expanding road capacity (net of any compensation to others affected by more or better roading – although note that better roading may produce other benefits such as lower emissions and less noise). However, public passenger transport is a possible alternative to expansions in road capacity, so some part of the cost of passenger transport might be legitimately imposed on road users. This would require more investigation.

Justifying expenditure on passenger transport on the basis of noise and (non-GHG) air pollution caused by road use is rather more tenuous, but if that is the argument such expenditure should feature explicitly in the CAM and be funded from some appropriate

[3] In any year some part of the discrepancy between road use expenditure and income from RUC and FED is likely to be attributable to forecasting errors and project delays, so not all of the $200m is necessarily attributable to theoretical misalignments between expenditure and income.

[4] Greenhouse gases are excluded on the assumption that they will be addressed as part of the Emissions Trading Scheme or carbon tax.

combination of RUC and FED. Implicit funding via sources such as MVR and property rates is likely to be inefficient.

Other expenditure comprises administration costs, subsidies to rail and sea freight, and loosely defined government objectives relating to regional development. Again some of this could conceivably be interpreted as relating to externalities of roads use (but not recognised as such in the CAM). If there is no validity to such argument, then funding for these types of expenditure, along with that on passenger transport, should have no interaction with the CAM – as recommended by most if not all previous reviews.

That is, although not an explicit part of the CAM, they still affect the outcome of the CAM because the total income to be collected from RUC and FED is determined as a residual after income from the other sources has been deducted from total expenditure. This blunts the LRMC pricing signal.

Model Simplification

A key point on which all reviews seem to agree, and we would also concur, is that fuel excise duties can be a reasonable proxy for all RUC allocation variables except ESA. Exactly where one would draw the line between a light vehicle and a heavy vehicle – in other words which vehicles would still be subject to RUC in order to recover ESA related costs – needs further research.

Some reviewers go a stage further and suggest that vehicle licensing fees could be used as a proxy for ESA, with far lower transactions costs. The accuracy of the proxy depends of course on the variance in loads and distances travelled across whatever categories of vehicles might be defined under a new licensing system. For any given vehicle category, is the variance in loads and distances narrow enough that licence fees could be a good proxy for the nonlinear relationship between road damage and axle weight?

That issue aside, replacing all RUC variables except ESA with FED means that small diesel passenger and commercial vehicles could be removed from the RUC system. However, if the CAM is changed in this direction there is the messy problem of off-road diesel use, especially in farming and fishing, to sort out.

The UK uses dyes to distinguish between on-road and off-road diesel use. Another option is some form of rebate scheme. These and other ideas need to be analysed.

In broad terms then, and given the second principle outlined in Section 2, the existing CAM can be expected *a priori* to send a reasonably accurate LRMC signal. Nevertheless, this is not a sufficient condition for retaining the CAM as is. In particular:

1. Do the finer details of the system significantly undermine its LRMC signalling and, more importantly perhaps, can any remaining shortcomings be improved without raising transactions costs by more than the cost of the shortcomings?

2. Or, as noted above, why bother refining the RUC system when a dramatic simplification of the CAM model would work just as well at lower cost?

We now look at (1) as there is less agreement amongst reviewers in this regard.

5.2 Discussion of Reviews – areas of less agreement

A number of issues around the details of scheme, raised by previous reviews, may be undermining the CAM's efficiency and equity.

1. Cross subsidisation – Space and time: congestion
   – Spatial: rural v urban roads, inter-regional
   – Temporal (long term): PAYGO versus amortisation
2. ESA – backloads

Cross subsidisation (congestion)

Both MPL and RTFNZ make the point that building new roads to relieve congestion is largely an Auckland issue, so it is inefficient and unfair to charge users nation-wide for the costs of dealing with it.

Congestion has become so bad in Auckland that in some places it is no longer confined to short time intervals and short stretches of road. Thus its relief is more an issue of fundamental road capacity than of dealing with peak traffic. It seems MPL agree with this, but they still maintain that road users in other parts of the country should not be paying for its relief, nor that heavy vehicle users should be paying for it as they make relatively low use of those roads at peak time. In other words cross subsidisation exists simultaneously over space (regions) and time.

If the congestion problem has reached the stage where roads are busy almost all of the time, the argument that there is cross-subsidisation over time is a *non-sequitur*. The cost of addressing fundamental capacity constraints belongs in the CAM.

If the Auckland problem is truly a peak time issue, then its inclusion in the CAM is inappropriate. As noted in Section 2, the CAM is not suited to dealing with congestion. Congestion by definition is time and place specific, so policies that deal with it must incorporate those two dimensions. Congestion pricing is worth investigating, but is beyond the ambit of this paper. If it is introduced most heavy users are in the fortunate position of being able to avoid the peaks – as they are avoiding them currently.

In the absence of congestion charging or some other model for allocating costs, what is the least distortionary way in which the cost of capacity expansion to alleviate congestion can be recovered in the CAM? Any answer here is likely to be far from optimal with regard to efficiency and equity.

Today's congestion frequently becomes tomorrow's fundamental capacity constraint. Hence spreading the cost through time, but otherwise using the standard CAM methodology should help to reduce distortions in RUC rates and reduce volatility in RUC rates if congestion expenditure is lumpy over time. Amortisation is discussed further below under temporal cross subsidisation.

Cross subsidisation (spatial)

With regard to the spatial dimension of cross subsidisation, there are at least two concerns; cross subsidisation between regions and cross subsidisation between rural roads and urban roads.

The state highway network is exactly that – a network. The value of a network increases with the number of users connected to it, with the speed of traffic through it, and with its reliability – be it a telecommunications network, an energy network or a roading network.

In any network there will always be parts that are being enhanced or repaired. Also the use of different parts of the network will vary overt time with the relative growth rates of different industries and general economic activity. It is not at all clear that varying RUC rates by region (and therefore inevitably over time as well), as different parts of the network are attended to, will improve the allocation of transport resources, given the economic life of those resources.

Operators would face additional uncertainty with regard to RUC rates and would probably average them over the lifetime of their investment in vehicles, effectively obviating the disaggregation by time and space. This conflicts with the fourth principle listed earlier.

There would also be incentives to purchase permits in one region and use them somewhere else, thereby raising enforcement costs. For operators who continually cross regional boundaries calculation of the appropriate RUC rate would be totally impractical. We thus see little merit in adding a regional dimension to RUC, even if it could be implemented at low transactions cost.

Does the same argument apply to urban versus rural roads? Some reviewers have argued that heavy vehicle road users pay for a greater share of state highway costs than is attributable to their use of state highways, with a corresponding too low a share of costs for the use of local roads. The situation for light vehicle users is the mirror image.

Selecting data from some period in the 1990s as MPL have done without any defence of its continuing validity means that one should not use the numbers presented as a measure of the inefficiency of the price signals produced by the CAM. Of course if there are inconsistencies in the CAM output that are attributable to errors in the way expenditure is allocated over the cost drivers in the model, these errors should be remedied. Conceptually, however, one must escape from the mentality of SRMC signalling, which the CAM system can never deliver – and shouldn't. We are not convinced that the LRMC signalling power of the RUC system is significantly adversely affected by temporary spatial inconsistencies unless they are dominated by (time and place specific) congestion.[5]

Cross subsidisation (temporal)

Apart from short term cross-subsidisation related to congestion, there is the issue of funding over long periods of time. From an economics perspective the cost of long-life assets should generally be charged to users over the life of those assets. This is usually accomplished by the amortisation of capital costs. The CAM, however, has no provision for amortisation, operating instead on a PAYGO mechanism. Various reviewers have claimed that this is inefficient. Technically it is, but is it significant? NZIER, in their literature review state three conditions under which annual expenditure is a reasonable approximation of the annualised cost of road provision:

1. The network is neither expanding nor contracting, with reasonably constant road quality.
2. Network expenditure does not fluctuate markedly over time.
3. Traffic growth is relatively steady and covered by the rate on investment in new capacity.

[5] MPL note that the deadweight costs of making prices align with marginal cost using current technology are likely to far exceed the benefits that might arise.

The most significant of these conditions is the second, which Kennaird believes holds reasonably well. The first condition, expansion of the network, is not a serious issue if the composition and capital life of the vehicle fleet is not particularly sensitive to increments in the size of the road network over time. Arguably the main growth in recent years has been around Auckland, and in this regard the rate of investment has not, until recently, kept pace with traffic growth – the third condition. However, this is more an issue of cross subsidisation over space rather than time.

Ultimately this is an empirical issue. It does not seem a huge task to re-run the CAM with the amortisation of all expenditure over the past 10-20 years. Whatever the result, the annualisation of costs will tend to mitigate the effect of regional differences in expenditure. For example, the current dominance of the Auckland region in roading expenditure (be it to address congestion or fundamental capacity) would be softened, but the trade-off is that the effect would persist for longer.

ESA – Backloads

Mentioned by various reviewers, there are two inter-related issues here that arise from the use of the fourth power in the ESA calculation:

1. The averaging of primary and backload weights.
2. Different vehicles/industries have very different ratios of backloads to primary loads.

As discussed above with regard to the distribution of axle weight, under a fourth power rule a simple averaging of weights over each axle produces an incorrect result for the road damage caused by the vehicle. The back loading issue is analogous. Carrying 20 tonnes in one direction and 10 tonnes in the return direction does not generate the same road damage as carrying 15 tonnes each way (under a fourth power ESA rule).

Given this nonlinearity, the ratio of backloads to primary loads can have a significant effect on the average RUC liability for any given vehicle. This is a particular issue in some industries such as dairy processing where primary loads and back loads vary dramatically.

Covec note that in the long run electronic RUCs could provide a means by which additional differentiation in RUC could be related to different load ratios. In the meantime without clear distinctions between vehicle types, differentiated charges would involve high transactions costs and lead to evasive strategies. This probably means that in the short term only highly specific-use vehicles such as milk-tankers and buses/coaches (which are at the other end of the issue – where tare weight is the main contributor to gross weight and vehicles are rarely full) could be readily identified and so differentially charged.

However, trying to find a fair average of primary and back loads that recognises the different patterns of back loading for different types of vehicles, misses the more fundamental point of road damage. Given the distortion caused by linear averaging, there is an argument for charging each vehicle according to its nominal gross laden weight for all kilometres travelled. This would encourage a more efficient use of the truck fleet and completely pre-empt the current problem of double-dipping that occurs when hauliers purchase supplementary lower-weight RUC licences for back trips.[6]

[6] Because RUC rates are calculated for a notional 55% average loading, purchasing lower weight supplementary licences for back trips means that the total outlay is lower than actual costs incurred.

Indeed, apart from special needs such as transporting houses, supplementary licences would no longer be necessary.

Given the cost recovery bottom-line of the CAM, setting RUC rates according to nominal gross laden weight may not change net payments by much, although mathematically there must be an increase in costs for vehicles that currently have high variance in loadings and a reduction in costs for those that are generally close to fully laden. Again this should enhance capital productivity, but as high back loading is not always possible (such as with respect to milk-tankers), the addition to the CAM of a few special vehicle categories should be investigated.

Note, however, that this would involve a fundamental change to the conceptual basis of the CAM in that the nature of the load and the purpose of the vehicle have so far been irrelevant to the RUC rate. Opening the door to vehicle/load type could promote a flood of applications for more such categories – conflicting with the fourth principle (in Section 2) on simplicity and time-consistency.

6. Recommendations

The CAM has served its purpose rather well. Structurally it represents a sound approach to dealing with recovering the costs of road use and presenting users with prices that are a reasonable representation of long run marginal costs. Not all departures from LRMC are attributable to inherent deficiencies in the CAM – the interface between the CAM and other aspects of road funding and expenditure is particularly problematic. That interface aside, as with any model there are trade-offs between theoretical desiderata and the need for transparency, simplicity and low cost. Is it possible to reconfigure the current CAM in a way that reduces the trade-offs?

When the system was devised diesel power represented a useful characteristic by which to identify heavy vehicles – a core requirement of any system that aimed to charge costs to those responsible for them (especially under a fourth power damage function). In recent years, however, more diesel powered four-wheel drive recreational vehicles have entered the fleet and diesel has also become a popular fuel option for light passenger vehicles. Subjecting all of these vehicles to road user charges is unwieldy and, moreover, unnecessary when it has been demonstrated that cost recovery from this vehicle group could be achieved more efficiently via fuel excise duty. Accordingly:

1. The Ministry should investigate removing ‘light’ vehicles from the RUC system and replacing all but the ESA component with fuel excise duty.

2. It should also investigate whether the ESA factor (for any given exponent) can be reasonably proxied by a suitably disaggregated classification of vehicle licence fees.

The CAM is never going to generate accurate short run price signals, such as those required to address congestion. Is was not designed for that purpose. As an indicator of LRMC, however, it is reasonably good, but the following initiatives have the potential to improve the model without incurring high transactions costs:

3. Major externalities that are not included in the CAM (or any replacement model) should be included. Examples are diesel particulates and noise.

4. Equally, however, FED and RUC should not be used as revenue sources for non-road related expenditure.

5. Expenditure related to (time and space specific) congestion should ideally be removed from the model and recovered through congestion charging. If this is not a readily available option the distortion cause by its continuing presence in the CAM could be reduced by converting the CAM from a PAYGO basis to an amortisation basis.

6. RUC rates at the top end of the scale should be calculated properly, not by linear interpolation.

7. RUC rates should be calculated on the basis of each axle and then averaged to obtain a per-vehicle rate, rather than averaging axle weights before calculation of RUC rates.

8. Subject to further analysis, there is a strong argument for removing the 55% average load factor and instead setting all RUC rates in relation to nominal gross laden weight, but:

9. Investigation of whether additional RUC classes can be introduced for particular types of dedicated vehicles such as milk tankers, where primary loads and back loads differ substantially.

A robust case has not been made for spatial disaggregation of the CAM (whether by region or by urban-rural areas). It would increase complexity, volatility and transactions costs without any marked gain in equity or efficiency. Perhaps, with the development of electronic RUC, the case for spatial disaggregation would be enhanced, but any move in this direction undermines the fundamental concept of pricing a network. This is a perilous path for refinement of the CAM.

With regard to the issue of PAYGO versus amortization, conceptually that latter is appropriate, but whether the results would be sufficiently different from what the CAM currently produces is an empirical question.

Local body property rates are a vexed issue. Income from local body rates (and expenditure on passenger transport) distort the operation of the CAM. Most reviewers recommend excluding rates income completely from the CAM unless there are certain types of expenditure that can be directly attributed to property ownership, with rates being reduced accordingly.

The trouble, as the 2001 Working Group pointed out, is that as things currently stand excluding rates income from the CAM would deliver a ‘surplus’ of income and lead to some parties paying twice for some types of road use. A second best solution, that is without the reform of property rates, is difficult to devise, but one option is shown in the table below.

All expenditure related to roads is funded 100% from RUC, FED and vehicle licence fees (excluding ACC as accidents costs are not incorporated in the CAM). Other expenditure is funded from rates in the first instance, with any residual coming from the NLTA etc as required.

Possible Alternative Mix of Income and Expenditure

	$m	$m
Expenditure related to road use	1900	
Not use related, but still road	600	
		2500
Funded 100% (by construction) from:		
RUC+FED+MVR (excl ACC)		2500
Other expenditure		
Public transport	400	
Other	300	
		700
Funded 100% (by construction) from:		
Rates		700
Other incl NLTA (-ve) (excl hypothecation)		0*

* This will not always be zero

Finally there are some technical issues that would appear to merit further research:

- The value of the exponent on the ESA variable – is four the best value?
- The reference axles for the ESA variable.