

**Peer review of marginal external costs research study**

**Freight Marginal External Costs  
Peer Review**

A review of the technical reports compiled by the  
Atkins and Jacobs Consortium on the updated  
methodology and approach to value Freight Marginal  
External Costs.

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## Introduction and Background to the Task

1. The Department for Transport has for many years recognised that there are economic and social benefits of shifting freight traffic from road to rail and canal/coastal shipping and operate a grant scheme to enable this to happen where the traffic flows meet value for money criteria. The core principle is that it is worth paying public subsidy to prevent the marginal external costs (MECs) which would otherwise fall on society. These MECs avoided are often referred to as Mode Shift Benefits.
2. In order to put the principle into practice, it is necessary to define the relevant external cost categories and to provide estimates of the values in each category which can then be used to calculate the Mode Shift Benefits for particular flows and determine whether the subsidy support required to shift the flow is good value for money to society. Naturally, the values used in this process need to be reviewed from time to time; road conditions change, infrastructure costs change, benefit values change, vehicle technology changes. The Department has reviewed the values every decade and this is the latest review which is more comprehensive in nature than the previous one.
3. The broad structure of the problem as defined in this part of the work is as follows. A set of marginal external costs of freight traffic on roads has been defined. These are :
  - Congestion
  - Pollution
  - Infrastructure costs
  - Accidents
  - Noise
  - Environmental assets
  - Behavioural costs to users
  - Upstream external costs of producing the inputs

These MECs then need to be offset partially by the taxes which road transport pays so as to yield the marginal net social benefit of shifting one unit of traffic away from road. The equivalent calculations on the rail and shipping side are outside this current piece of work.

4. On this occasion, the Department decided to use the evidence on congestion and pollution from the National Transport Model, together with internal evidence on the vehicle taxation side, and to commission consultants to provide evidence on the values for bullets 3 to 8 in the list above. In August 2019, the Department asked me to peer review the consultants' work. I have received working drafts, participated in a teleconference, provided comments to the Department and the consultants, and received replies. This is my review of the six draft final technical reports relating to items 3 to 8 on the above list. It is not a systematic audit of the work.
5. A few preliminary remarks are in order. First, in my opinion, the consultants have done a good job in drawing together disparate sources of evidence to produce a coherent set of results. Progress has been made in some areas such as the computation of the upstream external costs, which could be of broader applicability elsewhere in the Department's work (eg via TAG). The comments below should be taken against that overall conclusion. Secondly, the Department has the practical task of welding together the work done on items 3 to 8 above with the internal work on congestion, pollution and vehicle taxation. A particular issue which I have flagged is that all the components of the mode shift benefit calculation need to be in the same unit of account (eg factor costs). Thirdly, several comments are not so much about the consultants' reports as about the challenges of using the results.

## Infrastructure Costs

6. These are the maintenance costs escaped by shifting the traffic from road to other modes. The methodology used reflects the data available and good practice from elsewhere. In some respects, the Department is not in the same position as it was at the time of the Surface Transport Costs and Charges (STCC) report of 2001 on which the previous values were based.
7. A key issue is the need to replace the cost drivers used in the STCC study (gvw kms for structures, standard axle kms for pavement reconstruction etc) by a single cost driver (Equivalent Standard Axles or ESALs). A second key issue is that the vehicle categories are reduced to just two--- rigids and articulated vehicles. The combined effect is to reduce the values per vehicle km relative to the previous values, especially for the rigids. It was explained that this is the most disaggregated vehicle and vehicle km data which could be obtained.
8. My appreciation is that the sort of flows which are under consideration within the mode shift benefit programme are HGV flows using typically 44 tonne 6 axle artics for container etc flows and 30 tonne 4 axle rigids for quarry and other heavy materials movements. Data supplied by the consultants suggests that while the artic category data used in the calculations is reasonably representative of the heaviest artics (possibly with an ESAL adjustment), the rigids data is not representative of the heaviest class of rigids.
9. In contrast, the consultants have been able to use a higher level of area type disaggregation than the STCC report. The issues here concern the statistical robustness and confidence in the individual cell values. In particular the very high values for London roads raise questions about whether the raw data for the London authorities is actually comparable in scope with that for the rest of the country. An issue for the Department is whether to use the results at disaggregate spatial level or simply to use suitably weighted aggregate values for Motorways, A Roads and Other Roads.
10. As the consultants say, a difficult issue is the treatment of road capital costs. Given that the method includes congestion costs, I would agree that including road capacity costs also would be double counting<sup>1</sup>. However, given that vehicle excise duty is included as an offset, it is more arguable that the element of capital cost which is due to heavy vehicles (design standards, pavement thickness etc) should be included. To include structural maintenance but exclude incremental capital costs seems slightly arbitrary. Clearly these costs would need to be calculated on some kind of smoothed multi-year average as in the original Road Track Cost Report.
11. The integrity of this section of the report depends upon any backlog maintenance remaining constant over the period. That is, the rate of spend on maintenance is assumed to be the sum required to maintain the network in a steady state. This point needs to be noted. If that assumption is not correct, an adjustment would be required.

## Accidents

12. The requirement for this category was to update the previous work. The methodology seems proportionate and probably all the data will support, but the Department should note this is a less detailed approach than for some of the other categories where the values are lower.

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<sup>1</sup> Assuming the future congestion costs in NTM are calculated using a fixed base network.

13. In deriving the values, there are two significant issues. The first is the value of the risk elasticity when HGV traffic changes. The second is the proportion of the social costs of accidents which are internalised through the insurance system ---and so are not marginal external costs. If the Department commissions further work on safety modelling and valuation at any point, these parameters should be revisited. Both of them are based on old work or even just simple assumptions.
14. Another issue is that, just as with the STCC report, it has proved impossible to disaggregate the accident data by congestion band. So the implicit assumption that they are uncorrelated should be noted.

### **Noise**

15. The methodology in this section seems appropriate, even quite detailed for this type of application. A number of specific comments were provided to the consultants at an earlier stage and have been addressed.
16. The method depends crucially on the assumption that the value per additional vehicle km is a linear interpolation of the value of a 3db change in the noise level (ie a doubling). A large change in the HGV flow is required to achieve such a change, so the results are sensitive to this assumption.
17. The noise values for Other Roads in urban areas are an order of magnitude higher than the current values. If this category of road is material to the mode shift benefit programme, the sensitivity of the results to the assumption in Para 16 would need to be considered further for this road category. This may depend partly on what level of road type disaggregation is actually used in computing mode shift benefits for specific flows. These values would be capable of changing the relativities between flows with different amounts of urban relief.

### **Environmental Assets**

18. These values are so low as to be well within the margins of error of the values in other categories. I don't have the specialist knowledge to challenge them or offer alternative ways of doing the sums, but I suspect some stakeholders would view them as derisory.
19. I wonder if the 25% penalty factor for landscapes of special value (National Parks, AONBs etc) is the best approach, since it is 25% of so little. Thinking of flows such as the Arcow Quarry or the gypsum flow in the Yorkshire Dales or the cement factory in the Hope Valley, would it be better to recognise such flows with a specific bonus such as 1 or 2 pence per vehicle km for the visual and other benefits of removing this traffic from special landscapes?

### **Behavioural Costs to Users**

20. I'm not familiar with the Murphy et al study on which this section is based and neither do I have any alternative approach or evidence to suggest. So I think this is a reasonable approach to the values which other vehicle drivers place on the frustration associated with being in a platoon of vehicles behind an HGV, and the stress associated with overtaking manoeuvres. Within that approach there are clearly issues about the treatment of multi-lane roads and the consultants have responded to these in their revised text.

21. On reflection, the main issue here is whether the approach captures all sources of behavioural cost to the rest of society. Here are some aspects which are probably not included in that method :
- Fear and danger for pedestrians and cyclists
  - Stress associated with driving alongside HGVs especially in adverse weather conditions, spray, fog etc.
22. It is noticeable that the 'Other' category now adds up to a lot less than the 10% uplift previously used. This may be because 10% was a guess, but another could be that not all sources of frustration, fear and stress are captured by the method.

### **Upstream Emissions**

23. TAG currently assumes that the external pollution costs associated with vehicle use are those created in between the filling station and the tailpipe. But clearly this is not a 'whole cycle' approach and the consultants have drawn on Defra work to try to add the upstream external costs of taking the fuel from crude oil at the refinery to delivered product at the filling station.
24. This is useful progress, and this is a report which potentially adds value beyond the scope of the mode shift benefit application and should be considered for inclusion in TAG.
25. At this stage, the values are restricted to the fuel inputs because there is very limited evidence on the net value of the externalities in metals and other inputs in HGVs versus locomotives and wagons and on the net externalities involved in scrappage. Effectively, it is being assumed that diesel powered HGVs are displaced by electric trains generated at the margin by renewables. Within the levels of uncertainty which apply to the values generally, this seems a reasonable assumption.

### **Implications for the Department in applying the results**

26. At a cross-cutting level, the most important generic issues are :
- How to map across from the categories HGV1 and HGV2 to the specific vehicle types likely to be displaced by the grant/subsidy scheme. My provisional view is that the Rigids category in NTM is unrepresentative of the type of heavy rigid vehicle which might be displaced in carrying heavy materials flows and should not be used. The Artics category values should be used for all flows, possibly with some adjustment to the ESALs in the Infrastructure cost category.
  - What level of spatial and road type aggregation to use. There is a great deal of variation between road types, congestion levels and urban/rural which must be reflected in the scheme. Whether this should be extended to region eg London, North-East etc and whether the data is robust enough to support this is, to my mind, dubious.
27. Particular issues which deserve consideration are :
- Whether incremental capital costs associated with provision for HGVs should be included. This is linked to the treatment of VED which is outside my remit.
  - Whether the assumption is valid that the annual rate of maintenance spend is at the right level to maintain the road network at constant quality level.
  - The values of the risk elasticity and proportion of accident costs internalised in insurance premiums

- Whether the interpolation method used to generate the noise values is sound enough to use.
- Whether there are still residual omissions which should be recognised (landscape and visual effects in sensitive areas ; fear and stress for pedestrians and cyclists for example)
- Whether the upstream external costs of fuel generation and delivery to the filling station should be recognised more generally (e.g. in TAG).

28. This report is a source document for the Department with a currency of ten years, subject to review and updating if particular values and parameters within TAG change during the period.