Department for Transport

Value for Money of Tendered Bus Services

Moving Britain Ahead

February 2016

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1. Executive summary

1.1 Local authorities are responsible for tendering local bus services. These services are unlikely to be commercially profitable and to run without local authority support. A route may be unprofitable if the costs of running it outweigh the commercial benefits. These routes are more likely to be in areas where population and demand are lower e.g. in rural areas. However tendered services can also exist in more urban areas as services with low occupancy on routes of socio-economic significance for the local community.

1.2 Local authority tendered bus services typically fall into one of two categories: day services that provide links to employment, education and local services; and evening and Sunday services which support shift workers as well as leisure travel. In both cases, insufficient demand and local geography combine to make these routes commercially unattractive.

1.3 This note presents an assessment of the value for money (VfM) of tendered services in England, excluding London.

1.4 The analysis is broken down by metropolitan and non-metropolitan areas.

1.5 The monetised benefits of tendered bus services include:

- benefit to passengers who are able to travel on the services and access work, leisure, education etc.,
- net profit to bus operators, which is made up of fare revenue and tendering subsidy, net of operating costs,
- net effect on road congestion from reduced car journeys and increased bus trips, and
- net effect of greenhouse gas emissions from reduced car journeys and increased bus trips.

1.6 The monetised costs are the local authority costs of tendered services.

1.7 For every £1 of local authority costs, we estimate that the benefits are £2. This is high value for money[1] and varies between metropolitan (£2.90 for every £1 of cost – high VfM) and non-metropolitan areas (£1.50 – medium VfM).

1.8 The operating cost data used in this analysis is likely to be an overestimate. We have included a sensitivity test, where operating costs are adjusted to reflect the lower cost of buses and equipment that may be used in tendered services. With this adjustment, the estimated benefit of tendered services in England (outside London) increases to £2.50 for every £1, which is high value for money. The benefit in metropolitan areas is £3.20 and in non-metropolitan areas it is £2.10 for every £1 spent, which is high value for money in both area types.

[1] Department for Transport (DfT), Value for Money Assessments. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/255126/value-for-money-external.pdf

1.9 The analysis does not capture the positive distributional impact of tendered bus services. People from more disadvantaged socio-economic groups are more likely to rely on bus transport due to lower car ownership[2] and lower average income.

1.10 Although tendered buses in non-metropolitan areas, especially rural parts, have lower occupancy due to higher car ownership, individuals in those areas without access to a car would be very isolated in the absence of a bus service. For those people the alternatives would be to walk, cycle, car share or use taxis; some of these might not be practical or simply too expensive. These individuals' loss of wellbeing in case tendered services are withdrawn has not been estimated in this analysis.

1.11 Further benefits from tendered services, which have not been estimated in this paper, could include:

- productivity benefits and tax receipts associated with the bus services that help people access better paid employment,
- greater local area spending from helping passenger access more markets, and
- cost savings to health authorities from improved access to preventative healthcare.

[2] DfT (2015) National Travel Survey 2014, statistics table nts0703

2. Value for money of tendered services

2.1 The Department for Transport (DfT) has undertaken an assessment of the value for money of tendered bus services in England outside of London[3]. Local authority tendered bus services typically fall into one of two categories: day services that provide links to employment, education and local services; and evening and Sunday services which support shift workers as well as leisure travel. In both cases, insufficient demand and local geography combine to make these routes commercially unattractive.

2.2 Early, late and Sunday services could potentially help shift and part time workers participate in the 24-hour economy whilst day services are able to help residents access local services such as healthcare. Tendered buses could also help maintain the independent living of elderly residents who are able to socialise and access local amenities using their concessionary travel bus pass.

2.3 Some assumptions have been made about the operating practices of bus operators and passenger behaviour.

2.4 The assessment considers local tendered bus services using the latest available data (mainly 2013/14).

2.5 There are uncertainties about some of the data inputs used in the analysis and sensitivity testing was used to estimate the effect on the value for money.

2.6 We acknowledge the possibility that some of these services could exist without tendered support. Although tendered services are highly likely to be commercially unviable, some bus operators could choose to run them in order to maintain a brand presence or consumer goodwill. Additionally, some tendered services play an important role in connecting passengers to the onward bus network and supporting demand more widely for bus operators. This would reduce the value for money of tendered bus services estimated in this paper.

Outline of costs and benefits

2.7 The cost-benefit analysis (CBA) of tendered bus services has been developed following principles from the Treasury's "Green Book"[4] and DfT's own guidance on transport scheme appraisal[5].

2.8 In line with those, all costs to government for procuring tendered services are treated as the costs of tender bus services, within the cost denominator.

2.9 The other costs captured in this analysis are those borne by society, such as fares and environmental damage from extra bus operation, and those borne by bus

[3] We have consulted the Urban Transport Group's (formerly Passenger Transport Executive Group) "The case for the Urban Bus" (2013) and members of the Association of Transport Coordinating Officers (ATCO) in establishing parts of the methodology in this paper.
[4] HM Treasury (2011) The Green Book: Appraisal and Evaluation in Central Government
[5] DfT (2014) Transport Appraisal Guidance TAG Unit A1.1 Cost-Benefit Analysis

operators - namely running costs[6]. They are treated as negative benefits (dis-benefits) in the benefits numerator of the CBA. This means that the analysis captures the net benefit to society obtained for each £1 of government expenditure.

2.10 The rationale behind government spending on tendered bus services is that demand on these routes is not sufficiently high, to allow bus operators to generate an adequate surplus. These services would require higher fares to run given the low patronage. However, if fares were increased, this would put some consumers off and even fewer passengers would be willing to travel, meaning the services are not self-sustaining. Despite this, there is sufficient demand for the service that the overall benefits from a social point of view are likely to outweigh the costs to operators and government. We find that tendered bus services have a positive net present value[7] (NPV) and a benefit to cost ratio (BCR) of 2.

2.11 Table 1 illustrates the types of benefits borne by society and bus operators, as well as the dis-benefits and costs to government.

2.12 The data sources for the analysis and explanation of the methodology are provided in the Annex.

Benefit	**Explanation**
User benefits	The monetised benefit of consumers paying less to travel than the maximum they would be willing to pay (consumer surplus). This category also includes social benefits such as socialisation, access to local services and wellbeing, as passengers' maximum willingness to pay for a fare is assumed to correspond to the benefit they would get from such activities.
Fare revenue Operating costs Subsidy payments to bus operators	Fare revenue is the sum of fare-box received by bus operators for providing the service. The operating costs to bus operators increase as a result of carrying passengers and are listed as a dis-benefit. Subsidy payments from government to bus operators are included as a benefit, however the administrative costs to local authorities in tendering services have been netted off.
Non-user benefits: Car decongestion Bus congestion	The availability of bus services means that some passengers switch from cars to buses, which reduces external costs of congestion, accidents, air quality problems and infrastructure degradation. Conversely the buses that carry these passengers create new congestion costs.

[6] We assume that all tendered bus services are tendered through minimum subsidy contract, whereby bus operators receive a fixed amount of subsidy, but they pay all running costs and collect the fare-box revenue. The subsidy makes the routes viable for operators as the fare-box revenue alone would not cover the running costs. In practice, bus services are also tendered through minimum cost contracts, whereby bus operators are paid a fixed amount aimed to cover the entire running costs of a service, as the local authority collects all fare-box revenue. However, we have assumed that all local authorities use minimum subsidy contracts because it is a more conservative approach - it does not take into account the revenue generated by local authorities when they collect fare-box from services let through a minimum cost contract. Incorporating local authority revenue receipts would reduce the cost to government of running tendered services, and increase the benefit to cost ratio of the analysis.

[7] Net present value is the net benefit of a scheme after all costs and dis-benefits are netted off. Costs and benefits occurring in the future are discounted, to reflect that consumers value the present more than the future and that the expected economic growth will make future monetised gains slightly less attractive, as incomes are expected to rise.

Benefit	Explanation
Carbon benefits	The net effect of reduced greenhouse gas pollution from car switching and increased pollution from trips made by individuals who would not have travelled in absence of the service.
Cost	**Explanation**
Cost of tendering services	The costs of running tendered services, including subsidies to bus operators and the administrative costs to local authorities.

Table 1 Tendered bus services costs and benefits explained

Results of the analysis

	Metropolitan areas	Non-metropolitan areas
Tendered service patronage	70 million	156 million
Total tender subsidy paid	£122 million	£195 million
Total tendered route length, million km	72 million km	229 million km
Operating costs per bus vehicle km[8]	£2.02	£1.86

Table 2 Tendered service patronage, tender subsidy and operating costs - metropolitan areas and non-metropolitan areas, 2013/14, England excluding London

Source: DfT Bus statistics tables bus0112, bus0205, bus0408[9]

2.13 Table 2 shows that in 2013/14, the total annual tender subsidy was lower (£122m) and fewer passengers were carried (70 million) in metropolitan, compared to non-metropolitan areas, where local authorities paid £195m in subsidy and carried 156 million passengers. Operating costs per bus vehicle kilometre were higher in metropolitan than in non-metropolitan areas, which could reflect metropolitan areas' more advanced on-board equipment, slightly newer buses and greater congestion that leads to lower fuel efficiency. Although running costs per vehicle kilometre are on average lower in non-metropolitan areas, longer average journeys lead to higher running costs per passenger.

£m	
Benefits (total)	**£677**
User benefits	£810
Non-user benefits	£14
Bus operator fare revenue	£239

[8] Operating costs are a combined average for commercial and tendered bus services, as data for tendered services alone is not available. This means operating costs are likely to be an overestimate. This is addressed later on in the paper. Additionally, the costs will vary between specific tendered services, depending on whether the service relies on greater utilisation of existing buses in the fleet such as in the case of an evening service or whether additional buses and staff have to be employed from scratch as with an all-day service.

[9] DfT Bus statistics tables can be accessed at https://www.gov.uk/government/collections/bus-statistics

£m	
Subsidy payment to bus operators	£233
Operating costs	-£606
Carbon	-£13
Costs to Government	**£333**
Net Present Value	£344
BCR	**2.0**

Table 3 Cost benefit analysis of tendered bus services – combined metropolitan and non-metropolitan areas[10]

Source: DfT analysis

2.14 Table 3 outlines the estimated value for money of tendered bus services. For every £1 of local authority costs, we estimate that the benefits are £2. This is high value for money[11].

2.15 Table 3 shows that there are significant benefits to users (£810m). Additionally, bus operators benefit from £239m in fare revenue and a further £233m in subsidy payments. The net effect of removing car congestion as passengers switch to buses, and the extra congestion from tendered bus services is estimated to be £14m (labelled as non-user benefits in Table 3).

2.16 Offsetting these benefits are £606m in bus operating costs and £13m net damage cost to the environment. Although the tendered bus services encourage some passengers to switch from cars to bus (thus helping the environment), the existence of these bus services creates a market for passengers who would not have otherwise travelled, and a number of new journeys are generated.

Comparison between metropolitan and non-metropolitan areas

£m	Metropolitan areas	Non-metropolitan areas
Benefits (total)	**£360**	**£317**
User benefits	£380	£430
Non-user benefits	-£4	£18
Bus operator fare revenue	£58	£181
Subsidy payment to bus operators	£88	£145
Operating costs	-£159	-£447

[10] The costs to government are based on the Net Public Transport Support for buses, reported in DfT statistics table bus0502. Due to the nature of the data collection, these figures contain some overheads and transfers within local authorities. We have made a conservative assumption that 30% of the reported cost to government is spent as overheads and transfers, meaning that only £233m of the £333m cost to government reaches bus operators in the form of tendered subsidy.

[11] DfT, Value for Money Assessments. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/255126/value-for-money-external.pdf

£m	Metropolitan areas	Non-metropolitan areas
Carbon benefits	-£3	-£10
Costs to Government	**£126**	**£207**
Net Present Value	**£234**	**£110**
BCR	**2.9**	**1.5**

Table 4 Cost benefit analysis of tendered bus services – by area type

Source: DfT analysis

2.17 As Table 4 shows, tendered services have a positive NPV of £344m per year with £234m of this being generated in metropolitan and £110m in non-metropolitan areas. The BCR varies between metropolitan (2.9 – high VfM) and non-metropolitan areas (1.5 – medium VfM). This is mainly due to a) the higher subsidy paid to non-metropolitan areas, as shown in Table 2, and b) the higher running costs per passenger of non-metropolitan area services. However, even in non-metropolitan areas tendered services represent a fairly good return for the taxpayer as they are medium value for money.

2.18 The analysis shows that the majority of user benefits are generated in non-metropolitan areas, as a result of the higher patronage there. These areas also generate the greatest level of greenhouse gas pollution, due to the longer trip lengths and higher demand.

2.19 It is important to note that in metropolitan areas the net effect of fare revenue, subsidies and operating costs is slightly negative (-£13m) compared to non-metropolitan areas where it is more significantly negative (-£121m). This should not be interpreted to indicate that bus operators make a loss on these services. However, the operating cost data used in this analysis is likely to be an overestimate[12]. Bus operators would expect to at least break even when running tendered services, so we have included a sensitivity test where operating costs are adjusted so bus operators make a small surplus (see Sensitivity testing section).

2.20 The NPV and BCR comparison between metropolitan areas and non-metropolitan areas needs to be made in the context of passengers' access to alternative modes of transport in those areas. Although the BCR of tendered services is medium VfM in non-metropolitan areas, the fact that a significant minority of people would be left with no viable transport alternatives without those services, could improve the value for money and strategic case for tendered bus services. In rural towns 15% of households do not own a car, a relatively large proportion, and this drops to 6% in rural villages and hamlets[13], which is not an insignificant proportion either. Tendered bus services are a very important lifeline to these communities and households without a car could face considerable difficulties without such services. For those households the alternatives would be to walk, cycle, car share or use taxis; some of these might not be practical or simply too expensive. These individuals' loss of

[12] Operating costs are an average of both commercial and tendered services. They are likely to be an overestimate for tendered services because bus operators might use older vehicles and spend less on extras for tendered service provision, as the routes they serve are not usually part of their flagship commercial offer.
[13] DfT (2015) National Travel Survey 2014, statistics table nts9902

wellbeing in case tendered services are withdrawn has not been estimated in this analysis.

2.21 The analysis does not capture the positive distributional impact of tendered bus services. As the lowest car ownership tends to be observed in the lowest income households[14], it is likely that the households which rely on tendered services also have smaller income on average. This makes tendered bus services yet more important for them as they have fewer viable options e.g. buying a car or using taxis if the bus links no longer served them.

2.22 There could be further benefits not included in the estimated costs and benefits above:

- productivity benefits and tax receipts associated with the bus services that help people access better paid employment,
- greater local area spending from helping passenger access more markets, and
- cost savings to health authorities from improved access to preventative healthcare[15].

Assumptions and uncertainties

2.23 The costs of operation are likely to be different from those estimated. It is uncertain how applicable the assumed costs might be to the operating conditions of tendered bus services and what surplus operators generate from running them. Given that operators require a subsidy in the form of a tender price to operate these services, it could be assumed that once it is taken away, services are likely to be withdrawn or fares to rise.

2.24 The variation in BCRs between metropolitan and non-metropolitan areas is mostly down to subsidy and running cost estimates. In practice, we might also expect the size of wider benefits to vary between metropolitan and non-metropolitan areas on a per-passenger basis. This is due to the network effects of greater transport connectivity and agglomeration of higher productivity organisations in metropolitan areas. The access to jobs and services is greater in metropolitan areas, potentially increasing the value per trip, although some of this is captured in the BCR through passengers' user benefits.

2.25 The user benefits have been calculated using evidence taken from research which covers both commercial and tendered services. This data might not be fully representative of passenger behaviour in the tendered market although it is uncertain whether as a result, benefits might be higher or lower.

2.26 Although tendered services are commercially unviable, there is a possibility that some might run commercially if government subsidy was removed. Although these services are likely to be loss-making and to tie up bus operator resources away from more profitable routes, there could be strategic reasons for operators to run them. Operators could choose to maintain customer goodwill or brand presence through such services.

[14] 47% of households the lowest income group did not have a car compared to 12% in the highest group and 24% in England. See DfT (2015) National Travel Survey 2014, statistics table nts0703

[15] Public transport offers access to healthcare and could lower health spending marginally, through the preventative role of health appointments as well as access to treatment. See Victoria Transport Policy Institute (2010) Evaluating Public Transportation Health Benefits and DfT (2013) Valuing the social impacts of public transport: final report.

2.27 If this is the case, the benefits of these services must be subtracted from the benefits of the central case, as they would still accrue in the absence of government subsidy. The costs for tendering such services remain, as government would be subsidising activity, some of which the private sector could provide itself. It has not been possible to quantify this effect due to a lack of evidence of how bus operators might behave if tendered services were withdrawn.

2.28 It is likely however that bus operators would not put a significant amount of tendered services into commercial operation if tendering was withdrawn. Table 5 shows that commercial network mileage only recovered to its pre-recession levels in 2012/13. Some 15 million kilometres of commercial mileage was added in 2013/14, compared to 21 million km of tendered services lost - some of this new commercial mileage could be recovering lost tendered routes. However, commercial mileage has only surpassed its 2007/08 levels for one year of available data. Thus, the recently added commercial mileage is more likely to be replacing commercial corridors lost during the weaker economic climate.

	million vehicle km		*percent*	*million vehicle km*		*percent*
Year	England excluding London	Change on previous year	Change relative to 2007/08	England excluding London	Change on previous year	Change relative to 2007/08
Commercial				**Tendered**		
2007/08	1,285	-	-	379	-	-
2008/09	1,272	-13	-1%	393	14	4%
2009/10	1,245	-27	-3%	396	3	4%
2010/11	1,251	6	-3%	389	-7	3%
2011/12	1,266	15	-1%	352	-37	-7%
2012/13	1,283	17	0%	322	-30	-15%
2013/14	1,298	15	1%	301	-21	-21%

Table 5: Comparison of commercial and tendered bus mileage

Source: DfT statistics table bus0201

Sensitivity testing

2.29 Given the uncertainty in the operating cost data, inputs sensitivity testing has been carried out to see how the BCR changes when bus operators break even or make a small surplus.

2.30 Lower operating costs (by -25%) were tested to reflect the generally “no-frills” vehicles and equipment used in tendered services. At this level the operating costs are approximately equal to the fare revenue and subsidy received by bus operators, with a small surplus as shown in Table 6.

£m	Lower operating costs (-25%)
Benefits (total)	**£829**
User benefits	£810
Non-user benefits	£15
Bus operator fare revenue	£239
Subsidy payment to bus operators	£233
Operating costs	-£455
Carbon benefits	-£13
Costs to Government	**£333**
Net Present Value	£496
BCR (England, excluding London)	**2.5**
BCR metropolitan areas	*3.2*
BCR non-metropolitan areas	*2.1*

Table 6 Lower operating costs sensitivity, combined metropolitan and non-metropolitan areas

Source: DfT analysis

2.31 With lower running costs, the BCRs increase to 3.2 in metropolitan and 2.1 in non-metropolitan areas respectively. This 25% lower level of operating costs also leads to a small surplus for bus operators when subtracting costs from fare revenue and subsidy receipts.

Conclusion

2.32 Tendered bus services provide a number of benefits to local communities and high value for money overall. They generate between £2 and £2.50[16] for every £1 of local authority spend.

2.33 These figures do not include wider benefits such as productivity gains in the economy, additional spending in local markets or health authority savings from improved access to healthcare and preventative treatment, enabled by bus transport.

2.34 Tendered services also provide a vital transport lifeline to some communities where no other low-cost or easily accessible transport alternatives exist. This is the case with rural services where although only a minority of households do not have access to a car, without their tendered local bus service those households could remain isolated.

2.35 In theory, some bus operators might choose to run specific tendered service routes commercially if local authorities stopped funding them. Such bus operators might be willing to sustain losses on those services in order to maintain brand presence, consumer goodwill or onward connections to the rest of their bus network. This would reduce the reported benefit of tendered services as some of the benefits would take place without government spending.

2.36 However, this is likely to be an exception as evidence on bus operator profitability suggests that although a number of operators might have healthy profits, some operate on low margins[17]. Profitability varies by individual area and the provision of services is likely to vary greatly, meaning the absence of tendered services can take away the guaranteed provision of bus services to communities where it plays an important socio-economic role.

2.37 Additionally, the commercial bus network only recovered to the 2007/08 levels in 2012/13. It is unlikely that recent commercial mileage recovery has picked up much of the tendered network as the latter are usually the most marginal if not wholly unprofitable routes. Bus operators are likely to prioritise recovering “prime” sections of the network lost during the recession or those borne out of changes to bus demand since then.

[16] The range is obtained from the figure presented in the initial cost-benefit analysis in Table 3 and the sensitivity for lower operating costs in Table 6.

[17] Evidence on bus profitability has been obtained from TAS Business Monitor available at http://www.tas-passtrans.co.uk/content/index.php (subscription based) and Competition Commission (2011) Local bus services market investigation.

Annex A: Technical annex

The value for money assessment was modelled using a number of data sources. This annex explains more of the CBA methodology.

This technical annex splits the benefits up between consumer, operator and non-user benefits of tendered services.

A.1 **User Benefits (Consumer Surplus)**

The consumer surplus represents the user benefits associated with local authority tendering. This is a measure of the difference between the fare consumers pay for bus services and the maximum they would have been inclined to pay. Consumers are assumed to be rational and to be able to estimate the potential benefit of a bus trip and weigh it up against the fare. The maximum they would be willing to pay for a fare is assumed to equal the maximum benefit to them from the journey. This includes social and economic benefits.

An exponential demand function has been used to calculate the consumer surplus:

$$Q = \alpha . e^{(\beta \times p)}$$

User benefit from tendered services is the net consumer surplus estimated from the market demand function above, minus the sum of all fares paid to bus operators. This is the net surplus between what a customer is willing to pay and what they end up paying for a service. The formula above can be rearranged to calculate the area under a curve which is equivalent to the user benefit:

$$Consumer\ surplus = \left(\frac{Q}{\beta}\right) \times \left(\ln\left(\frac{Q}{\alpha} - 1\right)\right) - (Q \times p \times \%\ fee\ paying)$$

Key:
Q = Demand for bus services (patronage)
p = Price of fare
α= Constant (base demand when price equals zero)
β = Price elasticity of demand (indicates the change in demand for a given change in price)

This model and the parameters α and β have been derived from TRL[18].

The price of fares has been assumed to be set at around £1.20 in metropolitan and around £1.70 in non-metropolitan areas, based on available evidence on fares, previously submitted to DfT by bus operators.

[18] TRL (2004) The Demand for Public Transport: A Practical Guide

The patronage has been obtained from DfT statistics table bus0112. Patronage figures are based on a 3-year average from the latest data to normalise variations in the data.

A.2 **Operator benefits**

We have assumed that bus services are tendered under a minimum subsidy contract. Under this contract model, the local authority pays bus operators a fixed amount for their services, whilst the bus operators bear the running costs and collect fare-box revenue. The subsidy helps the operators reach a sufficient surplus to make the tendered routes viable.

When operating tendered bus services, bus operators gain fare revenue and incur operating costs. The cost of running a bus service varies due to differences in operator, region and route-specific conditions. However, average operating costs per kilometre have been calculated for metropolitan areas (which exclude London) and non-metropolitan areas. Additionally, the tender subsidy payment to bus operators has been recorded as a benefit. Notably, the statistics published by DfT on the cost of tendered bus services[19] include some local authority overheads, and a small amount of other subsidies and transfers, which are not part of tendered services. Although appropriate as a measure of cost to government, these figures have been revised down to account for these overheads, using a factor of 30%.This is likely to be too high as a measure of the overheads incurred in tendering, but it provides a conservative estimate by decreasing the net subsidy that bus operators receive as a benefit.

In practice, some tendered service contracts are let through minimum cost contracts, where local authorities collect all the fare-box revenue, but contract values are higher in order to reimburse bus operators for all of their running costs. Assuming that some services are let through minimum cost contract would mean that the revenue from these services is recorded as a reduction in cost to government in the CBA, which would increase the BCR. Thus we have chosen to assume all tendered services are let using minimum subsidy contracts, in order to produce more conservative value for money estimates.

Formulas used:

Revenue gain = average fare * patronage
Operating costs = bus km * average operating cost
Subsidy payment to bus operators = cost to government of tendered bus services * 70% [subtracting 30% overheads from reported subsidy figures]

See A.1 for data sources on fares and patronage.

Bus kilometres have been obtained from DfT statistics table bus0205 and operating costs from DfT statistics table bus0408. Subsidy payments have been obtained from DfT statistics table bus0502 and figures are based on a 3-year average from the latest data to normalise variations in the data.

A.3 **Non-user benefits**

WebTAG provides values for the marginal economic cost of cars (MECC)[20] by congestion, infrastructure, accidents, local air quality noise, greenhouse gases and indirect taxation.

[19] DfT statistics table bus0502
[20] DfT(2015) WebTAG Databook: Unit A5.4

WebTAG breaks MECC down every 5 years, with values for 2010 and 2015. Greenhouse gases have been excluded from the overall MECC and the carbon impacts of tendered services have been calculated instead (see below).

The car to bus mileage diversion factor is assumed to be 31%[21], based on evidence from TRL.

Formula used:

MECC [reported per km of diverted car trip] * 31%[22] [car to bus mileage diversion factor] * total length of tendered service trips

A.4 **Carbon Benefits**

Carbon emissions were calculated through the change in bus and car kilometres, resulting from the introduction of tendered services. The reduction in car journeys is a result of modal shift from cars to buses due to tendered services. Due to modal shift, there will be a decrease in car kilometres whilst the tendered bus services will lead to an increase in bus kilometres. Changes in mileage were multiplied by the carbon values available from WebTAG[23].

[21] TRL et al (2004) The Demand for Public Transport: A Practical Guide
[22] TRL et al (2004) The Demand for Public Transport: A Practical Guide
[23] DfT (2015) WebTAG Databook: Unit 3.4