A National Statement on Local Bus Infrastructure Executive Summary

greener journeys

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June 2014

This document presents the case for a 'national statement on local bus infrastructure' to promote long term investment in bus related infrastructure and priority measures.

Rationale for a National Statement

There are 5.1 billion journeys made each year in Great Britain by bus. That's more than three times the number of journeys undertaken by rail and four times the number of journeys on the London Underground. Buses support economic growth, improve our health and quality of life and are good for the environment. They are an essential part of vibrant, sustainable communities.

Although road traffic levels have remained relatively stable during the recent recession, traffic congestion in urban areas remains a stubborn and costly problem - reported by the Cabinet Office to cost the UK economy at least £11 billion per year.

The solution to this problem lies in making better use of existing road capacity through targeted investment in local bus infrastructure and selective priority measures that improve the performance of the transport network as a whole.

This improved network performance will cut delays, reduce congestion, improve the environment and increase road safety. It will also reduce transport costs and support economic growth by allowing businesses to more easily connect with potential suppliers, provide consumers with improved access to a wider range of suppliers and improve the functioning of the labour market, allowing skills to be better matched to employment opportunities.

Working with KPMG LLP, we estimate that targeted investment in local bus infrastructure and selective priority measures will typically generate £3.32 of net economic benefit for each £1 of cost incurred, with further benefits expected in related policy areas such as social welfare and public health. This level of return represents high value for money according to the Department for Transport's appraisal guidance.

Unlike the rail network, and now the strategic road network, there is no national-plan or policy-statement for investment in infrastructure to improve bus services and no statement of what the Government wants the bus sector to deliver in return for public funds and resources.

The devolution of transport funding and decision-making to the Local Growth Fund and Local Enterprise Partnerships respectively means that transport schemes will need to compete with other growth initiatives for capital investment. In this new environment it will be increasingly important to make sure that devolved decision-makers remain aware of the role that buses play in supporting economic activity and that funds are made available to improve the reliability of local transport networks.

Greener Journeys therefore calls on the Government to issue a National Statement on local bus infrastructure to raise the importance of investing in bus infrastructure as part of co-ordinated local growth initiatives.

Objectives for a National Statement

The objectives for the National Statement are to:

- promote investment in local bus infrastructure to increase network reliability, reduce journey times and enhance the passenger experience
- encourage greater partnership working between local authorities and bus operators in developing new schemes and realising the benefits of existing schemes
- provide passengers and operators with a degree of certainty on the future development of their networks by asking the local decision-makers to set out what they want the bus sector to deliver and commit to a longer term programme of investment.

The ultimate aim is to increase investment in local bus infrastructure to improve connectivity, economic growth and social mobility, as well as provide everyone with improved access to essential services.

Contents of a National Statement

The National Statement will provide a focal point for local bus infrastructure policy and practice. It will:

- set out the Secretary of State's vision for local bus infrastructure
- promote best practice approaches to scheme development and partnership working, including providing advice on investment appraisal
- document current and committed bus infrastructure schemes.

The Statement will help encourage local decision-makers to commit to a longer term programme of investment in bus infrastructure schemes to improve network performance and support economic growth, social mobility and competitiveness.

Over time, the National Statement could develop in the same way as the Higher Level Output Specification and Roads Investment Strategy, including benchmark standards for key strategic outcomes such as average journey times, service reliability and passenger satisfaction, together with a dedicated fund to promote investment in particularly innovative schemes and demonstration projects.

1 Introduction

There are 5.1 billion journeys made each year in Great Britain by bus. That's more than three times the number of journeys undertaken by rail and four times the number of journeys on the London Underground. Buses support economic growth, improve our health and quality of life and are good for the environment. They are an essential part of vibrant, sustainable communities.

Although road traffic levels have remained relatively stable during the Great Recession, traffic congestion in urban areas remains a stubborn and costly problem - reported by the Cabinet Office to cost the UK economy up to £11 billion per year[1].

The solution to this problem lies in making better use of existing road capacity through targeted investment in local bus infrastructure and selective priority measures that improve the performance of the transport network as a whole.

This improved network performance will cut delays, reduce congestion, improve the environment and increase road safety. It will also reduce transport costs and support economic growth by allowing businesses to more easily connect with potential suppliers, provide consumers with improved access to a wider range of suppliers and improve the functioning of the labour market, allowing skills to be better matched to employment opportunities.

Working with KPMG LLP, we estimate that targeted investment in local bus infrastructure and selective priority measures will typically generate £3.32 of net economic benefit for each £1 of cost incurred, with further benefits expected in related policy areas such as social welfare and public health. This level of return represents high value for money according to the Department for Transport's appraisal guidance.

Unlike the rail network, and now the strategic road network, there is no national plan or policy statement for investment in infrastructure to improve bus services and no statement of what the Government wants the bus sector to deliver in return for public funds and resources.

The devolution of transport funding and decision-making to the Local Growth Fund and Local Enterprise Partnerships respectively means that transport schemes will need to compete with other growth initiatives for capital investment. In this new environment it will be increasingly important to make sure that devolved decision-makers remain aware of the role that buses play in supporting economic activity and that funds are made available to improve the reliability of local transport networks.

Greener Journeys therefore calls on the Government to issue a National Statement on local bus infrastructure to raise the importance of investing in bus infrastructure as part of co-ordinated local growth initiatives.

In the following section we identify the objectives for a National Statement. In Section 3 we outline the challenges and opportunities for funding and investment. In Section 4 we provide an assessment of the costs and benefits of bus priority measures and in Section 5 we discuss the requirement for strategic planning on bus infrastructure.

[1] Cabinet Office (2009) An analysis of urban transport

2 Objectives for a National Statement

The objectives for the National Statement are to:

- promote investment in local bus infrastructure to increase network reliability, reduce journey times and enhance the passenger experience
- encourage greater partnership working between local authorities and bus operators in developing new schemes and realising the benefits of existing schemes
- provide passengers and operators with a degree of certainty on the future development of their networks by asking the local decision-makers to set out what they want the bus sector to deliver and commit to a longer term programme of investment.

The ultimate aim is to increase investment in local bus infrastructure to improve connectivity, economic growth and social mobility, as well as provide everyone with improved access to essential services.

The three objectives are the guiding principles for achieving better bus service quality. They are inter-linked and it is unlikely that any one of the objectives can be fully achieved without the others.

Investing in traffic management and selective priority measures can increase the capacity and efficiency of urban transport networks, increasing network reliability and reducing journey times. Working in partnership with bus operators, national and local government need to take the lead in delivering bus infrastructure improvements to make sure that co-ordinated local growth initiatives can realise their full potential.

The devolution of major scheme funding from the Department for Transport to the Local Growth Fund presents an opportunity for local decision-makers to work with bus operators to develop a longer term strategy for their networks through a programme of investment supported by a commitment to funding.

3 Challenges and opportunities

3.1 Efficiency of transport networks

Urban traffic congestion presents challenges to the way we go about our everyday activities and imposes genuine costs on the UK economy. By improving the efficiency of transport networks we can reduce the costs associated with delays and poor travel time reliability and go some way towards improving economic productivity, the environment and our quality of life.

The devolution of transport funding from central government to the Local Growth Fund presents a challenge to local decision-makers to make sure that their local transport networks can support their growth initiatives and an opportunity to commit to a longer term programme of investment in transport infrastructure.

There is good evidence[2] that selective priority measures generate significant benefits in terms of improving network efficiency and their use must be part of the solution to the problems associated with urban traffic congestion. Whilst relatively small scale schemes can make a significant difference, priority measures are most effective when implemented as part of a package of corridor or area-wide treatments on roads where congestion is most disruptive.

3.2 The funding challenge

The capital investment required to fund bus priority measures is typically low relative to other solutions to urban traffic congestion, although the costs vary in relation to the nature, scale and location of the scheme.

A 'basic' bus lane costs in the region of £150,000 per kilometre, however costs can increase for whole corridor-based treatments or where schemes are implemented alongside complementary traffic calming measures[2]. Bus priority measures for urban corridors can therefore cost in the region of £1 million to £2 million. That's less than the £5 million threshold for the DfT's major schemes funding and a relatively large share of the existing Integrated Transport Block allocated to local authorities. This can make the funding of small and mid-sized schemes difficult.

Local Growth Fund

From 2015 the DfT will devolve much of its capital funding to the Local Growth Fund[3] for Local Enterprise Partnerships to spend on delivery of their Strategic Economic Plans. This will include £819 million of local major transport scheme funding and £300 million from other transport funding streams in 2015/16 and a further commitment of more than £5 billion of transport funding to 2020/21 to enable long term planning of transport investments in local areas. Subject to meeting the DfT's requirements, Local Enterprise Partnerships will review and approve business cases, decide which investments should be prioritised, and make sure that investment programmes are effectively delivered.

Better Bus Areas

The Better Bus Area Fund was set up to improve economic growth and reduce carbon emissions by enhancing bus services and facilities in specific geographic areas. The first iteration of the fund awarded £70 million in 2012 to 24 local authorities who successfully bid for funding to improve bus priority and stop improvements, passenger information and ticketing. The second iteration of the fund made provisions for local authorities to be designated as Better Bus Areas and for the DfT to gradually transfer Bus Service Operators Grant (BSOG) payments from operators to the relevant local authority. This second iteration however has not gained the same momentum as the first, suggesting that some refinement may be required to see Better Bus Areas becoming more widely adopted.

There are good examples of city regions and LEPs working together to promote public transport infrastructure. For example, Transport for Greater Manchester is investing £122 million in 25 miles of bus network improvements, including the £54 million Cross City bus package and the £68 million busway between Leigh, Salford and Manchester. The creation of the Local Growth Fund presents an opportunity for local stakeholders in other areas to provide similar leadership in the provision of transformational improvements in the performance for urban transport networks.

4 The benefits of selective priority measures

4.1 Impact of priority measures

Selective priority measures range in scale from those involving the removal of a pinch-point or bottleneck at a single junction to area-wide interventions such as the London Bus Initiative. Priority measures include bus lanes, junction priorities, bus gates and quality bus corridors which are employed either on their own or in combination with each other and other traffic management measures.

[2] Bus Priority: The Way Ahead Resource Pack Edition 2', Department for Transport, 2004, updated to current prices

[3] HM Treasury, Investing in Britain's Future, June 2013

Box 1 – Types of priority measures

Bus lanes are the most commonly used priority measure. They improve bus journey times and service reliability and are relatively quick to implement, however, they can reduce highway capacity for other road users.

Selective priority at junctions either by permitting buses to make turning movements prohibited to other traffic, by giving preference to flows containing a high proportion of buses, or by adjusting signal controls when a bus is detected in the traffic stream. Like bus lanes, junction priority measures improve bus journey times and service reliability but can reduce highway capacity for other road users. They tend to be most effective in areas with lots of signalised junctions.

Bus gates and **bus only streets** prevent cars from accessing specific areas particularly in town centres and pedestrian zones.

Where demand is high, **guided busway** and **quality bus corridor** solutions provide dedicated rights of way, junction priority and improved passenger waiting facilities.

When correctly implemented in the right locations, selective priority measures can improve the overall efficiency of transport networks, generating improvements to in reliability, reductions in delays and improvements in journey times.

The Department for Transport cites evidence from a series of case studies showing the impact of corridor-based priority measures[4]. Whilst the evidence shows the impact to depend on the nature of the built environment and the type and scale of priority measure implemented, the case studies note:

- reductions in bus journey times of between 10 and 50%
- reductions in bus delay or excess waiting time of up to 65%.

Improving bus service quality by reducing journey times and improving reliability is a key factor in encouraging modal shift from cars to public transport. A recent report by the Institute for Transport Studies estimated that between 18 and 23% of car users could be encouraged to switch to buses if buses were quicker and more reliable[5]. So long as bus priority measures are well designed and their impact on other road users reduced, bus priority measures can lead to an improvement in the efficiency of the transport network as a whole.

4.2 Value for money

Selective priority measures can be very effective in improving the performance of transport networks at a relatively low cost. Working with KPMG LLP, Greener Journeys estimates that priority schemes can typically generate £3.32 of benefits for every £1 of cost incurred by the Government[6].

Based on case study evidence from existing bus priority schemes, Table 1 shows a break-down of the typical costs and benefits of bus priority measures. The analysis is presented as a 10-year net present value and based on the following assumptions, which are supported by the research detailed in 4.1 above:

[4] Bus Priority: The Way Ahead Resource Pack Edition 2, Department for Transport, 2004

[5] *Buses and the Economy II: A survey of expenditure of visitors to city and town centres*, Institute for Transport Studies, University of Leeds, December 2013

[6] *Note: The Eddington Transport Study estimated that urban network improvements have an average cost benefit ratio in excess of 3:1, going up to 4:1 for growing and congested urban areas. It is also consistent with the findings of recent analysis of city region public transport schemes which found a median BCR of 3.5:1 - Jacobs (2011), Value for money and appraisal of small scale public transport schemes.*

- 25% saving in in-vehicle time for bus users along the priority corridor
- 50% reduction in delay for bus users along the priority corridor
- 10% increase in generalised journey time for car users along the priority corridor
- £250,000 capital cost per route kilometre.

The analysis has been prepared accordance with the Department for Transport's guidance on transport modelling and appraisal. A description of the data, modelling assumptions and methodology is presented in Appendix B.

Table 1: Bus priority costs and benefits

	10-year NPV per £1 of investment (2010 prices and values)	£
1	**User benefits:** Generalised journey time benefits	 £4.05
2	**Non-user benefits** Decongestion, safety, local air quality, noise, greenhouse gases	 £0.71
3	**Bus operator benefits** Change in operating profits	 £0.19
4	**Wider economic benefits** Improved labour market accessibility and jobs from increased retail spend	 £1.13
5	**Cost to Government** Government Investment Change in concessionary reimbursement Reduced fuel tax	 £1.00 £0.61 £0.21

For each £1 capital investment, a bus priority scheme is expected to generate £6.07 of benefits (10-year NPV) to users, non-users and the wider economy. It will also be expected to generate a £0.21 reduction in fuel duty as travellers switch from cars to buses and a £0.61 increase in concessionary travel reimbursement as a result of the increase in bus miles associated with increased service frequency. Taken together this works out at £3.32 of benefits for each £1 of cost to Government.

So long as priority measures improve the efficiency of the network as a whole, the relatively low capital costs of priority schemes mean that they represent high value for money according to the DfT's appraisal guidance.

The nature of priority schemes means that improvements to network performance can be delivered quickly with little or no disruption during construction. The benefits are lasting and can be realised immediately.

Sensitivity analysis

Bus priority schemes by their nature are locally-based, meaning that outcomes and costs can vary widely from scheme to scheme. Table 2 presents a sensitivity analysis on the core assumptions on investment costs and journey time impacts.

Table 2: Sensitivity analysis

	Base Case	Investment costs double	20% lower decrease in journey times for bus users	50% higher increase in journey times for car users
Present Value of Benefits (PVB)	£6.07	£6.07	£2.97	£2.13
Present Value of Costs (PVC)	£1.83	£2.83	£1.63	£1.83
Net Present Value	£4.24	£3.24	£1.34	£0.30
Benefit Cost Ratio	3.32	2.15	1.82	1.17

The sensitivity analysis shows that even if investment costs double or benefits are not realised at the same level as the base case, bus priority schemes still represent good value for money. The benefits are, however, sensitive to impacts on remaining road users who have not shifted to bus. This underlines the importance of planning bus priority in such a way so as to minimise the impact on other road users as much as possible.

5 Strategic planning of transport networks

5.1 Strategic planning for rail and highways

The Higher Level Output Specification for railways and proposed Roads Investment Strategy sets out what the Government wants each network to deliver over the medium to longer term. Further details of each planning framework are set out below.

Road Investment Strategy, Highways

The proposed Road Investment Strategy (RIS) has four key components:

- Long term strategy, setting out the vision for the Strategic Roads Network
- A performance specification, making clear what the company will deliver
- An investment plan, specifying the schemes and areas where money will be spent
- A statement of funds available (SoFA) the government commits to provide.

The DfT aims to have the first RIS is in place by the end of 2014, with plans to refresh this in 2017 to align with rail investment

High-Level Output Specification, Railways

Under the Railways Act 2005, the Secretary of State for Transport needs to provide the Office of Rail Regulation with information on:

- what the Secretary of State wants to be achieved by railway activities during the five-year review period (HLOS)
- public funds available for this delivery (Statement of Funds Available, SoFA).

The Government's role is specified as a strategic one, not discussing the details of how these outputs should be delivered.

The benefits of a longer term planning framework are arise from setting out a co-ordinated programme of work centred around a specific set of objectives and supported by a degree of certainty

in funding. The longer term planning and financing framework provides those working in the sector with clear and common purpose.

5.2 A National Statement on Local Bus Infrastructure

Unlike the rail and road networks, there is no national plan or policy statement for bus infrastructure and no statement of what the Government wants the bus sector to deliver in return for public funds and resources.

Whilst the devolution of funding from the DfT to the Local Growth Fund presents an opportunity to develop a longer term strategy for bus networks, there will be competing demands for funding from other growth initiatives.

The prioritisation of a potentially very diverse set of growth initiatives ranging from investing in skills to improving transport presents a challenge to decision-makers and therefore Greener Journeys therefore calls on the DfT to make a National Statement on local bus infrastructure to raise the importance of investing in bus infrastructure as part of co-ordinated local growth initiatives.

The Statement will provide a focal point for local bus infrastructure policy and practice by:

- setting out the Secretary of State's vision for bus infrastructure
- promoting best practice approaches to scheme development and partnership working, including providing advice on investment appraisal
- documenting current and committed bus infrastructure schemes.

The Statement will help encourage local decision-makers to commit to a longer term programme of investment in bus infrastructure schemes to improve network performance and support economic growth, social mobility and competitiveness.

In the longer term, the National Statement could develop in the same way as the Higher Level Output Specification and Roads Investment Strategy, including benchmark standards for key strategic outcomes such as average journey times, service reliability and passenger satisfaction, together with a dedicated fund to promote investment in particularly innovative schemes and demonstration projects.

Appendices

6 Appendix A – Stakeholder consultation

6.1 Introduction

The stakeholder consultation was undertaken in three stages. The first stage was with specialists and groups familiar with the bus industry. The second stage involved consultation with local government and transport authorities. The final stage will involve interaction with central government policy makers and the political parties.

From mid-November 2013 to mid-February 2014, we have conducted consultations with 54 individuals from 42 organisations, broken down by category in Table 3 below.

Table 3: Stakeholder consultation

Category	**Consulted Organisations**	**Consulted Individuals**
Central Government	5	6
Political Parties	1	1
Local Government	5	5
Local Transport Authority / PTE or Equivalent	7	11
Bus companies	6	10
Local Transport Interest Groups	1	2
Employers	4	4
National Transport Interest Groups	6	6
Business Groups	4	6
Academic Specialists / Institutes	3	3
Total	**42**	**54**

6.2 Key issues highlighted from the consultation

The policy initiative had a high level of support from the stakeholders. There was also however a strong view that bus priorities work when targeted to a particular problem within a local context. Further points related bus priority measures are highlighted in Table 4 below.

Table 4: Consultation summary

Issue	Details
Moving people rather than moving buses	The case must be put forward in terms of how bus priority measures encourage the movement of people rather than the movement of *buses per se*, or reduce the movement of other modes of transport (e.g. cars and own vehicles). The relationship between bus priority measures and other modes of transport have to be handled head-on, particularly in exploring 'win-win' situations that are helpful for both types of movement. Nevertheless, other stakeholders also mentioned that bus priority measures is likely to, and in must, by definition involve some reduction in the usage of cars. However, the political sensitivities and the care in picking the right language were mentioned by many stakeholders.
Bus priority is more than just bus lanes	There are a number of policy instruments that fall under this heading of Bus Priority. The consultations outlined the following measures (as a minimum): ▪ Bus signalling (SVD) ▪ Bus gating ▪ Bus lanes ▪ Quality bus corridors (QBCs) It is important to identify which instruments are useful in what circumstances, and why initiatives have failed to have the impact that they have. A number of stakeholders also noted that bus priority is most effective when combined with other initiatives – such as those that target inner city of workplace parking.
Reliability as the main goal	The role of bus priority schemes in improving ***reliability*** must be highlighted, just as much, and in fact some stakeholders argued, more so than reducing in-vehicle journey times. Reliability was defined as average delay times (i.e. unscheduled additional in-vehicle journey minutes).
Impact on businesses	Many points were highlighted: ▪ What is the relative impact of bus passengers vs car passengers on inner cities? Highlight that the evidence shows bus passengers spend just as much as car passengers. ▪ What is the impact on shops and businesses along the routes? This will continue to be a difficulty. For example some bus companies argued that irrespective of the overall savings to a large number of passengers, shop owners on a bus route are likely to be against the measure and it is unlikely that arguments on transport efficiency can win them over. Therefore minimising the impact of this will have to be kept in mind, including selecting the right routes. ▪ A business group however also raised that public transport were very important to small business employers in being able to get their workers to work on time. It is a key determinant of business location – especially for start-up businesses that often have to rely on low-cost labour. ▪ Reduction in congestion may also help those businesses that need to rely on cars if 'non-essential' car use is reduced. TfL pointed out that the reduction of passenger cars on the roads has helped tradespeople (who need their vehicle) to move around better – and the additional costs involved (e.g. congestion charge) were being directly passed onto customers who were willing to themselves pay for that reliability.

Financing	In the future, bus priority schemes will have to compete with other infrastructure initiatives, and show *economic* benefits in order to secure funding. Therefore, getting a very clear idea on this would be important for local authorities.
Working arrangements with bus companies and local authorities	There was a strong consensus that both bus companies and local authorities had to work very closely at all stages of implementing bus priority measures, and in particular in identifying areas where there exists a real problem. Bus companies identified that a reason why priority schemes are less successful was because they are implemented in areas where a bus priority scheme can most *easily be implemented* rather than where the need is greatest. While bus priority schemes have been successfully implemented under very different types of working arrangements between companies and authorities, bus company backing of priority schemes and a commitment to 'give-to-get' arrangement was seen as being very useful in 'selling' the schemes to both public and important local stakeholders.

7 Appendix B – Analytical framework

This appendix describes the modelling framework used to calculate the costs and benefits of the proposed bus bonus scheme. We initially describe the inputs, key assumptions, calculations used in the revenue and demand modelling, and finally the calculations used in the welfare analysis.

7.1 Inputs

The inputs for the framework are derived from Department for Transport and National Travel Survey (NTS) data except where specified.

Table 5: Data sources

Input	Source
Number of passenger trips	DfT Bus Statistics, 2012/13, Table BUS0103
Patronage by ticket type	*Green Light for Better Buses,* DfT 2012, Figure 2.7
Patronage by journey purpose	NTS, 2012, Table NTS0409
Average revenue per passenger	DfT Bus Statistics, 2012/13, Table BUS0402
Mode share (car and bus)	NTS, 2012, Table NTS9903
Operating cost per vehicle km	DfT Bus Statistics, 2012/13, Table BUS0408
Vehicle kilometres travelled	DfT Bus Statistics, 2012/13, Table BUS0203b
Number of Vehicles	DfT Bus Statistics, 2012/13, Table BUS0602
Government support for bus services	DfT Bus Statistics, 2012/13, Table BUS0501a, Local Transport Capital Block Allocations

The model calculates impacts in the following geographical zones: London; English Metropolitan Areas; English Non-Metropolitan Areas; Scotland and Wales. Bus patronage is further broken down by ticket type categories, which are: Ordinary Adult; Season Ticket; Concessionary Fare; and Other.

The inputs listed above provide the base data for the year 2012/13. The model is then programmed to calculate the following:

- A Do Minimum scenario, which estimates the future year values for patronage and fares under no further government intervention
- A Do Something scenario, which estimates the impacts of the bus priority scheme on patronage, by modelling the impact on in vehicle time (IVT) and delay time on bus journeys of bus priority improvements in 2014/15.

The Do Minimum scenario requires assumptions about underlying patronage and fares growth, which will be covered in the next section on assumptions.

The Do Something scenario requires further inputs on how bus users will react to a change in the generalised journey time. To derive the changes in demand as a result of the bus priority impacts on IVT and delay time we require the following inputs. In addition to calculate the impacts as a result of

the Mohring effect on headway we require the travel time elasticity presented above along with the Wait Time value of time factor presented below.

Table 6: Modelling assumptions

Input	Value	Source
Travel Time Elasticity	-0.50	Balcombe et al (2004)
Delay Time value of time factor	3.00	WebTAG 3.5.6 (August 2012)
Wait Time value of time factor	2.00	WebTAG 3.5.6 (August 2012)

7.2 Assumptions

7.2.1 Bus priority benefits and costs

The benefits and costs of bus priority schemes were taken from individual case studies as outlined in section 4.2. These produced a range of potential impacts. Additional calculations were then undertaken to extrapolate these impacts out to the wider bus market.

7.2.1.1 Benefits

The direct benefits of bus priority schemes on bus users come in two forms, IVT savings and delay time savings. Case study research indicated that, after implementing a bus priority scheme on a specific corridor, benefits of a 25% fall in journey IVT and a 50% decrease in delay time fell in the acceptable range. However, as the introduction of bus priority measures tend to cover only certain portions of a full bus corridor it is unlikely every passenger will benefit from the measure for the full length of their journey. As a result, the potential IVT and delay time saving from a bus priority scheme are adjusted for this by assuming that only 65% of the passengers on a corridor receive the benefits.

Total IVT savings (%) = Specific scheme IVT savings (%) x Scheme as a percentage of bus corridor

Total delay time savings (%) = Specific scheme delay time savings (%) x Scheme as a percentage of bus corridor

These benefits come into effect in the year 2014/15 providing a one off impact on general journey time over and above the Do Minimum assumptions (see below). These effects are then compounded in future years by the Mohring effect.

7.2.1.2 Costs

The implementation of the bus priority scheme will require capital investment by government to deliver the required infrastructure. Case study research indicated that the costs of a bus priority scheme ranged from £500,000 to £3.6 million per bus corridor, in 2010 prices. We have applied a cost of £1.5 million per corridor, or more specifically, £250,000 per km.

To extrapolate out to a regional level we multiplied the cost per corridor by the estimated number of bus corridors in each region. This was arrived at by dividing the patronage, adjusted for market size, in each market by the estimated daily corridor patronage.

Number of corridors = Total market patronage / Daily corridor patronage

Table 7: Modelling assumptions - patronage

Market	Assumed Daily Corridor Patronage
London	12,000
English Mets	9,000
English Non Mets	5,000
Scotland	8,000
Wales	4,000

These costs come into effect in the year 2014/15 providing a one-off impact on government capital spending.

7.2.2 Bus priority market size

The implementation of bus priority measures will only benefit passengers who travel on the corridors where new infrastructure is placed. Different geographical markets will have different needs for bus priority improvements. The table below shows the ratio of bus trips affected for every trip affected in London (i.e. for a national rollout of bus priority, for every 1 trip affected in London, 6 trips would be affected in the English Mets).

Table 8: Bus priority market size

Market	Number of trips affected for every trip affected in London
London	1
English Mets	6
English Non Mets	4
Scotland	2
Wales	2

7.2.3 Costs to other highway users

Although several case studies outlined neutral or sometimes even positive effects of bus priority measures on general traffic journey time it is likely that the implementation of such schemes will have a negative, if often limited, effect on car journey times. To account for this we have included a 10% journey time cost to the car users whose trips will be affected by bus priority measures. This impact is somewhat softened by car user diversion to bus travel.

7.2.4 Underlying trends: Do minimum scenario

Do minimum demand is based on a series of underlying trends outlined in the table below.

Table 9: Underlying trends

Year-on-Year Change	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
Real Fares (London)	2.00%	2.00%	1.50%	1.00%	0.50%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
Real Fares (non-London)	0.50%	0.50%	0.50%	0.50%	0.50%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
Headway[7]	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
GVA	1.92%	2.24%	2.58%	2.58%	2.44%	2.37%	2.38%	2.39%	2.36%	2.26%	2.19%	2.16%
Employment	0.69%	0.69%	0.68%	0.68%	0.44%	0.44%	0.43%	0.44%	0.43%	0.54%	0.54%	0.53%
Population	0.69%	0.59%	0.59%	0.58%	0.61%	0.60%	0.60%	0.59%	0.59%	0.53%	0.52%	0.52%
Car Ownership	1.61%	1.65%	1.56%	1.53%	1.08%	1.06%	1.23%	0.87%	1.03%	1.04%	1.03%	1.02%
Car Time	1.02%	0.98%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Car cost	-1.91%	-3.64%	-2.02%	-2.06%	-2.11%	-2.15%	-2.20%	-2.25%	-2.30%	-2.35%	-2.41%	-2.47%
Rail Cost	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%

We assume no underlying growth in in-vehicle time, walk time or delay time.

We have also made supply-side assumptions for underlying service level trends. Underlying trends in the number of bus kilometres are determined by the increase in headway for all areas (0.50% increase per year) and cuts in tendered services of 5.20% per year between 2013/14 and 2015/16 for all non-London services.

7.3 Demand, revenue and cost modelling

7.3.1 Demand

The demand model is the driver of the entire modelling framework. Changes in demand for bus services are what lead to economic benefits, changes in revenue and changes in costs as a result of service level changes.

The model is based on a transport user's demand curve, where the price of travel is the generalised cost of travel. This model keeps the impact of fare changes and the impact of generalised journey time changes separate:

Generalised Cost = Fare + Generalised Journey Time

Changes in either element of generalised cost will affect demand. The magnitude of the impact on demand is determined by the elasticity of demand for the relevant elements of generalised cost:

Change in Demand (%) = Fare elasticity x Change in Fare (%) + Travel Time elasticity x Change in Generalised Journey Time (%)

For the implementation of the bus priority scheme, the change in demand will largely be driven by the change in IVT and delay time. The impacts of a 25% fall in IVT and a 50% reduction in delay time acts

[7] These are the underlying increases in headway, which are supplemented by the mechanics of the Mohring factor described in 7.3.1

to reduce generalised journey time. The overall percentage change impact on generalised journey time is multiplied by the travel time elasticity to calculate a percentage change in demand.

There is also a 'feedback effect' from generated demand, where there is an increase in service frequency (decreased headway) as a result of an increase in demand.

The increase in demand means that it is more efficient for bus services to operate. They will increase frequency as a result, capturing the extra demand. The improved frequency attracts further demand, and the virtuous circle continues.

As a result of the mechanics of the model, we have assumed that service frequencies are based on the previous year's change in demand:

Change in Headway (%) = - Change in Frequency (%) + underlying headway changes

Change in Frequency (%) = Previous year demand change (%) ^0.6

Therefore:

Change in Headway (%) = - Previous year demand change (%) ^0.6 + underlying headway changes

The resulting change in frequency changes the generalised journey time because average wait times decrease. Every minute of wait time saved is worth two minutes of journey time saved. We use this value of time factor to convert changes in frequency to changes in generalised journey time. The travel time elasticity of -0.5 is then applied to these changes in generalised journey time to calculate the percentage change in demand.

7.3.2 Revenue

Changes in demand directly drive any changes in revenue. Revenue is calculated as demand multiplied by fare for each individual geographical area. Commercial revenue is separated from concessionary travel reimbursement. Concessionary travel reimbursement only changes due to changes in services and, therefore, generalised journey times.

7.3.3 Cost

The modelling framework assumes that operators will expand operations but receive the same profit margin as in the base year. These profit margins are:

- Non-London Areas: 8.8%
- London: 2.6%

This is a national average of 6.7%, as reported by TAS in its most recent bus industry monitor summary[8]. The model then fixes these profit margins to calculate the resulting cost based on regional bus revenues calculated as described above.

7.4 Cost-benefit analysis and appraisal

The purpose of the cost benefit analysis is to analyse the economic costs and benefits of the bus bonus scheme compared to a situation where no further government intervention was made. The DfT's WebTAG provides the framework under which the majority of the analysis sits. However, due to the need to calculate wider economic benefits, we have not followed the guidance in some aspects of our analysis. We have noted these cases below.

7.4.1 Benefits

Benefits and disbenefits are experienced by those directly affected by the policy and also by third parties who have acquired some sort of benefit as a result of the policy. The benefits are grouped as follows: bus-user benefits; non-bus-user benefits; private sector provider impacts; and wider impacts

[8] http://www.tas.uk.net/content/index.php/news/112-bus-profits-down-for-second-year-in-a-row-as-real-term-revenue-falls-again

7.4.1.1 Bus-user benefits

User benefits are formed of two separate elements:

Fares benefits: the reduction in fares enjoyed by all passengers who take up the scheme, including generated passengers. This is calculated using the rule of a half:

Fares benefits = ½ x – change in fare x (Demand under Do Minimum + Demand under Do Something)

Generalised Journey Time benefits: the reduction in generalised journey time caused by increases in frequency as a result of the Mohring Effect and impacts from changes in in-vehicle time and delay times. This is also calculated using the rule of a half and values of time as included in WebTAG 3.5.6:

GJT benefits = ½ x – change in GJT x Value of Time x (Demand under Do Minimum + Demand under Do Something)

7.4.1.2 Non-bus-user benefits

Non-user benefits are calculated on principles set out in WebTAG unit 3.13.2. Whilst this unit is usually used for rail appraisal, we have adapted it for use in this context. We have assumed a diversion factor of 31% for the number of kilometres travelled by a car driver as a result of an increase in the number of bus kilometres travelled. Simply put, for every 10km additional bus kilometres travelled, we assume 3.1km of the additional 10km came from car drivers shifting mode to bus.

The remainder of the methodology is based on WebTAG unit 3.13.2: The diverted car kilometres are split by five congestion traffic bands, and by road type. Once split, we calculated the decongestion benefits by using the following values (also from WebTAG 3.13.2):

Table 10: Valuing traffic congestion

Values, pence, 2010			
Weighted Average p/car km	**2010-2014**	**2015-2019**	**2020-2024**
Congestion Band 1	1.2	1.3	1.4
Congestion Band 2	3.0	3.1	3.3
Congestion Band 3	10.5	10.7	11.3
Congestion Band 4	91.2	83.8	66.0
Congestion Band 5	159.0	175.4	219.0
Infrastructure	0.1	0.1	0.1
Accident	1.6	1.7	1.9
Local Air Quality	0.1	0.1	0.0
Noise	0.1	0.1	0.1
Greenhouse Gases	0.9	0.8	0.7
Indirect Taxation	-5.1	-5.0	-4.5

7.4.1.3 Private sector provider benefits

Private sector provider benefits are based predominantly on the financial impacts on the bus companies. This includes the difference between the Do Something scenario and the Do Minimum scenario in:

- Operating costs
- Revenue
- Total government support.

7.4.1.4 Wider Impacts

The wider impacts calculated in this analysis is the value of jobs generated. Jobs are generated as a result of improved labour market accessibility and improved retail access.

In the case of labour market accessibility the methodology used to calculate the generated number of jobs is based on the ability to continue carrying out activities as a result of the removal of bus services. This is covered in detail in papers produced by the Institute for Transport Studies, University of Leeds[9]. The estimated proportion of bus trips where the bus user is completely dependent on the bus to commute to work is formed through the following rationale:

- Percentage of trips which are commuting = 19%
- Percentage of bus commuters with no car access = 43%
- Percentage of bus commuters with no car access where the trip is greater than 3 miles = 59%

By multiplying all of these proportions, we can infer that 5% of all bus trips are dependent on the bus to commute to work. This is multiplied by the proportion of bus trips that are not diverted from car drivers (assumed to be 21%), which leads to a compound impact on 1% of all generated bus trips. Assuming that one full-time commuter will have to undertake 220 return trips per year (based on the number of working days in a year), which translates to 440 single trips, the generated number of jobs is:

New jobs through access = 1% x generated demand / 440

There are similarly jobs created through improved retail access. The 2013 ITS study indicated that the percentage of bus users who *"wouldn't have otherwise have undertaken (retail or leisure) activity if the bus service was removed"* is 16%. Combined with a newly generated trips factor of 21%, and the proportion of bus trips that are shopping trips (16%) we assume that the compound proportion of new generated trips that are shopping trips is 16% x 16% x 21% = 0.5%. The same report reported that every return bus trip generates £49 of retail spend – or £24.50 per single trip. Recent government figures suggest that £36,000 of retail spend[10] holds up one job in the retail sector. Therefore:

New jobs through retail spend = 0.5% x generated demand x £24.50 /£36,000

These generated jobs are then monetised by multiplying the number of jobs by the average between the national median salary (£25,603 in 2010 prices) and the annualised full-time minimum wage (£10,466 in 2010 prices), which is £18,035 per job.

7.4.2 Costs

Costs are made up of three categories:

1. Broad transport budget:

This is the change in subsidy for the bus market, caused by increases in concessionary travel reimbursement as a result of service level changes and other devolved funding.

2. Government investment:

This is the amount of money the government would initially need to invest to put in place the bus priority scheme and realise its benefits. We have modelled a base cost of investment and a high cost of investment.

3. Indirect tax revenue:

[9] *Buses and Economic Growth, 2012* and *Buses and the Economy II, 2013*

This is the loss in fuel duty formerly paid by car users that have now transferred to bus. It is usually included as a negative benefit in WebTAG appraisal, but has been included in the costs here to fully represent the costs to Government as a whole. However, we have not modelled the potential increase in fuel duty net of BSOG paid by bus operators to the government as a result of increased services. Therefore, this figure is likely to over-estimate the loss in indirect tax revenue to the government.

7.4.3 Appraisal Summary

The results of the appraisal are summarized in a table listing all monetised costs and benefits. The table presents the total net present value over 10 years from 2014/15, but at 2010 prices.

Wider impacts are also included, and are the average number of jobs generated, and the annual monetised impact of these jobs.