A SMOOTHER RIDE

Can capital investment deliver more efficient bus services?

URBAN TRANSPORT GROUP

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About Urban Transport Group
The Urban Transport Group (UTG) is the UK’s network of city region transport authorities.
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About Steer
Working across cities, infrastructure and transport, Steer is a consultancy combining commercial, economic, technical and planning expertise

EXECUTIVE SUMMARY

The bus is the nation's most used form of public transport[1]. The bus is vital in keeping our city regions moving and growing. It delivers multiple and overlapping economic, social, health and environmental benefits, with **each £1 invested in bus estimated to bring an economic return of nearly £4.50**[2].

However, despite the ubiquity of the bus, the essential service it provides and the wider benefits it continues to deliver, patronage and networks have been steadily shrinking for decades. In the ten years to 2018/19, the rate of patronage decline in metropolitan areas averaged just under 2% per year[3].

This longstanding pattern of decline was accelerated by the COVID pandemic, during which time patronage fell dramatically and is yet to fully recover. At the end of the last financial year (2022/23), bus patronage in metropolitan areas was around 90% of the level that would have been expected if pre-pandemic trends had continued.

Meanwhile, above average inflation (particularly fuel costs), rising staff costs and congestion (which means bus companies use their main assets, drivers and vehicles, less efficiently) have made bus services more expensive to run, meaning the same amount of revenue buys less in terms of outputs.

In the face of declining demand and rising costs, commercial bus operators necessarily focus on running their most profitable routes, whilst local authorities struggle to find money in their own restricted budgets to patch and mend the resulting gaps in the network. **If this situation continues, it will leave the bus market in peril.**

Increased government revenue support during and post the pandemic has been vital in keeping bus networks running and ensuring passengers have a service to return to. However, with enhanced revenue funding set to end in April 2025, **a sustainable funding solution is required for the longer-term, including exploring avenues for making much needed revenue funding go further.**

This paper explores one such potential avenue – **whether capital investment in bus can be used to make bus services more efficient**, thereby boosting patronage, and reducing operating costs, enabling operators to expand networks and grow revenue.

The two main mechanisms through which this could be achieved are; investment in new, more efficient vehicles (in this case, zero emission buses) and in the provision of bus priority measures.

As well as contributing towards achieving net zero, investment in zero emission buses (ZEBs) can reduce the day-to-day operational costs of bus services due to their lower running and service costs[4]. In theory, this could allow bus operators to provide improved service levels for the same cost.

Similarly, investment in bus priority can help to speed up services and make them more punctual, reducing the impact and costs of congestion. The effect of this is to make services more efficient to operate and more attractive to passengers.

To explore the impact of these kinds of capital investments on the bus networks in metropolitan areas, we used our unique Metropolitan Bus Model tool to run several scenarios, based on a deregulated bus market (as this is currently representative of most areas). This is an aggregate model which forecasts the impact of high-level external factors on bus patronage, operator behaviour, fares and mileage. The model was also able to explore the efficiency savings capital investment enabled, including how this impacted on operator decisions and the size of networks. It is, however, important to note that in a commercial, deregulated bus market, there is no guarantee that all such savings would be directly translated by operators into service improvements.

The modelling found that **under the 'do nothing' scenario the bus market in metropolitan areas would shrink from 780 million trips a year in 2022/23 to 506 million trips by 2035/36 or 35%**, a loss of 274 million bus trips. **Vehicle kilometres would fall from 468 million a year in 2022/23 to 267 million in 2035/36 or 43%**, a loss of 201 million vehicle kilometres.

Through modelling the impact of capital funding (in both ZEBs and bus priority) and revenue funding in metropolitan areas, we found that when compared to the 'do nothing' scenario:

- **Investment in ZEBs could deliver an additional 46 million trips and 33 million vehicle kilometres a year**
- **Investment in bus priority could deliver an additional 18 million trips and 7 million vehicle kilometres a year**
- **Maintaining the current enhanced revenue funding beyond April 2025 could deliver an additional 48 million trips and 33 million kilometres a year**
- **Combining investment in ZEBs, bus priority and revenue funding could add an additional 126 million trips and 88 million vehicle kilometres a year**

The modelling shows that investment in capital measures alongside maintaining current enhanced levels of revenue funding can deliver more efficient bus networks, adding millions more passengers and journey kilometres than would otherwise have been the case. **However, the modelling shows that these scenarios would still only serve to slow down, rather than reverse, the long-term pattern of declining bus services.**

To break the cycle of decline and achieve growth and transformation, **there is a need for government to review its overall approach and attitude towards long term bus funding.** Buses provide an essential service to millions of people and businesses, delivering huge wider benefits, from carbon reduction to levelling up, whist also cutting congestion and unlocking access to labour markets. As such, **revenue and capital funding for bus should be seen as an essential investment.** An investment in the environment, in people's opportunities, in economic growth and in our places and communities.

THE SCENARIOS

To help understand how capital investment can be used to deliver more efficient and effective bus services, we developed several scenarios. These scenarios test the impact of different capital interventions, as well as of maintaining existing enhanced revenue funding beyond April 2025 and combining this with capital investment. A baseline 'do nothing' scenario provides a reference point against which these can be measured.

The scenarios have been investigated using our unique Metropolitan Bus Model, an aggregate model which forecasts the impact of high-level external factors (e.g. public funding, population, employment, GDP, car ownership, fuel prices) on bus patronage, operator behaviour, fares and mileage.

We have based the model runs on 2022/23, the latest full data available, and have run the model to assess impacts through to 2035/36.

It is important to note that all results are based on the six metropolitan areas (Greater Manchester, Merseyside, South Yorkshire, Tyne and Wear, the West Midlands and West Yorkshire), so any benefits and investment costs would need to be scaled up to the national level to understand the full costs and benefits of an intervention.

The modelling for this report is based on a deregulated bus market as this is the current system for the UK outside London. Greater Manchester is the exception to this, having commenced its first tranche of franchised bus services in September 2023. This change is not accounted for in the modelling.

'Do nothing' scenario

This scenario provides us with a 'do nothing' reference point against which we can understand the impact of any interventions that we make on the bus market. The scenario captures the impact of COVID on the bus market and the subsequent recovery. This scenario, in line with government plans, sees the current enhanced revenue funding deals for bus end in April 2025, from which point we work on the assumption that revenue funding will return to pre-COVID levels.

The model forecasts that ending the enhanced revenue funding settlement would have a large negative impact on the bus market, with an accelerated decline in mileage, patronage, and subsequently revenue generated by operators.

In this 'do nothing' scenario, by 2035/36:

- **Patronage would fall from 780 million trips a year in 2022/23 to 506 million trips in 2035/36, a loss of 274 million trips a year in the metropolitan areas.**
- **Vehicle kilometres would fall from 468 million a year in 2022/23 to 267 million in 2035/36, a loss of 201 million vehicle kilometres.**

In this scenario **our city region bus networks would be severely hollowed out, with service levels a little over half what they were in 2022/23.** Given the economic, social and environmental benefits that bus delivers, and the essential service it provides for many people, this serves to highlight the continuing need for long-term revenue investment in bus.

The rest of this report compares each of the investment scenarios against this 'do nothing' scenario to understand the impact of additional capital investment as well as the potential impact of maintaining current enhanced revenue funding levels post April 2025.

Investment in Zero Emission Buses scenarios

Buses are the main commercial asset of a bus company, as well as setting a significant part of their cost base - both capital in terms of purchase and revenue in terms of operating costs. Whilst there has been significant investment in new vehicle technology, Department for Transport (DfT) statistics for 2021/22 estimate that **more than 50% of buses used in the metropolitan areas are over a decade old**[5]. At that time, only 1% of metropolitan area buses were electric (although this is increasing all the time as new orders come through), with a further 6% being hybrid. The base assumption in the Metropolitan Bus Model is that 5% of the fleet is renewed each year, with 10% of these new buses being ZEBs.

Though their upfront capital costs are higher, ZEBs can usually be expected to have lower operating and service costs compared to diesel buses. Recent high electricity costs have had an impact on this, however, we can reasonably assume that these will reduce and stabilise over time. Through its Zero Emission Bus Regional Areas (ZEBRA) scheme, the government currently covers 75% of the additional costs of purchasing ZEBs compared to diesel equivalents.

If ZEBs can potentially deliver operational savings, these can potentially be invested in service improvements and deliver enhanced outcomes for passengers. Investment in ZEBs would also help local authorities achieve their net zero targets and deliver cleaner air, improving public health and delivering wider benefits.

It should also be noted, however, that the following scenarios do not take account of the wider changes to bus operations and the associated costs, such as depot upgrades and increased charging infrastructure, which would also be required to enable fleets to be electrified.

To explore the potential impact of capital investment in ZEBs we developed four scenarios:

ZEB Scenario 1: **All electric, no other change**	• All new vehicles are electric • No change in vehicle replacement rates (5% of the fleet is replaced each year, but all are electric) • No change in levels of Government subsidy for ZEBs (covers 75% of the additional costs of purchasing ZEBs)
ZEB Scenario 2: **All electric, faster replacement**	• All new vehicles are electric • The vehicle replacement rate increases so that the entire fleet is replaced over a 12-year period • No change in levels of Government subsidy for ZEBs (covers 75% of the additional costs of purchasing ZEBs).
ZEB Scenario 3: **100% subsidy for additional purchase cost, no other change**	• No requirement for all new vehicles to be electric • No change in vehicle replacement rates (5% of the fleet is replaced each year, 10% of which are ZEBs) • Increase in Government subsidy for ZEBs (covers 100% of the additional costs of purchasing ZEBs)
ZEB Scenario 4: **All electric, faster replacement, 100% subsidy for additional purchase costs**	A combined scenario where: • All new vehicles are electric • The vehicle replacement rates increases so that the entire fleet is replaced over a 12-year period • Government subsidy for the additional cost of ZEBs is increased to 100%.

The table below provides a summary of the key outputs when compared to the 'do nothing' scenario.

The additional vehicle kilometres are provided due to the operating efficiencies of the ZEBs, enabling operators to retain more services and passengers, and allowing them to expand their networks.

	Output by 2035/36 compared to the 'do nothing' scenario			
Scenario	**Patronage (trips, per year)**	**Vehicle kilometres (per year)**	**Revenue (per year)**	**Operating costs (per year)**
ZEB Scenario 1: **All electric, no change in replacement rate or subsidy**	+ 14 million	+ 10 million	+ 1.3%	+ 1.2%
ZEB Scenario 2: **All electric, faster replacement, no change in subsidy**	Unchanged	Unchanged	Unchanged	Unchanged
ZEB Scenario 3: **100% subsidy for additional purchase cost, no other change**	+ 1 million	+ 1 million	Unchanged	Unchanged
ZEB Scenario 4: **All electric, faster replacement, 100% subsidy for additional purchase cost**	+ 46 million	+ 33 million	+ 4%	+ 4%

One of the challenges of delivering efficiencies through the purchase of ZEBs is that, even under the current ZEBRA scheme, they still have a higher up-front cost compared to a diesel vehicle, which must be offset before any benefits can be delivered to the network[6].

In ZEB Scenarios 1 and 2, local authorities or operators must still meet 25% of the additional costs of purchasing ZEBs. ZEB Scenario 2 concentrates this additional cost over a shorter period, meaning there is no decrease in operating costs expected over the modelled period. **It is important to note that the vehicles are likely to last beyond the end of the modelled run in 2035/36, so will continue to reduce operating costs over time.**

Whilst ZEB Scenario 3 increases government subsidy to cover 100% of the additional costs of ZEBs, it does not include accompanying measures to speed up the replacement rate or a requirement for all new vehicles to be electric. In Scenario 3, the replacement rate remains at 5% of the fleet each year, with 10% of these new vehicles being ZEBs. This sees operating costs remain broadly unchanged, as bus operators continue to replace their fleet with mainly diesel vehicles meaning not enough ZEBs are purchased to have an overall positive impact on operating costs.

Scenario 4 remedies this by increasing the replacement rate, ensuring all new vehicles are electric and covering 100% of the additional costs of purchasing ZEBs. This means that the benefits of ZEB investment can be realised more quickly.

ZEB Scenario 4 delivers 46 million additional trips and 33 million additional vehicle kilometres a year by 2035/36, when compared to the 'do nothing scenario'. These additional vehicle kilometres are provided due to the operating efficiencies of the ZEBs, enabling operators to retain more services and passengers. The overall increase in operating costs is caused by the increased size of the network, facilitated by the efficiency savings from the capital investment.

ZEB Scenario 4 had a cumulative cost to the Government of £2.5 billion over 12 years. The additional benefits delivered through this scenario highlight the importance of closing the gap between the cost of a diesel bus and a ZEB, whether this be through government subsidy or through the price of ZEBs falling over time.

It is also important to bear in mind that wider changes to bus operations and the associated costs, such as depot upgrades and increased charging infrastructure, would also be required to enable fleets to be electrified. Our 2022 report *'Decarbonising urban vehicles – Challenges and opportunities for city region public authorities'* explores these issues in more detail and sets out next steps. Speeding up the delivery of ZEBs would also require enhancements to the production pipeline. Forthcoming UTG research will examine how to enhance manufacturing capability and remove barriers to meeting demand for ZEBS.

Investment in Bus Priority scenarios

Congestion presents a challenge to the bus industry, with bus speeds in our urban areas significantly imapcted. This means that operating the same level of service becomes more expensive, as buses take longer to cover the same amount of distance, causing the assets to be used less efficiently. In turn, this negatively affects patronage, as bus services become less reliable, and passengers find themselves stuck in the same traffic as they would in their own car.

Bus priority is a generic term for initiatives designed to speed up bus journeys, including bus lanes, bus gates, and priority at traffic lights. Initiatives may address a whole route or corridor or be targeted at specific pinch points. If investment can reduce journey times and improve punctuality, bus operations can become more efficient and deliver improved levels of service for the same cost.

To understand the impact of bus priority, we modelled three scenarios where all bus journeys across the metropolitan areas were speeded up by different amounts:

- **Bus priority Scenario 1**: 30 seconds faster
- **Bus priority Scenario 2:** 1 minute faster
- **Bus priority Scenario 3:** 1 minute 30 seconds faster

These time savings were achieved gradually over five years, from 2023/24, with equal improvements each year.

It should be noted that, as an aggregate model, the Metropolitan Bus Model is only able to model journey time savings over the entire network. This is why we have modelled relatively small savings to all journeys. It is likely that well-targeted local bus priority interventions can deliver better outcomes on a scheme-by-scheme basis – for example a scheme on a congested corridor with a high number of buses running each hour could deliver a much higher journey time savings for a significant volume of passengers.

The table below provides a summary of the key outputs of the modelled scenarios when compared to the 'do nothing' scenario.

	Output by 2035/36 compared to the 'do nothing' scenario			
Scenario	**Patronage (trips, per year)**	**Vehicle kilometres (per year)**	**Revenue (per year)**	**Operating costs (per year)**
Bus priority Scenario 1: 30 seconds faster	+ 4 million	+ 1 million	+ 1%	+1%
Bus priority Scenario 2: 1 minute faster	+11 million	+ 4 million	+ 2.3%	+ 2%
Bus priority Scenario 3: 1 minute 30 seconds faster	+ 18 million	+ 7 million	+ 3.7%	+3.1%

As would be expected, the more bus journey times are sped up, the more patronage and revenue increase as the bus becomes more convenient and attractive.

Bus priority Scenario 3, where journey times are 1 minute 30 seconds faster, delivers an additional 18 million trips and 7 million vehicle kilometres by 2035/36, when compared to the 'do nothing' scenario. This is achieved through bus priority enabling a larger bus network than the base scenario, which is reflected in higher fleet operating costs (a bigger network leading to higher operating costs). This increased cost is not a reflection of bus priority making operations less efficient.

The bus priority scenarios cost between £800 million to £2.4 billion, spread over five years.

Continuation of Enhanced Revenue Funding scenario

Revenue funding provides bus operators with a direct contribution towards the cost of running services. This can either come as money direct to the operator, such as Bus Service Operators Grant or the English National Concessionary Travel Scheme funding, or be used to buy specific outcomes, such as a tendered network.

Suppressed patronage levels through and following the pandemic have seen revenue support from government increase to help protect service miles in the absence of passenger revenue, and to support the introduction of the national £2 fare cap.

To understand the impact of revenue support, we ran a scenario, which explored what would happen if enhanced revenue funding continued at the current level beyond 2024/25 until 2035/36.

The table below provides a summary of the key outputs, when compared to the 'do nothing' scenario.

	Output by 2035/36 compared to the 'do nothing' scenario			
Scenario	**Patronage (trips, per year)**	**Vehicle kilometres (per year)**	**Revenue (per year)**	**Operating costs (per year)**
Continuation of enhanced revenue funding scenario	+ 48 million	+ 33 million	+ 5.5%	+ 5.1%

By maintaining the current enhanced level of revenue support, patronage was forecast to be 48 million trips a year higher than the base scenario by 2035/36. This is achieved through funding enabling bus companies to run an additional 33 million vehicle kilometres, which is the main reason for the increased fleet operating costs: again, a bigger network means higher operating costs.

In this scenario, the continuation of revenue funding prevented a sudden drop off in operating kilometres and patronage that otherwise would have been expected after April 2025 had enhanced funding ended, as planned. It enabled operators to maintain a larger network and a higher level of patronage than in the 'do nothing' scenario.

This scenario would cost £63million per year above pre-pandemic levels. It should be noted that revenue funding has been kept constant in this scenario and has not been increased with inflation, effectively reducing the pot each year. This will limit the impact of revenue funding in the latter years of the scenario.

Combined Capital and Revenue Funding scenario

The final scenario explores the impact of combining investment in ZEBs and bus priority, whilst also continuing to provide revenue funding at the current enhanced level.

To do this, we modelled the following scenario:

- Bus priority Scenario 2: A one minute journey time saving plus
- ZEB Scenario 4: All electric, faster replacement, 100% subsidy for additional purchase cost plus
- Continuation of enhanced revenue funding scenario: Extension of the current enhanced government revenue support to 2035/36

The table below provides a summary of the key outputs of this combined scenario when compared to the 'do nothing' scenario.

	Output by 2035/36 compared to the 'do nothing' scenario			
Scenario	**Patronage (trips, per year)**	**Vehicle kilometres (per year)**	**Revenue (per year)**	**Operating costs (per year)**
Combined capital and revenue funding scenario	+ 126 million	+ 88 million	+ 14.6%	+ 13.7%

The combined scenario shows the potential of bringing together capital and revenue funding to deliver a larger, more efficient bus network that has significantly higher levels of patronage than the 'do nothing' scenario. This scenario would deliver an additional 126 million trips a year and 88 million vehicle kilometres a year by 2035/36, compared to what would be expected in the absence of additional funding.

Again, it should be noted that revenue funding has remained constant throughout this scenario and has not increased with inflation, effectively reducing the pot each year. This will limit the impact of revenue funding in the latter years of the scenario.

CONCLUSION

Bus patronage and networks have been in long term decline in England outside of London. This trend has been exacerbated by the COVID-19 pandemic and the subsequent cost of living crisis, which have accelerated changes to our travel patterns.

Government support has helped to protect bus networks since the beginning of the pandemic, safeguarding more service miles and reducing fares. This has seen patronage return to around 90% of where we would have expected it to be had the pandemic not happened, however it has left operators with a significant revenue gap. This is compounded by the increasing costs of bus operations, linked to inflation and congestion.

If this situation continues to play out, it will leave bus operators requiring higher levels of revenue subsidy each year to provide the same level of service rather than growing and transforming the network, with all the wider benefits that would bring. This report has explored whether capital investment can help make that much-needed revenue funding go further by making bus networks more efficient, providing scope to increase vehicle kilometres and boost patronage.

Our model shows that capital investment can indeed unlock efficiencies, and that these benefits can be multiplied by combining that investment with enhanced revenue funding support. **Together, maintaining revenue support at the current enhanced levels, increasing the take up of ZEBs, and delivering bus priority to knock one minute off each journey, make it possible to increase bus patronage by 126 million trips a year when compared to the baseline scenario.** The capital investment results in year on year efficiency savings for operators, allowing them to potentially reinvest the savings back into the network, therefore delivering higher levels of service and in turn generating further revenue.

These interventions would undoubtably make a huge difference to patronage levels and passenger experience. Crucially, they would also contribute towards wider goals of cutting congestion, achieving net zero and levelling up, although quantifying these wider benefits is beyond the scope of this report.

Revenue funding will continue to play an important role in providing the networks and fare levels our city regions need. Capital investment can help to maximise the benefits of that revenue funding, creating efficiencies and providing a service that is attractive to people.

But, crucially, our modelling has also demonstrated that the scenarios examined are not enough to reverse the long-standing pattern of decline, only to slow it down.

To reverse the cycle of decline and achieve growth and transformation, there is a need for government to review its overall approach to bus funding and work in partnership with local government to find a way forwards.

Buses provide an essential service to millions of people and businesses. Revenue and capital funding for bus is an essential investment. An investment in the environment, in people's opportunities, in economic growth and in our places and communities.

Forthcoming UTG research will begin to map the pathway to place bus, and local transport in general, on a financially sustainable footing to support long-term growth and maximise the wider benefits it continues to deliver.

REFERENCES

[1] DfT National Travel Survey

[2] KPMG (2020) Maximising the benefits of local bus services

[3] DfT Bus Statistics BUS01A

[4] Zero emission buses: local authority toolkit https://www.gov.uk/government/publications/zero-emission-buses-local-authority-toolkit/

[5] DfT statistics table BUS06f

[6] The Zero Emission Bus Regional Areas (ZEBRA) scheme is a competitive fund that has helped local authorities and operators transition to zero emission bus fleets. The scheme has covered 75% the cost difference between a zero emission bus and a conventional diesel bus.

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