

Shared e-scooters

A summary of the socio-economic benefits

A study by Volterra Partners

October 2022



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Foreword



Luke Thurley
Associate at Volterra Partners

Micromobility is an increasingly popular form of transport, greatly enhancing the connectivity of the cities and towns where such schemes operate. People's behaviour relating to travel is changing. Micromobility offers users both a green travel option and flexibility to suit evolving post-Covid working patterns.

In the UK, the rise of micromobility (and in particular shared e-scooters) has been a very recent trend. We still remain in an initial trial period, which will now last to May 2024. There still remains a knowledge gap around the socio-economic impacts of the micromobility industry. This research on behalf of Voi Technology (hereafter 'Voi') seeks to address this gap.

There are clearly some areas which have attracted negative media, such as safety concerns and inconsiderate use of e-scooters. Yet the economic benefits are wide-ranging and in many ways similar to those economic benefits arising from cycling. This study demonstrates that the introduction of shared e-scooters into UK towns and cities have the potential to revitalise struggling high streets, improve accessibility to employment opportunities, encourage linked public transport trips, and create environmental benefits that can help us in our drive to reach net-zero.

It is up to the government, working collaboratively with industry, to find appropriate ways to address any negative impacts and harness the positive socio-economic benefits.

The people utilising e-scooters as an alternative transportation solution come from an increasing range of demographic and socio-economic backgrounds. E-scooters can also improve accessibility options for some of the most vulnerable in the population, particularly some mobility-impaired users. The initial findings presented in this benefits study provide a clear indication that shared e-scooters have net positive socio-economic impacts in the UK towns and cities in which they operate. It is now up to decision-makers across all levels of government to carry on this work by looking at the socio-economic impacts of the micromobility industry as a whole, and for them to decide whether the licensing of shared e-scooters is made permanent at the end of the trial period. This report sets out a number of recommendations for future work directions, to build on findings presented here.



Matthew Pencharz
Head of Public Policy, UKI

Voi Technology launched its first UK e-scooter scheme in Northamptonshire in September 2020 and there has seen incredible demand for this new mode of sustainable transport - one that is safe, sustainable, affordable and convenient - ever since with over 18 million trips (October 2022).

Voi is now the UK's largest provider, operating in 17 towns and cities outside of London.

The environmental benefits of micromobility have become increasingly clear, especially as the service has become more normalised. Our surveys - with thousands of respondents - show four in ten of our riders are using an e-scooter instead of making the same journey with a car or taxi to get around - helping reduce congestion and the associated pollution, whilst also having material wellbeing benefits.

We believe people need to be given a variety of sustainable alternatives to cars because not everyone wants, or is able, to cycle and so micromobility should be added to that. Offering this choice is crucial to the wider Government aim of ensuring half of all urban journeys are made by an active mode to achieve its net zero ambitions.

Shifting people to new modes of transport has inevitable economic consequences too. While the understanding of the economic and social benefits of cycling has been examined recently, the impact of micromobility - a relatively nascent mode - has received sufficient attention. That's why we are proud to have partnered with Volterra to undertake this independent research.

This independent research, which is an industry first, shows micromobility has the potential to transform our towns and cities economically by helping generate millions of pounds of local spend, support employment and help create equity for those in low-income communities. As the report highlights in close detail, micromobility can reinvigorate and change the places we live for the better.

Study rationale

Overview

Transport behaviours in the UK are changing. In the early stages of the Covid pandemic in 2020, and in order to support a sustainable restart of local travel and help to alleviate crowded public transport services, the Department for Transport (DfT) allowed the trials of shared e-scooters in some of the UK's urban areas.¹

The trial period has been extended to run until May 2024 (at the time of writing), and an extensive monitoring system is in place to assess the impacts on safety and wider impacts.² Since the beginning of the trials, it is clear that micromobility has had a far greater impact than just reducing the number of cars on the road. This is a significant impact in itself – analysis suggests that the studied operator's shared e-scooters has removed at least 4.0m independent car trips from the road to date [April 2022, the period up to which data were made available], with this expected to rise to 6.1m by end of 2022 and 10.9m by the end of the trial period. A range of wider impacts need to be considered in order to fully understand the impact of shared e-scooters. These cover the following elements and many more: sustainability, economic, equality, transport, and other social impacts.

Volterra Partners, an economic consultancy specialising in the economic and social impact of development projects and transport infrastructure, have undertaken an independent study using Voi data.

This summary document highlights the key findings of this initial socio-economic study. The benefits assessed in this study broadly align with the benefits presented for previous studies undertaken to assess the impacts of cycling. Similar to cycling, key benefits include increased local expenditure, improved wellbeing and environmental benefits to name a few.

This study was commissioned by Voi and is based on Voi ride data only. All mention of e-scooters and statistics or impacts relating to e-scooters are relevant only for Voi e-scooters in their respective trial areas only, unless otherwise stated.



VOLTERRA DISCLAIMER: Volterra was commissioned by Voi Technology to undertake an independent socio-economic appraisal on the direct and wider impacts of shared e-scooters. Volterra's appraisal considered both the beneficial and adverse impacts associated with shared e-scooters, seeking to quantify and monetise these impacts where possible, and qualitatively discuss the need for future research into impacts where it was not. The full appraisal report was produced for Voi Technology as an internal document, to inform their discussions with key stakeholders in the industry.

In preparing this report, Volterra has relied on information provided either publicly or by the client, and we do not accept responsibility for the content, including the accuracy and completeness, of such information. The estimated impacts are scenario-based where appropriate and are based upon interpretations or assessments of available information at the time of writing. Actual events frequently do not occur as expected. This is particularly true in innovative or fast changing sectors. Shared e-scooters are a relatively new and innovative mode within the wider transport ecosystem. The reliability of forecasts in emerging markets such as these is particularly challenging, as frequently further innovation or step changes can occur that are not readily forecast. For this reason, we do not accept responsibility for the realisation of any impact estimate, given findings are time-sensitive and relevant to current conditions at the time of writing. Volterra's work aims to consider the overall benefits and costs of e-scooters. This summary document presents the socio-economic benefits identified in Volterra's work. Whilst it is not incorrect to present these specific benefits, it should be recognised that it is only a partial picture of the overall net socio-economic impact.

This document does not present the potential adverse impacts of shared e-scooters, although this can be discussed with Voi on request. In Volterra's professional opinion, there is an overall net socio-economic benefit related to shared e-scooters.

^{1,2} Dft. 2022. E-scooter trials: guidance for local authorities and rental operators.

Key findings

All figures relate to Voi's existing trial areas alone. The socio-economic benefits by all trial e-scooters across the UK could be far greater.



Independent socio-economic benefit analysis suggests e-scooter operations across Voi's existing trial areas could provide a £53 million benefit in 2022 alone, extending to £2 billion over the next 60 years*

High streets

It is argued that e-scooters and other forms of micromobility form part of the essential solution to creating an enhanced visitor experience on high streets and city centre areas.

E-scooter operations could lead to a **£1.2bn boost^{**}** for the studied trial areas struggling high streets if introduced permanently, as a result of increased food & beverage (F&B) expenditure alone.

In 2022 alone, this equates to **£32m in extra expenditure,** supporting an estimated **700-1,400 jobs per year** in the studied trial areas.

It is estimated that between **0.1% to 0.7%** (Birmingham, the minimum; Bristol, the maximum) of all shopping trips in a trial area are carried out by users on the studied operator's e-scooters for the different locations around the UK

In 2022, it is estimated that approximately **£8.7m will be redistributed** (central scenario) from out of centre retail parks and online shopping towards (non-F&B) retail shopping on the high streets in the studied trial areas.



*Please see Volterra disclaimer in Study Rationale. These figures represent the total monetised benefits and exclude health and safety disbenefits.
 ** NVP, central estimate.

Key findings

Equality

There are 6 studied trial areas (out of 11, given Northampton and North Northamptonshire are combined for this specific analysis) where over 1 in 5 of e-scooter trips originate from within the 20% most deprived areas in the country.

In total,

1 in 4 trips

either start or end in the country's top

20% most deprived areas.

This demonstrates that the studied operator is not only just operating successfully in affluent areas of the country currently; their model can be a success in a variety of different urban areas.



On average,

30% of users ride a shared e-scooter to get to or from work,

indicating a general shift of e-scooters use from leisure purposes to commuting.

This is greater than the 15% proportion of all trips in the 2019 NTS (pre-pandemic) that were estimated to have a main purpose of commuting, suggesting Voi e-scooters are disproportionately used for work and commuting purposes.

This shows that Voi e-scooters are having a potentially significant impact on accessibility to employment.

The studied operator's user-base clearly has a higher concentration of users in both the very low and very high salary brackets.

The literature suggests e-scooter riders that fall into lower income brackets are more likely to use e-scooters as an affordable travel option, whereas higher income riders use the service for convenience or leisure.

In the case of the studied operator, it is anticipated that their 'Voi for All' discount scheme makes shared e-scooters accessible to all sub-groups of the population.



Key findings

Transport

It is estimated that the studied operator's presence has

removed at least 4m independent car trips

from the road to date

[April 2022, the period up to which data were made available].

This figure is expected to rise to 6.1m by end of 2022 and 10.9m by the end of the trial period. This replacement of independent car trips takes average car occupancy into consideration; in reality, the number of shared e-scooter users (individuals) switching from use of car to shared e-scooter is even higher.

If made a permanent solution, the studied e-scooter operations could result in up to

£64m of decongestion

benefits to existing highway users and up to

£273,000,000 of benefits

in travel time savings from users moving from walking to e-scooters in the studied trial areas (over the permanent appraisal period).

There is a large breadth of evidence that suggests e-scooters are, on the whole, complementary to public transport use, rather than a substitute.

Modal shift away from car trips results in environmental benefits such as reduced greenhouse gas emissions, improved local air quality, and decreased noise nuisances.

Combined, these benefits are valued at £312k in 2022, increasing to £1.7m over the e-scooter trial appraisal period, and

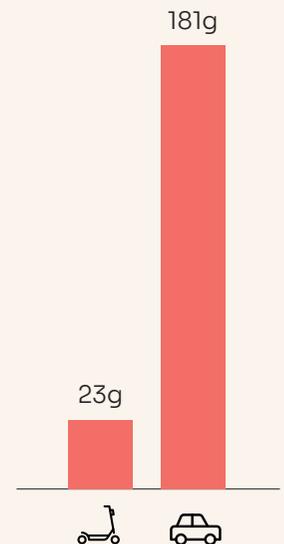
£14.3m

over the 60 year appraisal period.

Cars, on average, emit over 28 times more PM2.5 particles per km travelled than the studied operator's shared e-scooters.

Once factoring whole-life carbon costs, an e-scooter, on average causes 23g of CO₂ emissions per kilometre travelled. As a comparison, an average petrol car emits 181g of CO₂ emissions per kilometre from exhaust emissions alone

CO₂ emissions per kilometre travelled



Key findings

Other social impacts

There is emerging literature that e-scooters can have overwhelmingly positive impacts on the mental health outcomes of users.

It is estimated that the studied operator's e-scooter operations could result in

£36m and £477m
in mental health and wellbeing benefits

over the two appraisal periods.

In the year of 2022 alone, the studied operator's e-scooters is expected to deliver £11m in wellbeing benefits.



Introduction

Overview of this study

Micromobility is an increasingly popular form of transport, greatly enhancing the connectivity of the cities and towns where such schemes operate. The studied operator's e-scooter fleets enable users previously constrained by unreliable and irregular public transport, or highly congested city centre roads, to move around their cities and towns freely. Micromobility services such as the studied operator's fleet of e-scooters have a wide range of socio-economic impacts. Whilst the existing literature investigates some of these socio-economic themes, there is very little research performing an all-encompassing socio-economic impact appraisal, with the monetisation of impacts where possible.

This report seeks to address that gap. It is written by Volterra Partners LLP ('Volterra') and has been commissioned by Voi (referred to as 'the studied operator'). The report summarises the initial findings of an independent study investigating the socio-economic impact of the studied operator's e-scooter operations. The study considers both the positive and negative socio-economic impacts of shared e-scooters, assessing these impacts in monetary terms where possible, as well through various pieces of other quantitative and qualitative analysis.

The impacts assessed fall under the following categories:

- **High street revitalisation**
- **Equality**
- **Transport**
- **Other social impacts**

Impacts are appraised at the national level where possible. Throughout the report, Bristol is used as the main case study due to the size of the studied operator's activities in the city. Where a national assessment is not possible, a range of analyses are utilised to illustrate the socio-economic impact that shared e-scooters are having within Bristol specifically.



For this summary document, monetised socio-economic benefits are calculated over two separate appraisal periods:

E-scooter trial appraisal period (2020 – 2024)

The studied operator's e-scooters were first introduced in September 2020. The DfT's e-scooter trial is currently expected to end in May 2024.³ Impacts are calculated over this time period, to illustrate the socio-economic impact that the studied operator's e-scooters have had to date, and are expected to have for the remainder of the trial period.

60-year appraisal period (2020 – 2079)

For the majority of transport schemes, impacts are appraised over a 60-year appraisal period, in line with the TAG guidance.⁴ This represents a reasonable appraisal period scenario where the studied operator's e-scooters become a permanent micromobility solution in its UK cities and towns.

Further detail on the methodology can be found in the standalone technical methodology appendices, which can be made available by the studied operator upon request when appropriate.

³ Move Electric, 2022. Rental e-scooter trials to be extended until May 2024. Available [here](#).

⁴ DfT, 2018. TAG unit A1.1 Cost-Benefit Analysis

Context of the study

Micromobility is a rapidly growing industry

Over the 2-year period 2019-2021,

100 million trips

were made through e-scooters in the UK, and the industry has received approximately

£1.3bn

in investment.⁷

It should be noted that for a proportion of this time period, there were very few trials going on, meaning that many of the journeys in this estimate were likely illegal personal e-scooter trips.

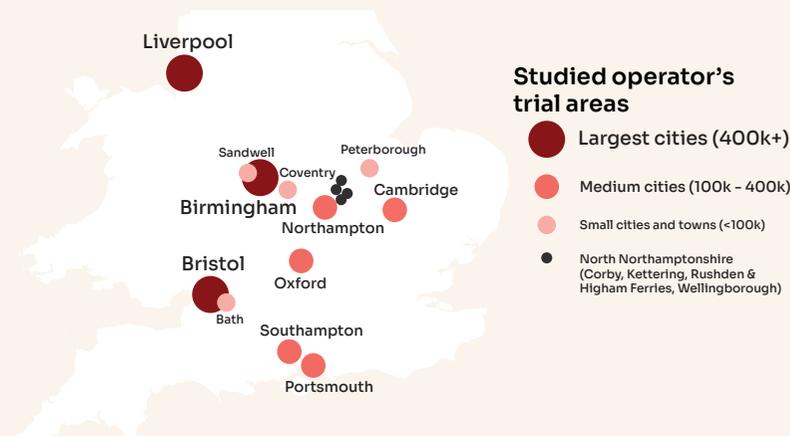
The population perceive greener transport as a key ingredient on the road to achieving net-zero ambitions.

A survey found that 38% of UK adults would switch to greener transport to reduce their carbon footprint, with 28% specifically choosing to switch to e-bikes or e-scooters.⁸

The UK government recognised the important role e-scooters could play in tackling the climate crisis, as well as reinventing transportation, during the early stages of the Covid-19 pandemic. Therefore, UK law was amended on 4 July 2020 to facilitate the introduction of shared e-scooter trials.⁹ The shared e-scooter trials have now been extended until May 2024.¹⁰

The studied operator is playing a significant role in growing the e-scooter market. Their fleet of e-scooters throughout the UK serve the following locations outlined in the table below and referred to as the studied trial areas throughout the rest of the report. Four smaller areas and towns within North Northamptonshire are combined and presented as a single trial area for the purposes of this report.

The studied operator acts as the exclusive shared e-scooter provider in the cities and towns that they operate in, and to date, have just over 1 million existing users in the UK, who have enjoyed 16.4m trips [September 2022].



Comparisons with previous cycling studies

There is an established body of evidence in the existing literature on the socio-economic benefits of cycling. **Cycling is the transport mode that is most commonly compared to micromobility, and in particular shared e-scooters.** The findings of previous cycling studies,^{5,6} outline a wide range of benefits related to this transport mode. Cyclists are thought to visit local shops more regularly, spending more than users of most other modes of transport. It is generally agreed that cycling can increase the reach of public transport nodes, whilst the provision of cycling facilities can help to overcome difficulties in accessing employment opportunities, and in some cases increase property values. In terms of softer social impacts, cycling can improve wellbeing and has clear environmental benefits by reducing emissions, air pollution and noise pollution.

This study demonstrates that shared e-scooters support very similar types of benefits to cycling, particularly those centred around improved wellbeing, better access to public transport and employment opportunities and improvements to the environment.

⁵ ECF, date unknown. The benefits of cycling – unlocking their potential for Europe.

⁶ Raje and Saffrey, date unknown. The Value of Cycling.



⁷ Connected Places Catapult, 2021. Micromobility – Creating a UK Micromobility vision

⁸ Intelligent Transport, 2022. NEWS Brits prefer to tackle climate change by switching to greener transport, says [TIER survey](#).

⁹ House of Lords Library, 2022. E-scooters: The road ahead.

¹⁰ Move Electric, 2022. [Rental e-scooter trials to be extended until May 2024.](#)



High Street revitalisation and tourism

Challenges for retail

Decline of town centre and high street retail

The structure and composition of the national retail industry has been transforming over the past decade. This is particularly relevant given evolving trends in retail towards online shopping, prompting concerns about the future viability of physical retail centres, which was further exacerbated by the Covid-19 pandemic and now facing a new threat; the cost-of-living crisis.

Out of centre retail parks and standalone sites saw the smallest reduction in unit closures (-4%) in 2021, compared to -5% in high streets and -7% in shopping centres respectively.¹¹ In fact, retail parks have outperformed shopping centres and high streets since 2015, with shopping centres going from the second-best performing areas to the worst.¹²

Unless action is taken, there will continue to be a further deterioration of the high streets and shopping centres in the future.



It is argued that e-scooters and other forms of micromobility form part of the essential solution to creating an enhanced visitor experience on high streets and city centre areas.

Shared e-scooters improve accessibility to local high streets and encourage people to travel to these areas. This is supported in rider data - the studied operator's summer survey (2022) found that around 25% of 3,493 survey respondents used a shared e-scooter for their last trip to get to or from a social engagement, and a further 14% used a shared e-scooter to run errands or go shopping.

Social engagements, shopping experiences, and other errands are often likely to take place on high streets and central areas. This suggests that shared e-scooters have a positive impact on the accessibility of high streets.

Increased high street expenditure

Reflecting existing studies, the assumed expenditure uplift ranges for F&B expenditure of 2.0%, 3.5% and 5.0% are assumed as low, core, and high uplift scenarios in this study, respectively.

F&B expenditure uplifts are estimated for all of the UK towns and cities that the studied operator is present in, and a 25% displacement factor - uplift that would occur in the absence of the introduction of e-scooters but due to alternative high street interventions (pedestrianisation, creation of parklets etc.) - is applied to these uplift estimates to be conservative. These uplift percentages are applied to estimates of total existing F&B expenditure in each studied trial area. Existing expenditure has been estimated by utilising publicly available rateable value (RV) data from the Valuation Office Agency (VOA), and applying standard relationships between (i) RV and rent, and (ii) rent and turnover. Given the uncertainties surrounding these relationships, three existing turnover scenarios are estimated for each studied trial area (low, core and high). Studied trial area boundaries align with agreed area boundaries that the studied operator is allowed to operate in.

^{11,12} PWC, 2022. Rate of store closures slowing, but chain operators not replacing vacant units.

Findings

In the ‘core-uplift core-turnover’ scenario, **it is estimated that the economic impact of increased F&B consumer expenditure is £1.2bn over the 60-year appraisal period**, i.e., in the scenario where shared e-scooters are made a permanent transport solution in the specific studied trial areas analysed in this report. **This additional expenditure could support in the range of 700-1,400 jobs per year.**¹³



Bristol is used as the studied trial area example to place this induced jobs uplift into context.

As a result of the estimated F&B expenditure uplift in Bristol, it is estimated that this additional expenditure is supporting 130-260 F&B jobs within the city in 2022. **This estimated uplift is equivalent to 0.8% to 1.7% of Bristol’s total employment in the food and beverage industry in 2020 (15,500), which is a material contribution for a single policy intervention.**¹⁴

Employment data should be monitored in this industry over time in the coming years, albeit it will be hard to determine the casual impacts of shared e-scooters, particularly during times of the Covid-19 pandemic followed by a cost-of-living crisis.

It is noted that there is significant uncertainty on the exact scale of the anticipated expenditure and employment uplift. For example, in the scenario where the highest expenditure uplift is achieved on the highest estimated level of baseline turnover, an uplift of £3.4bn (NPV, 60 years) in F&B high street expenditure could be achieved. In contrast, over the same period, the low-uplift low-turnover scenario would result in a minimum (albeit still significant) economic impact of £458m (NPV).

Therefore, despite the variance caused by the sensitivity of the model to input assumptions, it is clearly evident that given the findings of the existing literature on e-scooters impact around the world, the scale of expenditure benefit that can be achieved by the introduction of shared e-scooters, on the F&B market alone, has the potential to be very significant.

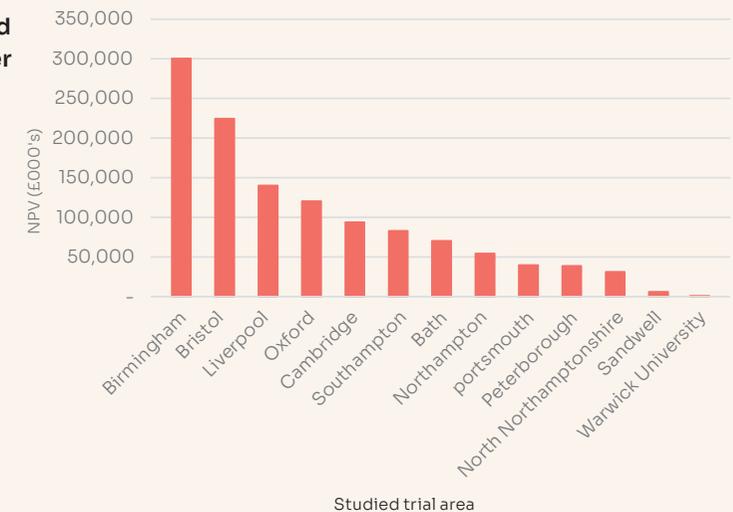
Even in the four-year trial period alone, it is estimated that the presence of the studied operator’s e-scooter fleets will lead to a £106m (NPV, core) uplift in F&B expenditure across its UK towns and cities, helping to boost UK high streets at a time when they are struggling most.



Figure 1 details the distribution of F&B expenditure impacts by trial area. These impacts are positively correlated to the quantum and economic value of F&B expenditure in the trial area boundaries. Therefore, Birmingham experiences the largest share of gross economic impacts (due to it having the highest estimated level of existing F&B turnover), with Bristol and Liverpool in second and third respectively.

Together these three cities experience a combined economic benefit of £665m (NPV) in the core-uplift core-turnover scenario – 55% of total benefits.

Figure 1. F&B expenditure uplift by trial area (core-uplift, core-turnover, 60-year appraisal period)



Source: Volterra calculations, 2022

¹³ The presented range reflects two different methodologies for estimating employment generation in this context. The lower end is based on estimated turnover per worker, and the upper end is based on estimated GVA per worker.

¹⁴ ONS, 2022. Business Register and Employment Survey.

Retail expenditure redistributed to high street

Whilst the literature does not suggest that the introduction of e-scooters materially increases expenditure in retail (non-F&B) businesses within a city, combining the results of the user survey with analysis of individual data suggests there **may be some redistributive impact away from out of centre retail parks and online shopping towards individuals shopping on high streets instead.**

Monetised retail expenditure redistribution

It is estimated that **between 0.1% (Birmingham, the minimum) to 0.7% (Bristol, the maximum) of all shopping trips in a trial area are carried out by users on the studied operator's e-scooters for the different locations around the UK**, dependent on the studied operator's e-scooter coverage relative to the size of the population in that location.

Following this methodology, it is estimated that of the £9.1bn of annual physical retail expenditure across all of the studied trial areas combined in 2022, £8.7m (0.1%) is the total amount of expenditure on high streets that has been redistributed away from out of centre retail parks and online retail towards high streets as a result of shared e-scooter users.

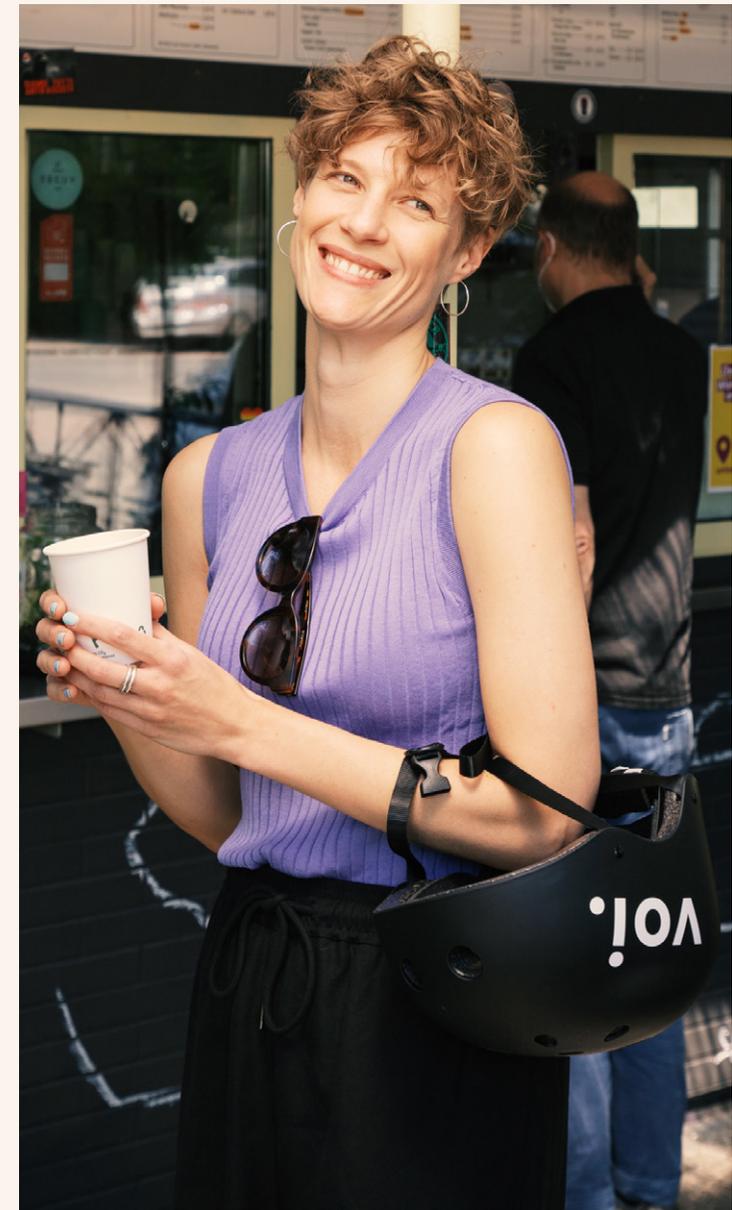
Combining this redistributed expenditure with the expenditure that would have always occurred by the studied operator's users on the high street, the total annual expenditure in 2022 by users within retail on the high street is estimated to be £37m (£13m of which is in Bristol alone).

An estimated £144m of high street expenditure will be redistributed from out-of-centre retail parks over the 60-year appraisal period, and £102m will be redistributed from online retailers.

Table 1. Redistribution benefits to high streets

Appraisal period	Net present value (£000s)		
	Redistributed from out-of-centre retail parks	Redistributed from online retailers	Total redistributed to high street
2022	5,092	3,617	8,709
E-scooter trial period	16,445	11,680	28,125
60-year appraisal period	144,026	102,293	246,318

Source: Volterra analysis, 2022.



Bristol case study

The studied operator’s UK ride data for the Bristol trial area demonstrates the likely impact of shared e-scooter trips on redistributing expenditure towards high streets. To identify high streets in Bristol, the Ordnance Survey (OS) and ONS methodology for defining high street areas was used within this analysis.¹⁵ According to this, there are approximately 72 high streets within the shared e-scooter Bristol trial area.

The studied operator’s UK ride data shows that there are approximately 1,500 shared e-scooter parking spots within the Bristol trial area. Around 200 of these parking spots are located exactly on Bristol high streets, equivalent to 14% of the total. One of the biggest competitors of high streets is out of centre retail parks, which are performing relatively well in comparison to high streets. The Bristol trial area encompasses approximately 12 retail parks.¹⁶ The total number of parking spots within 150m¹⁷ of the 12 retail parks is around 34 spaces, equivalent to 2% in total, significantly lower than the number on high streets.

The UK ride data for the Bristol trial area shows that the number of shared e-scooter trips that ended in the high street locations (430,000) is equivalent to 31% of total trips across a 4-month period. The number of trips to retail parks were much lower, with only 31,000 trips ending nearby to retail parks.¹⁸ Therefore, shared e-scooters are more utilised for high street trips rather than trips to retail parks. Whilst it is difficult to ascertain the exact purpose of these high street trips (visits to high streets are no longer solely for shopping

purposes in the modern world), it is likely that these disproportionate trips are helping to support the revival of Bristol’s high street.

In fact, even if only 14% of these 430,000 trips to high streets in Bristol were for shopping purposes (as per the the studied operator’s summer survey results), then approximately 60,000 trips would be contributing to the vitality of high street retail, double the number of e-scooter trips made to out of centre retail parks.

Supporting this finding, results from the studied operator’s 2022 summer user survey found that if shared e-scooters were not available, then around 36% of respondents would have shopped either online or at a different location.

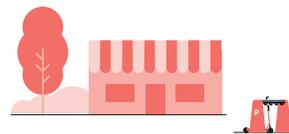
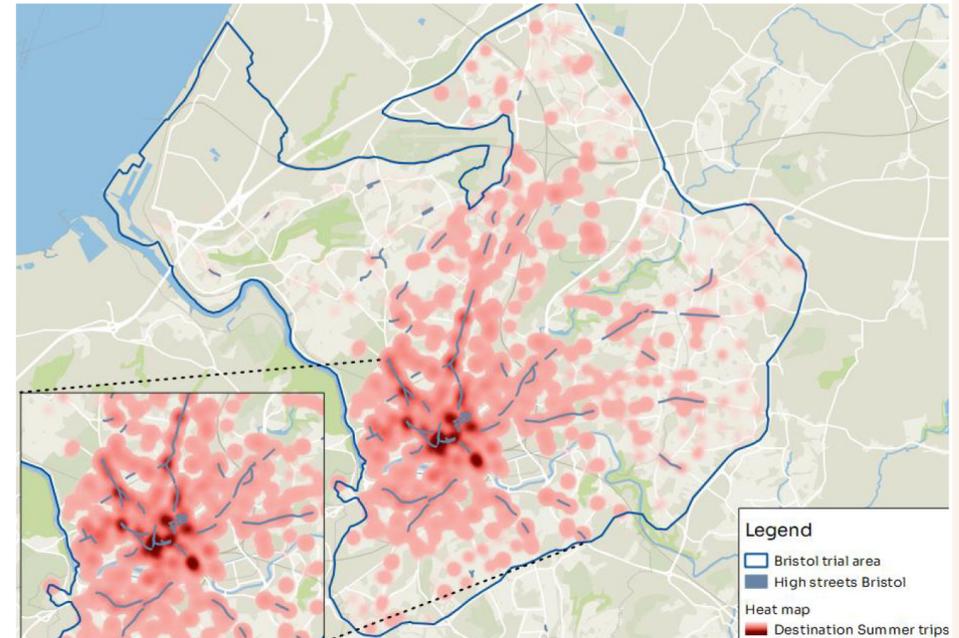


Figure 2. Heat map of the destination of Bristol summer e-scooter trips and location of Bristol high streets

Source: Voi UK ride data; OS & ONS, 2019. OS and ONS release report on the geography of Britain’s high streets; Volterra analysis, 2022.

Without the studied operator’s e-scooters, there would likely be a significant reduction of shoppers visiting Bristol’s high street locations, due to reduced accessibility and preference for alternatives.

Figure 2 shows a heat map of the end location of shared e-scooter trips in Bristol. Also displayed is the location of Bristol’s high streets. The map shows that the ‘hotter’ or ‘lighter’ colours that represent a higher number of trips are concentrated around the main high street locations within Bristol. This illustrates shared e-scooters success at attracting people and improving accessibility to high streets, which is likely contributing to the revival of these locations.



¹⁵ Ordnance Survey and ONS, 2019. OS and ONS release report on the geography of Britain’s high streets.

¹⁶ Google Maps, 2022. Retail parks in Bristol.

¹⁷ A simplifying assumption is made that all trips that end within 150m of the retail parks are going to use the facilities at the retail park.

¹⁸ 150m from the retail parks.

Equality

Personal affordability

Existing highway users

Shared e-scooter trips remove vehicles from the highway by encouraging modal shift from the private car to the shared e-scooter. **It is estimated that the studied operator's shared e-scooter trips have removed at least 4.0m independent car trips from the road to date [April 2022, the period up to which data were made available], with this expected to rise to 6.1m by end of 2022 and 10.9m by the end of the trial period.**

This replacement of independent car trips takes average car occupancy into consideration; in reality, the number of shared e-scooter users (individuals) switching from use of car to shared e-scooter is even higher. The 4.0m trip replacement estimate to date is based on an assumption around car occupancy of 1.4 shared e-scooter users, to reflect the fact that some car trips replaced would have had multiple e-scooter users riding together in that car in the counterfactual situation. This decongests the highway, facilitating shorter journey times for existing highway users. Shorter journey times result in lower expenditure on fuel, and a lower rate of car value depreciation. This represents a personal affordability benefit to existing highway users, which is monetised alongside as part of the decongestion impact presented in section 7.



Shared e-scooter users

Introducing shared e-scooters to a town or city increases the travel options available to a population. Shared e-scooters do not directly restrict the supply of other transport modes. There are also no reports of public transport supply levels being adversely affected as a result of increased shared e-scooter usage. In fact, shared e-scooters are intended to complement, and encourage use of, public transport, as discussed in the subsection Increased access to public transport (at least 20% of the studied operator's e-scooter trips are linked with public transport trips according to the studied operator's previous two user surveys).

Users will voluntarily choose to ride by shared e-scooter despite it being a more expensive mode of transport in comparison to walking, cycling and on occasion, public transport and private cars.

It is important to note that this increase in cost should not be considered as a disbenefit in isolation. Instead, it is clear that there must be other benefits more than offsetting the additional financial cost of shared e-scooters in order for people to utilise them, given that no one in the UK is obliged to use shared e-scooters. **By this, we mean that clearly, UK residents who use shared e-scooters are 'willing to pay' for their trips. This could be for a variety of reasons, but are likely mainly due to factors such as journey time savings (particularly when compared to walking), journey time reliability benefits (particularly when compared to unreliability public transport networks and highly congested roads), and wellbeing** (enjoyment from riding e-scooters) benefits. These benefits are by nature expected to be larger than any personal affordability disbenefit, otherwise, in reality, people would not utilise shared e-scooter fleets.

These offsetting time savings, reliability and wellbeing benefits are discussed later on in this report, in the subsections **Travel time savings to shared e-scooter users, Reliability (travel time), and Wellbeing and mental health impacts.**

However, it is not unimaginable that in the future, e-scooter riding could become so common-place, that levels of public transport supply decreases as a result of modal shift. This could have negative personal affordability impacts for some people who were previously reliant on those public transport services. Therefore it is imperative that in the future, modal shift from public transport to e-scooters and its impact on overall supply levels is monitored by public authorities and mitigated against, if necessary.

Qualitative assessment

Purchasing shared e-scooter trips can be done through a number of methods, including Pay As You Go, daily pass and monthly pass options. Furthermore, the studied operator offers a range of discounted pricing structures to specific groups of society, such as 'Voi 4 All' (offering 50%+ discounts to low-income groups, including refugees), 'Voi for Heroes' (discounted rides for NHS staff, emergency service workers, military personnel and veterans, asylum seekers and refugees), and 'Voi 4 Students' (offering 20% discounts on monthly passes).

This highlights the positive role that the studied operator is having in providing affordable travel options to those who most need it. It should be noted that daily and monthly pass options offer an unlimited number of rides once paid. This means that the more the studied operator's e-scooters are used, the more affordable they become as a travel option.

Deprivation

Spatial analysis

The English Index of Multiple Deprivation (IMD) ranking provides an assessment for deprivation under a number of domains.¹⁹ There are 6 trial areas²⁰ (out of 11, given Northampton and North Northamptonshire are combined for this specific analysis) where over 20% of the studied operator's e-scooter trips originate from within the 20% most deprived areas in the country. **In total, 24% of shared e-scooter trips either start or end in the country's top 20% most deprived areas.**

This national finding is partly driven by high numbers of trips within each studied trial area boundary to highly deprived areas, but also by the fact that the studied operator is currently operating in urban areas that are more deprived on average than national levels. Given the greatest density of trips always tends to be in the very centre of cities, which typically do not fall in the 20% most deprived (refer to maps of Bristol, Birmingham and Liverpool below), this finding of accessibility to lower income areas is by nature always likely to be suppressed.

The most notable areas are Birmingham, Liverpool and Sandwell, **where over 40% of trips originated from highly deprived areas.** The income and employment domains of deprivation recorded a similar proportion of trips originating from highly deprived areas, although in the income domain only 5 areas had proportions above 20%, which lowers to 4 areas when considering the employment domain. The proportion of trips that end in highly deprived areas is similar to those that originate in these areas, suggesting that Voi e-scooters are often being used for return trips within highly deprived areas, rather than just one way.

¹⁹ MHCLG, 2019. Index of Multiple Deprivation.

²⁰ Note that North Northamptonshire trial area includes the following towns: Corby, Kettering, Northampton, Rushden & Higham Ferrers, and Wellingborough.

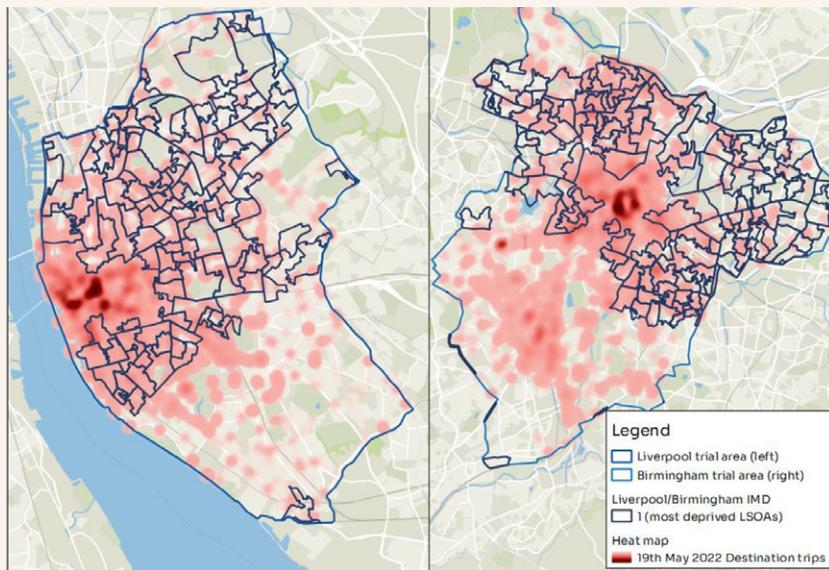
The studied operator has so far been successful in making its services equitable across cities, which was a key aim identified within the existing literature on micromobility schemes. Sandwell is an example location of where the studied operator’s introduction is directly impacting the country’s most deprived residents, as the area possesses 17 out of 18 LSOAs within the 20% most deprived areas in the country.

The studied operator’s e-scooters provide a transport option for these residents to access nearby areas such as the city of Birmingham and demonstrates that **the studied operator is not only just operating**

successfully in affluent areas of the country currently; their model can be a success in a variety of different urban areas.

Additionally, Figure 3 shows the destination of trips in Liverpool and Birmingham on Thursday 19th May 2022, with the ‘hotter’ colours representing more trips. This heat map is overlaid onto the boundaries of areas that are within the top 10% most deprived LSOAs in the country. The maps show that whilst a high proportion of trip destinations are inevitably concentrated in the city centre, there are high numbers of trips that end within highly deprived areas in inner city locations.

Figure 3. Heat map of end location of Voi e-scooter trips and highly deprived areas, 19th May 2022: Liverpool and Birmingham



Source: MHCLG, 2019. Index of Multiple Deprivation; Voi UK ride data; Volterra analysis, 2022. Note that the Birmingham trial area boundary has been extended from July 2022, but is excluded here due to a lack of ride data for that month.



Bristol case study

Figure 4 provides a heat map of the origin locations and destination locations of e-scooter trips overlaid onto the most deprived areas in Bristol. This shows that there is a lack of trips that have started and ended in the most deprived areas of Bristol. This is likely at least in part due to the fact that Bristol is less deprived on average; the pockets of deprived inner-city areas, which are slightly less frequent in number than many UK cities, are generally being well served.

A key issue is that the Bristol trial area does not extend to the most southern areas LSOAs that are some of the most deprived in the country. Therefore, **to make shared e-scooters more equitable in Bristol, the local authority could consider extending the trial boundary, and more broadly e-scooter boundaries for urban areas should be designed with the deprivation composition of cities and towns in mind.**

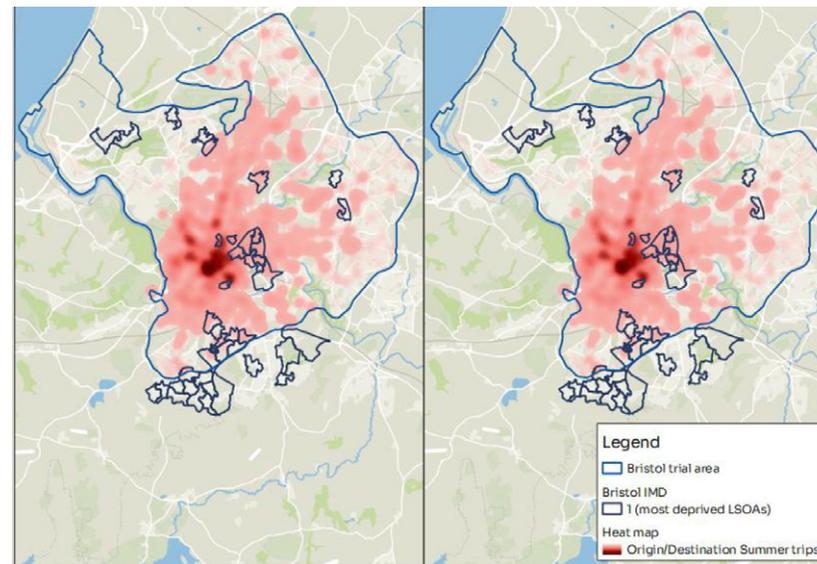


Figure 4. Heat map of: start locations (left) and end (right) locations of the studied operator’s e-scooter trips and highly deprived areas in Bristol, Summer 2022

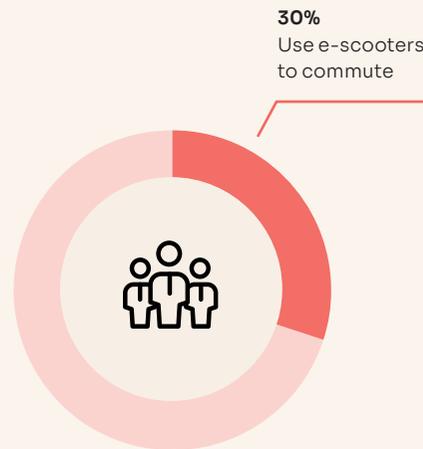
Source: MHCLG, 2019. Index of Multiple Deprivation; Voi UK ride data; Volterra analysis, 2022.

Enhanced access to employment

Analysis of the studied operator

The studied operator’s Summer 2022 (July) and Winter 2022 (Feb) Survey results found that on average, 30% of users ride a shared e-scooter to get to or from work.²¹

This is greater than the 15% proportion of all trips in the 2019 NTS (pre-pandemic) that were estimated to have a main purpose of commuting, suggesting **shared e-scooters are disproportionately used for work and commuting purposes.** This shows that the studied operator’s e-scooters could have a potentially significant impact on accessibility to employment.

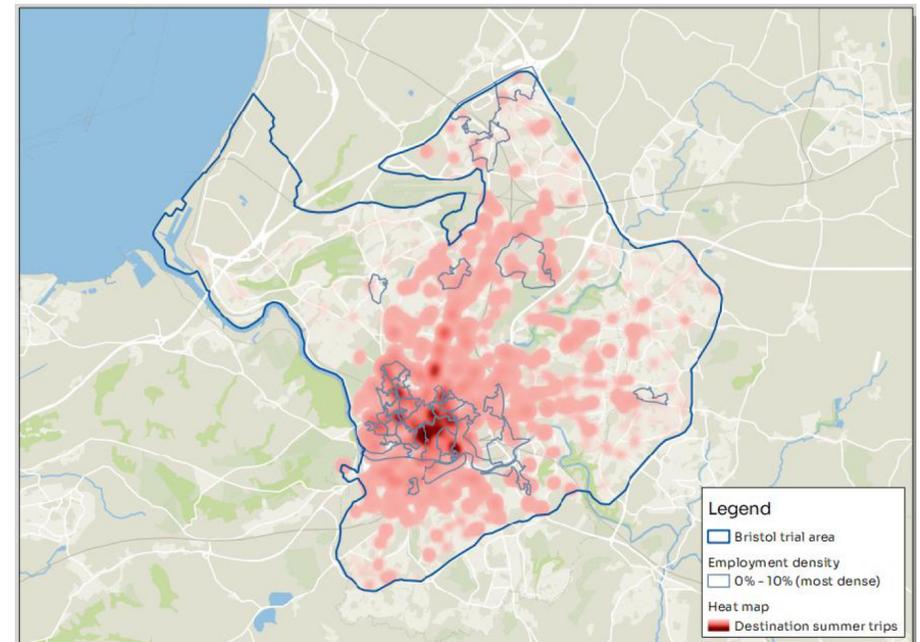


Bristol case study

In Bristol, there is a broadly positive correlation between the number of trips in the morning and the employment density of the end location. This indicates that a significant number of morning shared e-scooter users likely use this form of transport to get to their place of work or education. In total, 60% of all morning trips (around 62,000 trips) in Bristol end in the top 10% most employment dense locations.

The heat map in Figure 5 illustratively shows this finding. The number of trips in the morning are overlaid onto the top 10% of employment dense locations in Bristol.²² The ‘hotter’ colours show a larger number of trips.

Figure 5. Heat map of Bristol summer trips and the top 10% employment dense areas



Source: ONS, 2021. Business Register Employment Survey; Voi UK ride data; Volterra analysis

²¹ Voi, 2022. UK Summer Survey; Voi, 2022. UK Winter Survey.

²² Note this is for summer rides only, and areas are defined as LSOAs.

The incomes of users

The summer survey results from the answers to ‘What is your annual yearly salary’ provides detail on the implied distribution of the studied operator’s users’ annual salaries. Results suggest that almost 20% of the studied operator’s users earn £15,000 or less a year. A log normal distribution was assumed to account for how salaries vary within the individual bands – this is the standard distribution assumed for understanding how salaries vary amongst the population.

Assuming a log normal distribution, in comparison to the income distribution general population of the studied trial areas, the studied operator’s user-base clearly has a higher concentration of users earning both very low salaries and very high salaries. This is demonstrated in Table 8 (note “Prefer not to say” responses have been removed from the analysis). This finding of larger tails at both ends of the income distribution aligns well with the existing US literature, which finds that **riders that fell into lower income brackets were more likely to use e-scooters as an affordable travel option, whereas higher income riders used the service for convenience or leisure.**

Assuming a log normal distribution also enables an estimate for the mean average salary of a user based on the survey results. The overall effect is that the mean salary of the studied operator’s users is £27,828, which is slightly higher than the population weighted average for residents of the studied trial areas where the studied operator is present (£26,666), but 15.3% below the overall UK average of £31,285.²³

The larger proportion of shared e-scooter users at the lower end of the income distribution – 19.2% earning below £15,000 compared to just 17.6% earning below this amount in the overall population of the studied trial areas – is likely at least in part due to the discounted fare schemes that the studied operator has introduced. ‘Voi for all’, in particular, has likely made shared e-scooters accessible to all local residents within the studied trial areas. **Discounted schemes similar to ‘Voi for All’ should be encouraged if the shared e-scooter trial period is made permanent, to continue to make this mode of transport accessible and attractive to all.**



Table 2. Voi user and city population salary band analysis

Salary bands	Percentage of Voi users in each salary band	Percentage of Voi trial area residents in each salary band
£0 - £5,000	8.2%	0.3%
£5,000 - £15,000	11.0%	17.3%
£15,000 - £25,000	21.9%	28.2%
£25,000 - £50,000	41.8%	38.6%
£50,000 - £100,000	13.9%	13.9%
> £100,000	3.3%	1.6%

Source: Voi, 2022. UK Summer Survey; ONS, 2021. Annual survey of hours and earnings – residential analysis; Volterra analysis.

²³ ONS, 2021. Annual survey of hours and earnings – residential analysis



Transport

Decongestion impacts (travel time savings and personal affordability impacts to existing highway users)

Shared e-scooter trips remove vehicles from the highway by encouraging modal shift from car to e-scooter. This results in many streams of economic impacts, including decongestion benefits.

Decongestion benefits capture the economic impacts of shorter journey times as a result of shared e-scooter trips removing cars, and hence congestion, from the highway. The travel time reductions themselves are an economic impact, as are the personal affordability impacts of reduced fuel usage and vehicle depreciation that occurs as a result of shorter travel times.

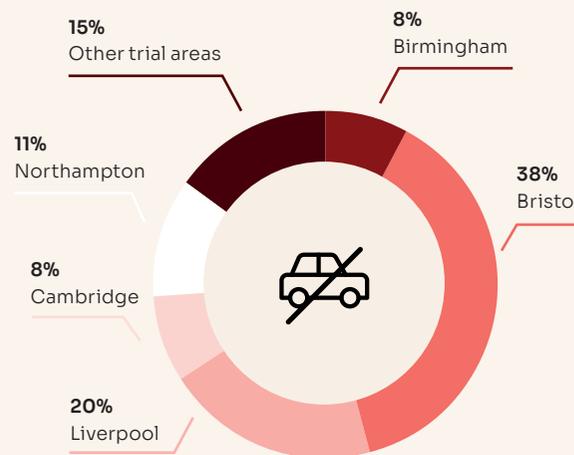
Decongestion impacts are calculated by utilising values of the marginal external costs (MECs) provided within DfT TAG guidance on pence per vehicle km removed from the highway.

Following the above methodology and accounting for average occupancy per car trip, **decongestion benefits are estimated to be £4.6m and £63.9m** over the e-scooter trial appraisal period and 60-year appraisal period respectively. **Due to the high levels**



of e-scooter trips in Bristol, the city makes up an overwhelming 38% of the decongestion benefits experienced across all trial areas (Figure 6).

Figure 6. Highway decongestion benefits by trial area



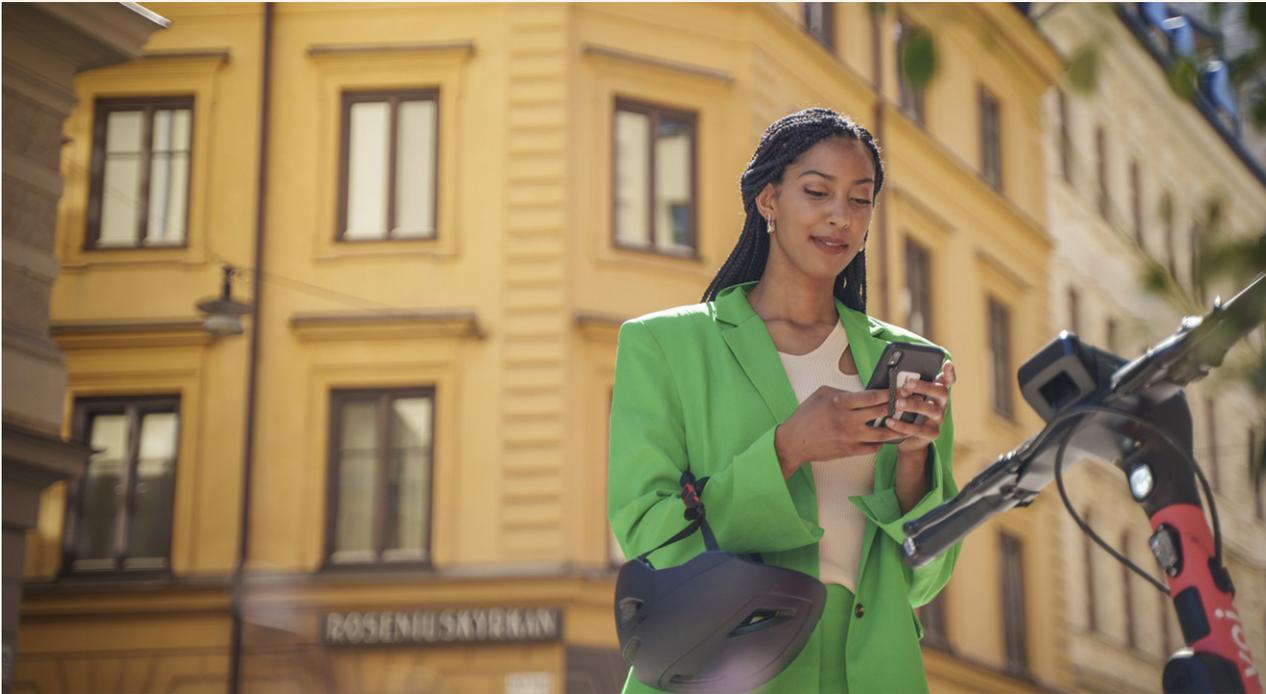
Source: Volterra calculations, 2022.

Travel time savings to shared e-scooter users

The travel time savings experienced by shared e-scooter users will largely depend on:

- The transport mode that users would have otherwise used; and
- The existing transport conditions of the trial area (e.g., highway congestion levels, levels of public transport service, etc.).

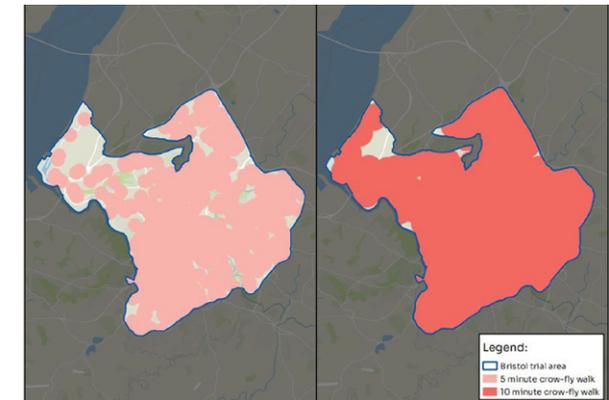
Transport conditions vary significantly for car trips and public transport trips between different trial areas and e-scooter routes. Therefore, for shared e-scooter trips which would have otherwise been public transport or car, it is very difficult to accurately calculate likely travel time savings (negative and positive) which occur as a result of modal shift towards e-scooters, in the absence of detailed transport modelling data for all trial area locations. The studied operator's users may experience travel time savings if they have switched from cars for trips in highly congested city centres. However, e-scooter travel times may be longer than certain car travel times in less congested out-of-centre locations. Due to this uncertainty, travel time savings for users switching from car and public transport are therefore excluded from this study.



Reliability (coverage) – a case study of Bristol

Figure 7 demonstrates the strong reliability coverage of the studied operator’s e-scooter parking spots within Bristol. For 80% of the Bristol trial area, you are typically only ever a maximum of a five-minute crow-fly walk from a shared e-scooter parking spot. **For a 10-minute walk, this figure increases to 97% of the entire Bristol trial area.**

Figure 7. Areas of Bristol within a 5-minute and 10-minute crow-fly walk of a shared e-scooter parking spot



Source: Voi ride data, 2021-2022. Volterra analysis, 2022.

A more direct comparison of travel times can be estimated between e-scooter, walking, and cycling. Average shared e-scooter travel times and distances have been determined from analysis of the studied operator’s UK ride data, and equivalent travel times for walking and cycling are derived assuming industry standard walking and cycling average speeds of 5 km/h and 15 km/h respectively.²⁴

Utilising these standardised walking and cycling speeds, and the average speed shared e-scooter trips, **each shared e-scooter trip that replaces a cycle trip is estimated to be 4.1 minutes slower on average, but each shared e-scooter trip that replaces a walking trip is 15.2 minutes quicker within the studied trial areas.** This intuitively makes sense given the limits of

e-scooter speeds currently imposed by DfT, compared to unrestricted speeds that can be achieved by users of private bicycles. This difference in travel time between shared e-scooters and cycles is made larger by the fact that the studied operator has taken the conscious decision to impose a slower speed limit (12.5mph) on their shared e-scooters than is mandated by the DfT (15.5mph).

Over the 60-year (‘permanent roll out’) appraisal period, the travel time lengthening of **users moving from cycle to shared e-scooters results in a disbenefit of £29m**, and the travel time savings of **users moving from walking to e-scooters results in a benefit of £302m**. Together, these impacts are a net benefit of **£273m**.



²⁴ Voi, 2022. Active Mode Appraisal Toolkit

Reliability (travel time)

E-scooters in many ways operate like bicycles. They have a similar average speed²⁵ and users operate them on the same infrastructure facilities (the highway and cycle lanes). Much like bicycles, shared e-scooter users can travel to cycle advanced stop lines ahead of other vehicles on the road, enabling them to route around queues. This means that **the travel times of shared e-scooters do not tend to be significantly affected by levels of highway congestion.**

It is commonly accepted that walking and cycling are the most reliable forms of transport in terms of travel time variation. Research by TfL tracked eight cyclists' journeys to work across a number of different traffic conditions and times throughout the day.²⁶ The study found that cycle journey times are highly consistent. One example 9.4km route from Colliers Wood to Victoria was completed by a cyclist on nine separate occasions. It also found that the variation between all "those journeys was 53 seconds on a journey time of 30 minutes. This represents a very low level of travel time variability.

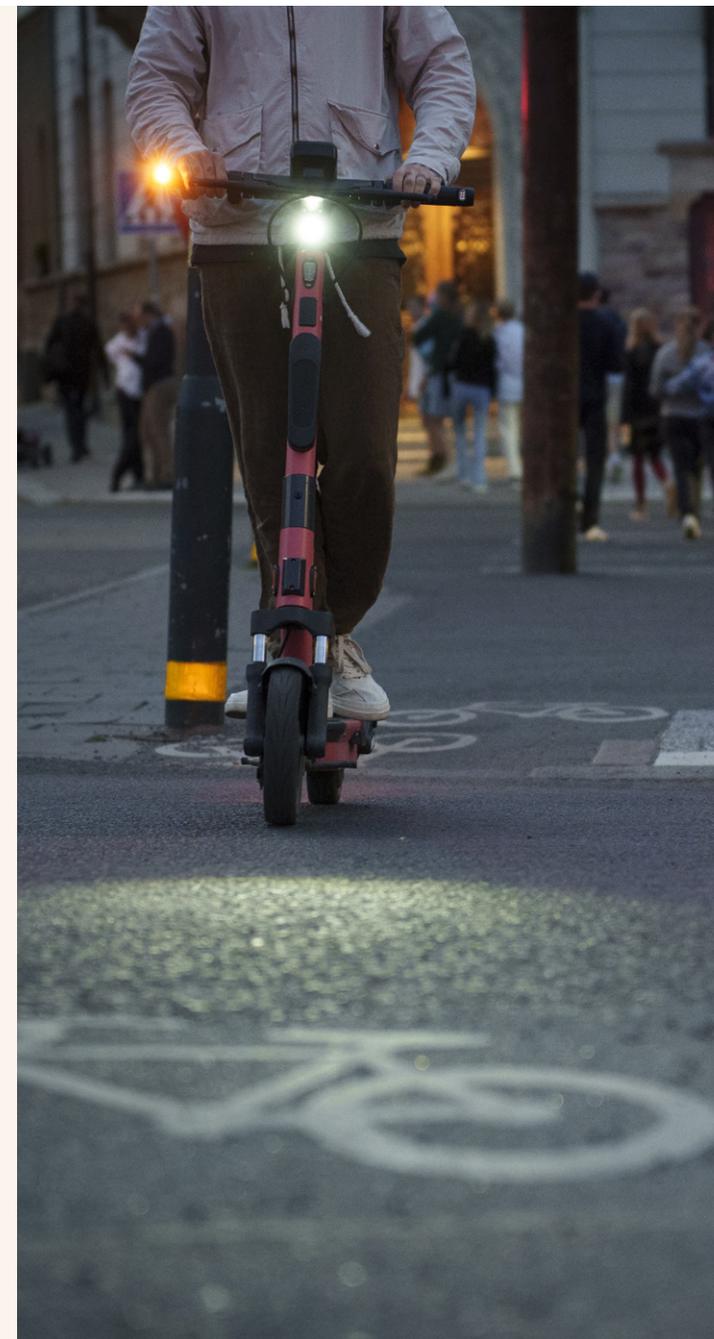
Given parallels between cycling and scooting, this can be taken as initial evidence for the travel time reliability of e-scooters, although further analysis needs to be undertaken through detailed transport modelling.

Infrastructure maintenance

Shared e-scooters remove cars from the road through modal shift, which decreases the rate at which infrastructure such as roads and bridges deteriorate.

This reduces maintenance costs and acts as a positive impact on central government. This positive impact is calculated through the MEC methodology and is calculated as £28k and £361k for the e-scooter trial appraisal period and 60-year appraisal period, respectively.

It is not thought that the presence of shared e-scooters in an urban area creates additional infrastructure maintenance costs. To date, the studied operator has not received any feedback from local authorities to suggest that the shared e-scooters have caused infrastructure degradation. Shared e-scooter users tend to utilise cycle lanes, and from an infrastructure perspective the requirement of shared e-scooters is primarily related to parking spots and racks.



²⁵ Voi, 2022. Voi Ride Data; DfT, 2022. Active Mode Appraisal Toolkit

²⁶ TfL, 2009. RNPR Traffic Note 11. Cycle journey time reliability

Increased access to public transport

There is a large breadth of evidence that suggests e-scooters are, on the whole, complementary to public transport use, rather than a substitute.

Analysis from EY on the studied operator’s global user survey found that approximately 63% of users combine shared e-scooter trips with public transport.²⁷ The summer and winter survey results suggest that, on average, at least 20% of the studied operator’s e-scooter users in the UK combined an e-scooter trip with public transport.

The proportion of trips that increase access to public transport clearly varies by city and specifically the nature of its public transport provision. For example, in Oslo, the proportion of trips combined was around 58%, whereas in Paris the figure was 15%.²⁸



Bristol: A closer look

Accessibility of public transport in Bristol has been under scrutiny recently, with only 42.5% of residents that live within the 10% most deprived areas being satisfied with the local bus service.²⁹ These communities are the most likely to use the bus services and therefore require improved accessibility options to encourage equality within the city. Shared e-scooters can help to reduce this by providing an alternative method that is more reliable.

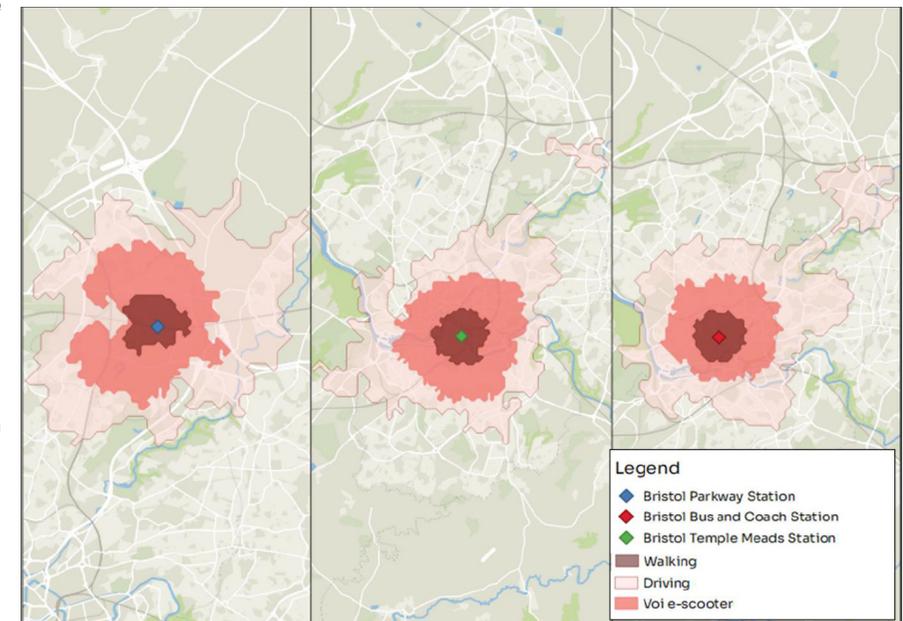
Additionally, it is estimated that approximately 60% of the the studied operator’s shared e-scooter parking spaces in Bristol are within 50m of a bus stop. Therefore, many residents are likely to combine shared e-scooter trips with a bus journey.

Figure 8 shows the areas of Bristol that can access three major transport hubs via a 15-minute journey by walking, driving, and taking a shared e-scooter. The three transport hubs include Bristol Temple Meads Station, Bristol Parkway Station, and Bristol Bus and Coach Station. In comparison to walking, e-scooting facilitates **much improve accessibility to public transport hubs within the city.**

Furthermore, in some highly congested areas of the city, even access to public transport

between shared e-scooters and cars is sometimes relatively comparable. For example, car travel times and shared e-scooter travel times from the Clifton Triangle to Bristol Temple Meads station are approximately the same. Similarly, car travel times and shared e-scooter travel times from Stoke Park to Bristol Parkway station are approximately the same.

Figure 8. 15-minute travel time isochrones arriving at key Bristol public transport nodes at 8.30AM (weekdays)



Source: Travel Time API; Volterra analysis, 2022.

^{27, 28} EY, 2020 Micromobility: Moving cities into a sustainable future

²⁹ Bristol City Council, 2019. Quality of life in Bristol 2019 – 2020

Other Social Impacts

Greenhouse gases

Shared e-scooters reduce greenhouse gases by removing car trips from the highway via modal shift. The total economic benefit of this reduction is monetised and estimated to be worth £1.1m and £8.8m in NPV terms over the e-scooter trial appraisal period and 60-year appraisal period, respectively.

Figure 9 displays the annual profile of mode shift related greenhouse gas benefits. Benefits increase rapidly between 2020-2022, representing the roll out of the studied operator’s e-scooters during the early phases of the trial period. Annual benefits then decrease substantially from 2022 to 2050, which is primarily as a result of assumed electrification of the car fleet forecasts, in line with current net-zero ambitions.³⁰ In reality, this estimated benefit is therefore conservative, given that within the current political climate, there is a realistic chance that net-zero goals could be pushed back, and the electrification of the car fleet could take longer to materialise. The fleet mix of cars is assumed to be constant post 2050 in the absence of a forecast. A slight increase in benefits is driven by the continually increasing monetised values of carbon, which are offset slightly by discounting methods.

Figure 9. Modal shift greenhouse gas monetised annual impact (NPV)



The production and maintenance of the studied operator’s e-scooter fleet inevitably has a carbon impact. Once factoring whole-life carbon costs, an e-scooter, on average causes 23g of CO₂ emissions per kilometre travelled. As a comparison, an average petrol car emits 181g of CO₂ emissions per kilometre from exhaust emissions alone – i.e., without considering any emissions related to production or maintenance.³¹

Given the monetised benefit greenhouse gas benefit above only captures the economic impacts of decreased exhaust emissions and not any of the whole-life carbon costs for the production, maintenance and operation of cars, for consistency of comparison, the whole-life carbon costs of the studied operator’s e-scooters are not monetised within the appraisal.



³⁰ DfT, 2018. Road Traffic Forecasts

³¹ BEIS, 2022. Greenhouse gas reporting: conversion factors 2022

Air quality

Shared e-scooters improve local air quality by removing car trips from the highway through modal shift. This means fewer harmful PM2.5 particles are emitted. The average car emits 0.02g of PM2.5 particles per km travelled. The average shared e-scooter of the studied operator emits 0.0007g of PM2.5 particles per km travelled. Cars, on average, therefore emit over 28 times the PM2.5 particles per km travelled than the studied operator's e-scooters.

The effect of improving air quality through modal shift of reducing cars, offset the small levels of PM2.5 particles emitted from the studied operator's e-scooters, are combined and then monetised. The result is £558k of economic benefit occurs over the e-scooter trial period and £4.8m over the 60-year appraisal period.

Noise

Shared e-scooters reduce noise disturbances by removing car trips from the highway through modal shift. The studied operator's e-scooters are assumed to emit negligible levels of noise. The economic benefits of this noise reduction are £56k over the e-scooter trial appraisal period and £710k over the e-scooter trial appraisal period.

Combined environmental benefits

The three environmental benefits outlined above combine to generate £1.7m of economic benefits over the e-scooter trial appraisal period, and £14.4m over the 60-year appraisal period.

Physical health benefits

The existing evidence base on whether the riding of e-scooters results in any physical health benefits is limited. Some e-scooter providers perhaps rightfully claim that riding e-scooters assists with the development of balance, core muscles, and coordination,³² but further research is required in this area before any conceivable health benefits can be monetised.

It is certainly conceivable that the studied operator's users who would have otherwise driven will experience a health benefit of some sort, in which case users experienced some sort of physical health benefit on an estimated 4.1 million trips in 2022.

Shared e-scooter users who would otherwise have walked or cycled will likely experience a health disbenefit when choosing to utilise an e-scooter instead. Whilst there are some health disbenefits related to shared e-scooters, it is important to place this disbenefit into context. What the health disbenefit does not capture is the individual's ability to make a choice. The individual may have a specific reason for choosing to utilise the shared e-scooter over a bicycle or walking at the time, ranging from travel time savings, to safety reasons (women travelling late at night for example), to temporary health reasons (recovering from sickness etc.). This wider context with respect to disabled people is considered below.



³² Raine, 2021. Is Riding An Electric Scooter Healthy For Me? Available at: <https://raine.co/blogs/news/health-benefits-electric-scooter#:~:text=Core%20development,-If%20you've&text=Riding%20an%20electric%20scooter%20strengthens,%2C%20thighs%2C%20arms%20and%20shoulders>

Disabled people (mobility-impaired users)

There is clear evidence that the introduction of shared e-scooters has benefitted people who are mobility-impaired (such as having multiple sclerosis for example), providing them with a usable and convenient transport alternative to private vehicles and public transport. New disability and inclusion research,³³ which is soon to be published, provides some insightful quotes from mobility-impaired users on how the introduction of shared e-scooters has improved their daily lives:

“There’s potential for people who can’t easily walk to a green space and back to get an e-scooter there rather than a car.”

“E-scooters might open up the potential for those who have some mobility difficulties today to make it easier for them to move around.”

“I do not find public transport accessible, so if e-scooters were and they made the journey quicker that would be great.”

The attractiveness of shared e-scooters to mobility-impaired users is demonstrated through analysis of the summer survey (2022) results. In response to the question “Has Voi allowed you to travel to places that previously you didn’t”, just over **1% of respondents stated yes, because I was previously unable to travel due to a disability**. This is a compelling finding, suggesting that for the month of April 2022 (the latest month for which individual ride data was provided) **approximately 3,000 of the studied operator’s current active users could be mobility-impaired** and utilising shared e-scooters to improve the everyday convenience of their lives. This figure would only be expected to increase as uptake in the population increases with shared e-scooter market maturity.

Clearly, based on the evidence presented above, the physical health disbenefits that some shared e-scooter users will experience due to switching from walking and cycling will be partially offset by the fact that shared e-scooters can provide a viable mode of transport for some of the most vulnerable groups in the population. The inclusivity benefits to mobility-impaired users are not quantified within this assessment, but this exercise is recommended for future work given the clear indications that shared e-scooters can make active travel accessible to mobility-impaired users, where previously it wasn’t.



³³ Open Inclusion (better for all), 2022. Perceptions of people who have disabilities, situational or permanent access needs on micromobility more broadly, and e-scooters more specifically.

³⁴ HM Treasury, 2021. Wellbeing Guidance for Appraisal. Supplementary Green Book Guidance.

Wellbeing and mental health impacts

It is conceivable this negative health impact is offset by a positive wellbeing impact. HM Treasury's Green Book provides a framework for monetising the benefits of improved wellbeing.³⁴ The framework details how every person or individual, a single point change in life satisfaction on a scale of 0-10 equates £13,000 of economic benefit over a two-year period, in 2019 prices.

It is conservatively assumed that **13% of the studied operator's active users experience an annual increase in life satisfaction of 0.1 over the ten-point scale – the 13% represents those users who ride with the studied operator 'just for fun' as per survey results.** These users are the most likely to receive a wellbeing benefit, but it's possible that other users would as well and hence this uplift in life satisfaction on shared e-scooter

users is considered conservative. An additional factor of 50% is assumed to account for the possibility that these users choosing to ride the studied operator's e-scooters for fun and wellbeing purposes would have found other activities in the studied operator's absence that might have caused the increase in life satisfaction of 0.1.

Utilising these assumptions, **over the e-scooter trial appraisal period, these improvements to wellbeing are estimated to result in £36m in economic benefit. Over the 60-year appraisal period, the economic benefits are estimated at £477m.**



³³ Open Inclusion (better for all), 2022. Perceptions of people who have disabilities, situational or permanent access needs on micromobility more broadly, and e-scooters more specifically.

³⁴ HM Treasury, 2021. Wellbeing Guidance for Appraisal. Supplementary Green Book Guidance.

Limitations

A study of this nature inevitably has certain limitations. The aim of this report is to provide a starting point for estimating the socio-economic impacts of shared e-scooters. It is emphasised that there are limitations specifically regarding uncertainty, non-monetised impacts and data. Further work involving much more detailed research than the high-level analysis carried out for this study, needs to be done.

In order to be conservative, this study does not attempt to make assumptions around how trips per person or uptake in the local population may increase over time. In reality, it is expected that uptake could increase over time, leading to higher net benefits.



Future directions

This study does not claim to be the complete picture of the estimated socio-economic impact of shared e-scooters in the UK. Instead, it provides an initial analysis of the estimated impacts of the studied operator's e-scooters during the UK trial period, as well as the indicative impacts if the operator's licences were to be made permanent in the towns and cities in which they currently operate. What this study hopefully does do, is provide some thought-provoking analysis on the wide range of potential socio-economic impacts (both expected and unexpected outcomes), which can initiate more detailed further research on this emerging transport solution in the future.

As a result of this study, a number of issues and knowledge gaps are identified in this research area, an area which currently lacks any guidance or standard practice around data collection and the appraisal of different e-scooter schemes. In line with the DfT's stated approach for how they will evaluate the impacts of the UK e-scooter trials,³⁵ it is recommended that future research exercises are undertaken on the following topics to enrich the existing knowledge base:

Geographical coverage – undertaken a nationwide assessment of the total socio-economic impacts of the shared e-scooter market in the UK. This nationwide assessment should consider how growth in shared e-scooter usage may grow in the UK's towns and cities as a result of rising popularity over time.

High streets – monitor for materially different changes in high street retail employment over time in areas where e-scooters are present and develop localised expenditure models than estimate the expenditure impacts of e-scooter users on the UK's struggling high streets.

Consider deprived areas – local authorities should consider extending the permissible boundaries in urban areas, with these boundary extensions designed with the deprivation composition of cities and towns in mind.

Travel time savings analysis – future research requires detailed transport modelling to be undertaken in the UK's cities and towns to determine the net time savings impact of users choosing to switch from car and/or public transport to the e-scooter mode of transport.

Safety and collision impacts – further independent analysis on the overall safety impact of shared e-scooters in the UK is required.

Public transport overcrowding – the impacts on the public transport network's overcrowding during peak hours should be assessed, given e-scooters disproportionately appear to displace trips from public transport at the busiest hours

Other cycling benefits – a number of benefits outlined in previous studies of the impacts of cycling are not assessed here. Shared e-scooters, due to their

similarity, have the potential to also result in these benefits. Future studies should look to assess (i) whether the presence of shared e-scooters can lead to increases in property values; (ii) tourism impacts; (iii) any agglomeration benefits; and (iv) provide a formal (Green Book compliant) Benefit Cost Ratio (BCR) of shared e-scooter schemes.

Physical health benefits / disbenefits – further independent research is required into the potential physical health benefits of e-scooters (balance, core muscles etc.) and how these offset physical health disbenefits from walking and cycling mode shift.



³⁵ <https://www.gov.uk/government/publications/e-scooter-trials-guidance-for-local-areas-and-rental-operators/e-scooter-trials-guidance-for-local-areas-and-rental-operators>



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