

FINDINGS AND RECOMMENDATIONS FROM  
ELEVEN SHARED ELECTRIC BIKE PROJECTS

# Shared Electric Bike Programme Report 2016



Department  
for Transport

bikeplus™  
carplus™  
supporting shared transport



Carplus Bikeplus would like to thank all those involved in delivering the Shared Electric Bike Programme. The eleven project managers and their partners have worked tremendously hard to deliver solid schemes under tight deadlines whilst contributing to the complex monitoring programme. Each project came across challenges during the first months of their development but used their experience and creativity to create vibrant projects. Thanks also go out to the programme Technical Panel which provided guidance throughout the process and Steer Davis Gleave who provided valuable input on the programme surveys.

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## Executive Summary

The programme set out to understand how the dual factors of electric assist (e-bikes) and easy access pay-by-the-hour shared provision (bike share) influences the take up of cycling. Who uses e-bikes, for what type of journeys and what are the resulting potential societal and environmental benefits?

Despite relatively small sample sizes, the programme has given strong indications that e-bikes and bike share can make significant contributions to widening the appeal of cycling to those who don't wish to, or cannot ride a **conventional** bike.

The programme has highlighted the potential for e-bikes to enable:

- new trips to be converted to cycling, and
- faster, hillier and longer journeys to be made by bike.

Our evidence shows that e-bikes can support a transition from car trips and contribute to a range of social and environmental policy areas.

By creating a network of shared e-bikes where people live, work, study and visit, many of the barriers to cycling are removed for a wider range of types of people. The three main barriers are:

1. the cost of buying an e-bike (overcome through bike share)
2. the physical effort (perceived and real) of cycling (partly overcome by electric-assist)
3. maintenance and repair of the bike (overcome through bike share).

The results are drawn from a 12-month sampling period. Accepting that some of the projects started from scratch within this period, the data have already started to establish a significant new evidence resource and set of lessons. The project was split into projects attracting one off tourist trips and those designed for regular commute or utility riders, for a breakdown see figure 5. The two groups received different surveys and are referred to in this report as "regular users" and "visitors".

The programme also examined the models of schemes developed and factors contributing to success. Since the projects launched, between the end of 2015 and the end of October 2016:

- 188 electric bikes have been provided
- 2,667 people have tried an electric bike
- 11,702 journeys have been undertaken

Half of those joining a scheme are using shared e-bikes at least once a week including 39% using them three or more times a week.



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E-bikes can make travel easier and more convenient enabling healthy, flexible, low cost travel for all abilities, in hilly areas and for longer distances without the need for too much exertion or to wear “cycling clothes”.

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The data indicate that providing e-bikes in a shared setting can contribute to a range of policy benefits. However the sample has been small and more data could now be obtained by extending the successful project to understand in more detail the impacts of the two factors (electric assist and shared access) and the processes that lead to the observed benefits.

The six headline benefits of e-bikes as evidenced through the projects funded within this programme are:

### 1. Shared e-bikes can attract new riders to begin to cycling

- Within the survey respondents, **one in three riders rarely or never cycled before** they started using shared e-bikes.
- The programme’s e-bikes attracted a **wider demographic** of cyclist. In particular, there was a high representation of women amongst the riders, a group who are otherwise difficult to reach: 45% of e-bike riders were female, compared to only 25% for personal bicycles (National Travel Survey 2015).
- The evaluation results suggest that that e-bikes can contribute to **normalising cycling for females**, to a greater extent than traditional bikes.
- Regular riders of shared e-bikes come from a **wide range of ages from 25-65**.
- One in three shared e-bike riders stated that the e-bikes made them **feel more confident** – suggesting that the insurance of the electric assist to tackle hills and keep up with traffic makes a significant difference.
- The programme collected many case studies of people using e-bikes to **support recovery from injuries and health difficulties**. 26% of regular e-bike riders agreed with the survey statement - “I have been able to cycle – I previously struggled to use a regular bike for fitness/health reasons”.

### 2. E-bikes can provide health and wellbeing benefits

- The positive contribution of e-bikes to health and well-being was demonstrated by the ability of e-bikes to **attract people back or into cycling** and lead to people cycling for longer (travel times and distances) which - even with the help of a battery - is providing vital exercise.
- The survey results show those using the e-bike regularly reported that **when using an e-bike, 58% feel happier and 41% feel healthier**.
- The most common reason given for choosing an e-bike was that it gave them **exercise** (reported by 37% of riders), followed by making it more **enjoyable** (34%).

### 3. E-bikes can enable new types of trips to be made as cycling trips

- Our data show that e-bike availability led people to using the e-bikes for **longer and hilly trips**, and allowed **shorter travel times**. The average length of trips

switched to an e-bike is 5 miles. This is notably greater than the average length of journeys by traditional bikes as a whole (3 miles).

- 33% of participants responded that e-bikes enabled them to cycle up hills they wouldn't have otherwise tackled by bike.
- The programme collected data and examples to back up how power assisted cycling has enabled people to **reduce their journey times** and fit more into busy routines; 35% of regular riders reported using e-bikes to cycle because it allowed them to reduce their journey time.

#### 4. E-bikes can enable people to reduce their car use

- E-bikes can **more closely rival a car than conventional cycling** enabling a greater number of trips to be considered for conversion from the car. The programme has indicated the scope for beneficial modal shift. 46% of respondents reported that their regular shared e-bike trips were previously made by car as a passenger, driver or in a taxi. The follow-up survey showed 22% of riders valued the e-bike as a tool to reduce their car travel. Exercise, more enjoyable journeys and shorter journey times are the main motivations for shifting to shared e-bike from car.

#### 5. Shared e-bikes can offer affordable and convenient access to new opportunities

- 22% of riders said their reason for choosing to switch to e-bike was because it was **cheaper than other modes**.
- Electric bikes **supported access** for those "Not in Education, Employment, or Training (NEET)"; 18% of regular riders indicated they were in this category and a further 18% were part time workers. Case studies demonstrate that by offering affordable, flexible, 24/7 access, the project supported those accessing employment and social opportunities.

#### 6. E-bikes hire supports a "try before you buy" model

- By providing low cost convenient access to trial an e-bike it can **overcome a barrier to purchase**. Desire to buy an e-bike is greatest amongst those who used the bikes regularly. In this sample the survey showed that **13% of regular riders have gone on to purchase an e-bike and a further 17% proceeded to purchase a standard bike**.
- For these people, trying an e-bike may have helped them overcome their worries about their fitness allowing them to realise they can cope without electric assist, hence the e-bike is a useful introductory tool.
- However, many indicated they prefer to use shared access indicating there is a **role for bike share as a trigger for purchase** and also for on-going hires.

The programme also allowed for an analysis of the factors contributing to creating sustainable successful shared e-bike schemes. **Chapter 4** outlines the relative merits of the diverse range of scheme designs, approaches to marketing and income generation. The most important factors leading to strong projects included:

- simple access to the bikes,
- the right choice of bike location,
- a diversity of users,

- attractive pricing and strong marketing partnerships.

Looking at the specifics of the individual projects; some were new projects and others were built into existing schemes leading to variation in how well established they had become within year 1 of the programme. The table below provides a summary of the initial assessment of the different models tested although each needs more time to be fully tested.

Project Model	Programme Analysis
On-street docking station: mixed and pure & electric fleets. Oxford and Exeter	Both models have had strong take up and appear to have the right ingredients to create successful schemes integrating with public transport at railway stations. The city schemes benefited from having an existing project to build upon and a diverse use through strong partnerships with Train Operating Companies, Universities, Councils and hospitals.
Workplace pool bike model	This tried and tested option for supporting business and inter-site staff travel has been strengthened with the offer of e-bikes for employers and University estates teams. The Eastbourne and Bristol projects with this model have done well to overcome the barrier some pool bike schemes experience of making access convenient using key codes and a smart lock apps. Interestingly this model has attracted attention from commercial operators.
Tourist based projects in rural areas	This model created more challenges as by their nature the audience is seasonal and affected by factors such as the weather. Plymouth and Isle of Wight schemes had strong use and each of the projects are looking at ways to diversify utilisation by attracting use for businesses and utility trips. This model needs further time to establish before conclusions can be made particularly with regards to addressing wider rural transport needs.
Bike loans schemes	The loan model packaged with cycle training and accessories has previously been proven to be a good method for converting potential cyclists, and the addition of e-bikes has widened the pool and increased success. Journematters in Rotherham is not supported by any revenue income, it is reliant on grant funding although it is exploring partner contributions.
Electric assist on adapted bikes	PEDALL has successfully offered for both guided group rides and private hires. This approach has allowed the project to widen its appeal to people returning from injury, riders irrespective of mental or physical ability and their carers from the existing conventional bikes and offer off-road riding.
E-bikes in social housing schemes	Compass bikes offering e-bikes on a free of charge basis in social housing units established there is a demand by residents and staff for the bikes but the barriers of cost and managing operational responsibilities are yet to be overcome.

The cargo e-bike scheme	Outspoken demonstrated the value of electric assist to delivery companies but struggled to create the right model to encouraged shared use by the wider population.
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The key recommendations from the programme are:

**1. Explore the potential for of increasing e-bike (and pedal bike) availability at more rail stations, travel hubs and accommodation networks across the UK.**

This would mean that last-mile or first-mile journeys by e-bike would become a reality for commuting, business travel and in visitor areas. This would not only contribute to local congestion reduction and healthier travel, but would unlock the associated benefits of “capturing” the longer approach journeys from car to public transport.

This would require expansion and enhancement of initiatives such as Plusbike and the cycle-rail developments to include e-bikes, as well as new coordinated partnership development including hotel and other accommodation chains.

**2. Bridge strategic development and delivery with the health sector around e-bikes.**

There are significant physical and mental health benefits of e-bike use, importantly reaching hard-to-reach sectors of the population. E-bikes work for preventative health as well as aiding recovery from illness.

New lines of communication could be developed between with the Department for Transport and Department of Health to optimise the contribution of e-bikes to health through informed policy and funding prioritisation. Regional and local public health organisations should to be involved in the funding and delivery of e-bike provision locally.

**3. Develop a strategic national programme of try-before-you-buy for e-bikes.**

Different models of try-before-you-buy are relevant to different contexts, but all have significant value in accelerating uptake in e-bike use. A national scheme would be a partnership involving manufacturers, Government bodies and bike shop networks, and be associated with other e-bike development initiatives.

**4. Open up funding from the OLEV (Office for Low Emission Vehicles) to include e-bikes alongside electric vehicles.**

E-bikes could be seen as an important part of solution in the move towards the development of ultra -low emission transport. With many of the advantages of the car in-terms of flexibility and suitability to hilly and longer trips, e-bikes even more than ultra-low emission vehicles can offer a method to improve air quality and reduce carbon emissions. Offering e-bikes in shared schemes provides access to a great number and offering them alongside shared electric car club vehicles would provide the extra benefits of cross fertilisation of membership demonstrated in other schemes.

**5. Update the cycle-to-work scheme so that it encourages people to acquire e-bikes.**

This could be by increasing the value threshold above £1000 or allowing and promoting a “top up” above £1000 from the rider or employer.

## **6. Evidence and further research**

The programme has demonstrated the role of robust evidence in informing delivery. We therefore recommend that the monitoring and evaluation that has been established during this programme is continued.

Two areas for further research have also emerged through this programme: in “closed community” residential accommodation (such new housing developments or student accommodation) and in how shared e-bikes can contribute to accessibility in more rural areas. Indications from the programme are that these have significant benefit, but we are not yet in a position to suggest good practice.

# 1. Context, aims and approach

## 1.1 Aims

The Shared Electric Bike programme was established to demonstrate:

- a. **How to accelerate uptake and use of e-bikes**  
*and understand better the barriers holding back e-bike use in the UK*
- b. **The role of a variety of bike hire / shared use models for e-bikes**  
*to remove the requirement for people having to make a significant purchase, to widen the reach of e-bikes to a wider variety types of people and contexts, and to understand better the role and potential of different shared/hire models for e-bike access,*
- c. **How to maximise the chance of creating schemes that are self-sustainable.**

The programme therefore has a significant emphasis on delivery, as well as opportunities for learning and developing best practice.

£700,000 funding was awarded by the Department for Transport to Carplus Bikeplus in March 2015.

## 1.2 Overall approach

The overall approach to the programme was informed through logic mapping. Whilst the programme’s primary focus was on maximising delivery and exploring the variety of contexts for shared e-bikes, the opportunity to understand how to best optimise outcomes and understand the scope of impacts was seen to be of significant value.

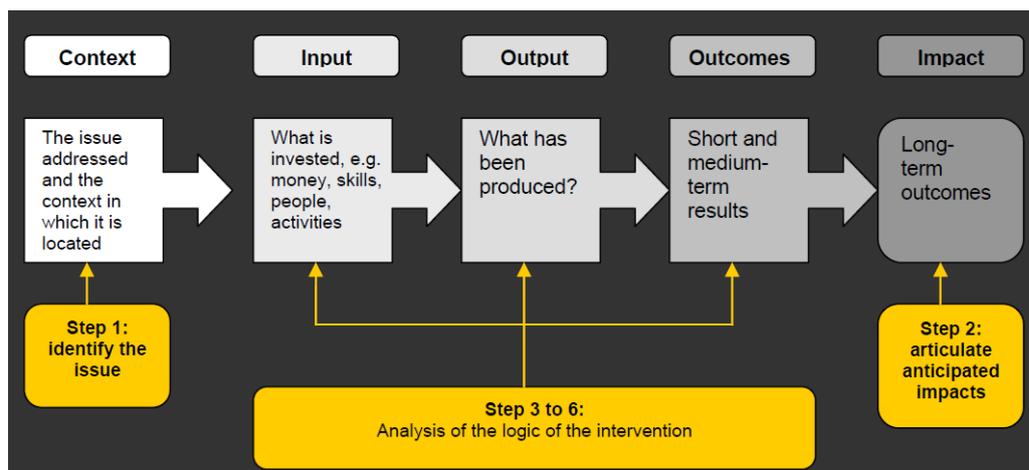


Figure 1: Logic mapping approach

Logic mapping was therefore used to provide:

- discipline regarding how the programme was established to ensure that it was properly contextualised and likely to lead to useful lessons on impacts and outcomes

- formal pathways to ensure that programme inputs were likely to lead to the types of outputs that would result in useful lessons
- the ability for us to communicate clearly the strategy underpinning the programme to a variety of audiences rather than simply reporting case studies as outputs.

Here, we do not formally map the elements of logic mapping to the report content, but:

- The contexts are set out in sections 1.3 and 1.5
- How we approached understanding impacts and outcomes is outlined in section 1.6
- Our understanding of outcomes and impacts is outlined in section 3
- Inputs and outputs are described in section 2.

## 1.3 Contexts

### 1.3.1 Policy

The range of policy areas e-bikes could potentially contribute to is extensive. This study is interested in whether shared e-bikes can help to deliver benefits primarily in the following areas:

- Health: both physical and mental well-being,
- Emissions: CO<sub>2</sub> reduction and air quality improvements,
- Congestion: reducing peak time traffic and increasing use of public transport,
- Equity: access for all ages and abilities to new opportunities; education, employment, utility and social activities,
- Financial benefits: Riders saving money and shared e-bikes use reducing pressure on other parts of the transport system,
- Enhanced viability of complementary shared transport schemes such as car clubs, cargo bike delivery.

but also in the wider areas of:

- Broader behaviour change: A missing component in door-to-door journeys, longer term shifts in personal travel and broader changes in attitudes (to health, environment, community etc)
- Communities: increasing culture of sharing, reducing need to private ownership and improving social interaction
- Space and place: reduced demand for parking, road space and car ownership through changing how people choose to travel.

### 1.3.2 E-bike sector development in the UK

An electric assist bike or pedelec (from pedal electric cycle) is a bicycle where the rider's pedalling is assisted by a small electric motor. The motor only provides an assist when the rider is pedalling. Such e-bikes are limited to 15mph in the United Kingdom or to 25kph in continental Europe. There is no requirement for vehicle insurance or registration for e-bikes and riders are not legally required to wear personal protection equipment such as helmets. For brevity in this document they will be referred to as e-bikes.

According to the Navigant report 2016 (see appendices), electric assist bikes sales outstrip those of any other electric vehicle. China is the lead market (although their definition includes

bikes which don't always require pedalling). North America and Western Europe continues to achieve steady and significant growth in e-bike sales, with Germany alone accounting for 535,000 unit sales in 2015 (an 11% growth on 2014). The report predicts that "during the next 10 years, **e-bikes in the region are expected to evolve from a specialty commuting or recreation device to a standard bicycle form that is accessible to nearly all bike consumers.** Navigant Research expects e-bikes to regularly replace bicycle purchases in Western Europe".

The uptake of e-bikes in the UK has been lagging behind that of other European countries. However as the development of technology, in particular the battery, is creating more reliable, lighter, more affordable e-bikes, with better range, retailers are now providing e-bikes with more shop space and increased profile in their marketing. Public awareness of e-bikes is still low although they have increasingly become a topic of interest by the media.

## 1.4 Embedding expertise into the programme

At the outset of the programme, we were aware of various e-bike schemes that had floundered in the UK (such as the Electric Bike Network) as well as limited but useful research on the e-bike sector. Furthermore, we had visited the successful large visitor e-bike rental schemes in continental Europe such as Movelo (Germany/Austria) and Flyer (Switzerland). We were also aware that e-bike sales in the UK did not match the boom being seen overseas. The research already suggested the role of e-bikes in attracting a wide variety of people into cycling, but this was not understood in the UK.



The initial approach to the programme was designed to embed current UK expertise into the design of the programme delivery as well as ensuring that overseas learning informed the programme.

This led to the development of a higher-level steering group and a technical advisory panel (members of both are given in Appendix 6.2). The steering group's purpose was to help frame the programme and define its priorities, scope and approach. It was also a useful sounding board for the delivery team.

The technical panel was selected due to their specific expertise in sectors relating to shared e-bikes. They were available to provide specific advice and input as the programme and projects developed. They also provided detailed support to the projects at both bidding and delivery stage.

The main reason for this support was to minimise as much as possible the risk of repeating known pitfalls in e-bike project design and delivery and (hence) optimising the chance of success and so maximising the breadth and depth of learning.

## 1.5 Scope of contexts for shared e-bikes

While we could speculate and make informed suggestions on the sorts of contexts where e-bikes could work, we were aware from other programmes (such as the Carplus Delivering Car Clubs in Scotland and England programmes) that in sectors at an early stage of development, interest emerges from sometimes unexpected sources. We were therefore keen to make sure that net was cast wide in providing the opportunity for types of projects to emerge in terms of scale, lead organisation and local contexts. Indeed, we were also interested in finding out what sort of contexts and organisations were interested in e-bikes.

We achieved this by an initial light-touch Expression of Interest round in Spring 2015. Within this, we *suggested* contexts and project types, but were open to ideas emerging beyond these. From this, we then invited a selection of projects to develop detailed bids.

The EoI round led to a great deal of varied interest. In consultation with the expert panel, we created a shortlist which was then approved by the project advisory group.

## 1.6 Approach to monitoring and evaluation

The EoI and bid rounds led to the selection of schemes not just in terms of their likelihood of scale and success, but also to provide the opportunity to explore outcomes and impacts.

The scale of the programme meant that it would not be possible to cover *both* the desired diversity of contexts *and* a formal and robust assessment of outcomes and impacts; it was acknowledged that more formal attribution of outcomes from inputs would not be possible, nor would the findings attempt to be statistically significant. Put another way, the programme's intention was to:

- derive lessons that could point to how to optimise the chances of success of shared e-bike schemes, and through this understand better how to maximise impacts
- *indicate* the nature and scale of outcomes, and suggest impacts,
- *indicate* the separate and joint roles of electric-assist and shared context.

In order to do this, the cohort of projects were selected deliberately to:

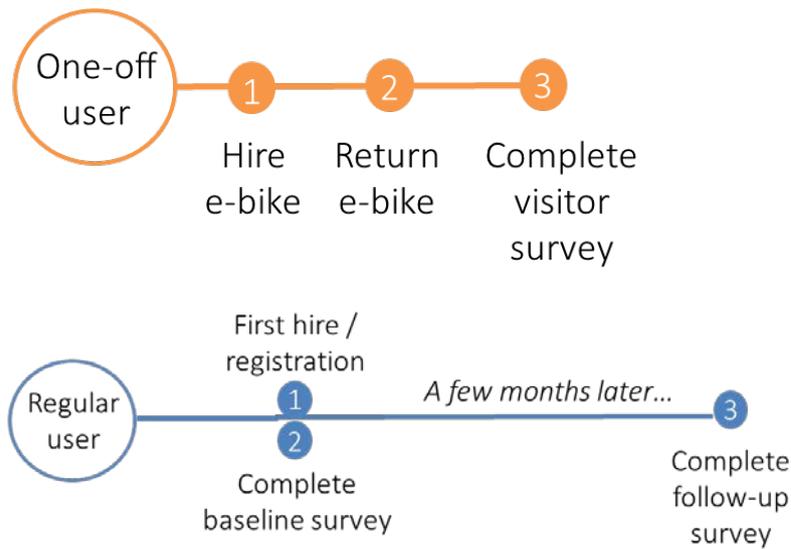
- examine a variety of potential trip types,
- attract a wider spectrum of riders and
- showcase different models for scheme development.

Carplus Bikeplus led the monitoring programme with support from Steer Davis Gleave. Data were collected in the following ways:

- Regular management reports from the project leads,
- Monthly hire data,
- GPS trackers were fitted to all bikes to capture specific trip data,
- and riders were requested to complete surveys.

There were two survey strategies for one off (mainly tourism projects) and regular riders (mainly urban commuter projects).

Figure 2: Survey Strategy



The e-bikes were fitted with GPS units, this provided distance, altitude and route data. In Oxford a control sample of 16 conventional bikes was used to compare how riders' trip patterns were different to e-bikes. The data sample was 91 standard OXONBIKE trips and 135 on e-bikes.

It is important to note that there were various limitations on the monitoring programme. The majority of projects launched in spring, enabling data to be collected over 6-7 months for most of the schemes. In total 535 respondents completed at least one survey (470 individuals) including 65 regular riders who completed both a baseline and a follow-up survey. In the overall programme (to October 2016), 2,667 people tried an e-bike for at least one journey. Using the overall total of respondents that completed a survey, the response rate was therefore just under 20%.

The number of follow-up responses is relatively low, but the overall response rate is in line with what is expected of this type of survey. The diverse nature of the e-bikes schemes and the fact that they are all managed by different providers presents a challenge in terms of response rates. As more schemes are rolled out we would hope that more baseline and follow-up data will be collected in 2017 and a second round of analysis can be carried out.

It should be noted therefore that the results reflect the nature of the local projects where



response rates were highest: Compass Bikes, Journey Matters and Plymouth Bike Hire. A wider distribution of survey responses across the various scheme types may change the nature of the findings.

It is therefore key that the programme took a multi-pronged approach and as well as having data from different sources all the project managers met for tele-conferences and face to face meeting to discuss outcomes and tease out consensus on main conclusions.

Figure 3: Launch dates

Winter 2015/16	Spring 2016	Summer 2016	Autumn 2016
Cargo e-bikes (Cambridge, Norwich) Compass Bike Housing Associations, (S.E England)	Isle of Wight, Red Squirrel Plymouth, Ecycle Hebden Bridge, We-Cycle Rotherham, Journey Matters Oxford, Oxon Bikes New Forest, All Ability PeDALL Eastbourne campus (University of Brighton)	Bristol, Co-wheels	Exeter, Co-bikes

## 2. Project details

Eleven projects were funded across England, siting 188 e-bikes in 11 projects at 16 locations.

The projects were selected to explore potential in a variety of settings and locations, rural and urban, on street, pool and hire bike schemes. The chosen projects were distributed as shown on the map (figure 4) below. Project details are set out on the following table (figure 5).

Figure 4: Map of projects



Figure 5: Summary of projects

Project	Location	Project Lead	E-bikes	Typology	Description
Oxonbikes	Oxford	University of Oxford in conjunction with Hourbike	22 (+50 standard bikes)	Workplace On- street	Predominantly serving universities and hospital sites, plus docks at the Park and Ride and rail station.
Co-bikes	Exeter	Co-bikes / Co-cars	23	On-street /Tourism & leisure /Work place /Car club	An addition to the established car club adding e-bikes to stations, university, business park, and Park and Ride.
Co-wheels	Bristol	Co-wheels	12 (+12 extra fleet)	Work place	E-bikes placed at University of West of England for inter-site trips and Bristol City Council & Avon Fire & Rescue for community visits.
	Eastbourne Campus	Eastbourne Campus, University of Brighton	20	On-street Students Work place	Half the e-bikes provide shuttle from the rail station to campus, half on longer term loans.
Journey Matters	Rotherham	Rotherham MBC	30 (+ fleet of 40)	Work place	A mobile hub offers 1-3 month loans to employees at and residents.
Compass Bikes	Oxfordshire & East of England	Sustainable Ventures	18	On-street /Tourism & leisure / Work place	Offering residents and staff free access to e-bikes at housing association developments in SE England
Red Squirrel Bikes	Isle of Wight	Visit Isle of Wight	20	Tourism & leisure	Daily hires from Newport, Cowes and Ride.
Plymouth Bike Hire	Plymouth	Plymouth bike hire	20	Tourism and leisure	Daily hires from edge of Plymouth with access to Dartmoor and the coast.
We:Cycle	Hebden Bridge	Alternative Technology Centre	13	Commuting / Tourism & leisure	E-bikes in hill top communities serving residents and visitors.
Outspoken Delivery	Cambridge & Norwich	Outspoken	7	Work place Specialist	Cargo e-bikes for delivery and local resident /business hire.
PEDALL	New Forest	National Park Authority	3	Specialist Off road	Adapted e-bikes for try-out sessions and day hires.
Total			188		

### 3. Outcomes and Impacts

The programme demonstrated that the impacts of the dual proposition of offering e-bikes and providing them in shared context are significant and wide ranging. The ability to make cycling “easier” attracted new people to have a go and existing cyclists to convert new types of trips to the e-bikes. This in turn helps people to improve their health, gain access to opportunities and to reduce their car use. The e-bikes have also been shown to play a role in supporting the local economy and the development of last mile cycle delivery.



#### 3.1 E-bikes can attract new riders to begin (or return) to cycling

The offer of an electric assist bike has the potential to attract new riders to begin or return to cycling by making cycling feel less challenging, more fun and safer.

Within the survey respondents, one in three riders rarely or never cycled before they started using shared e-bikes.

Just under half (49%) of respondents reported that their main e-bike journey was commuting (28%) or for business (21%) and 81% stated their main e-bike trip wasn't previously made by bike suggesting a proportion of participants switched their commute to the e-bike.

Section 3.2 below reports on the wider demographics of e-bike riders which also indicates the potential for e-bikes to widen the appeal of cycling beyond those currently riding conventional bikes.

The Cycle Boom study (reference in appendix) identified different groups of riders:

- **Reluctant Riders** who had not cycled in the last five years or had either stopped or substantially decreased their cycling;
- **Re-engaged Riders** who had started cycling in the last five years after a hiatus in adult life or who had not cycled since childhood;
- **Resilient Riders** who had been cycling consistently in the last five years or who had increased their level of cycling over this period.

The programme has demonstrated how electric bikes have encouraged reluctant riders to begin cycling. Many of those taking an e-bike from the projects commented on the enjoyment they have derived and how they would not have gone out and exercised if the e-bikes had not been available.

Analysis of the free text comments from participants highlighted that the main benefit stated (61% of comments) was how riders found using the e-bikes to be less challenging and more fun to cycle than conventional bikes— this transition from seeing cycling as difficult exercise has allowed a new audience to be encouraged to try cycling. Experiential feedback shows how e-bikes have rekindled the joy of cycling for those who have not cycled in years —creating “Re-engaged riders”.

34% of these surveyed in the shared ebike schemes stated they felt confident compared to 17% from results of a survey standard bike share. E-bikes provide an experience of cycling that gives rider’s confidence that they will have power assistance to support their fitness and overcome challenging terrain. Many talk about the e-bike ‘smile’ and the feeling of ‘constantly having a tail wind’. In addition many riders reported they feel safer and more robust, like a vehicle, when riding on roads and that they could keep up with the pace of the traffic which gave them confidence.

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## CASE STUDY: Erica, Sheffield Resident

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### Erica, Sheffield resident

Erica hadn’t ridden a bike since she was a young child, but the loan of an e-bike from the Cycle HUB at Meadowhall, and a bit of cycle training, means she is now commutes 5 miles every day on her bike.

**“The last time I’d used a bike I was 9 or 10 years old. There were no bike loan schemes where I lived before, so to try cycling again would have meant buying a bike. I live in a small apartment so I’d want to know I would definitely use one if I bought one and had to keep it at home, that’s why the Rotherham loan scheme was perfect for me.”**

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## CASE STUDY: Craig, from Maltby, Rotherham

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Craig has made a radical change to his commute to work, by cycling on an e-bike. As part of the loan project delivered by Rotherham Metropolitan Borough Council (RMBC) hired an e-bike for three months cycling a daily 16-mile round trip from his home to his place of work at Integrated Services, specialist division within Wolseley UK Ltd, in Rotherham town centre.

**“It has taken a while to build up my level of fitness, but now I cycle to and from work and ride at the weekend whilst out doing my shopping. I didn’t cycle before and I wanted to try one before I bought one, I ended up saving £56 per month on bus travel and lost 2 stone in weight!”**



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One in three (31%) stated in the baseline survey that they rarely or never cycled before they started using shared e-bikes.

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**“Best experience I’ve had since being a child it’s like I just started cycling for the first time very enjoyable its awesome”**

John, Rotherham

**“Fantastic! An amazing ride - 30 years since I last rode a bike.”**

Plymouth e-bike rider

**“Around the city they are brilliant, because there is so much stopping and starting and they just accelerate effortlessly. My commute is about eight miles each way, so the beauty of these for is that I didn’t arrive at work all sweaty and need a 15 minute shower, so I could just wear my normal clothes.**

Oxonbike Rider

**“I’d recommend one to someone like my mum, to help get her out on a bike. My dad cycles a lot, and they could cycle together if she had one of these as she could keep up with him.”**

Carl-Eiler, Sheffield

**“I felt far more confident on road, than my normal bike, as I had more power.”**

Eastbourne rider



### **3.2 Attracting a wider demographic of women and older people to cycle**

Many of the new people attracted to cycling through the offer of electric assist bikes were women and older riders. By offering a less physically challenging option the e-bikes encouraged those with lower levels of fitness or less confidence about their fitness to participate.

The gender split of survey respondents in the programme is more balanced than that reported for use of personal bicycles in the National Travel Survey. 45% of e-bike riders were female, compared to only 25% for personal bicycles (National Travel Survey 2015).

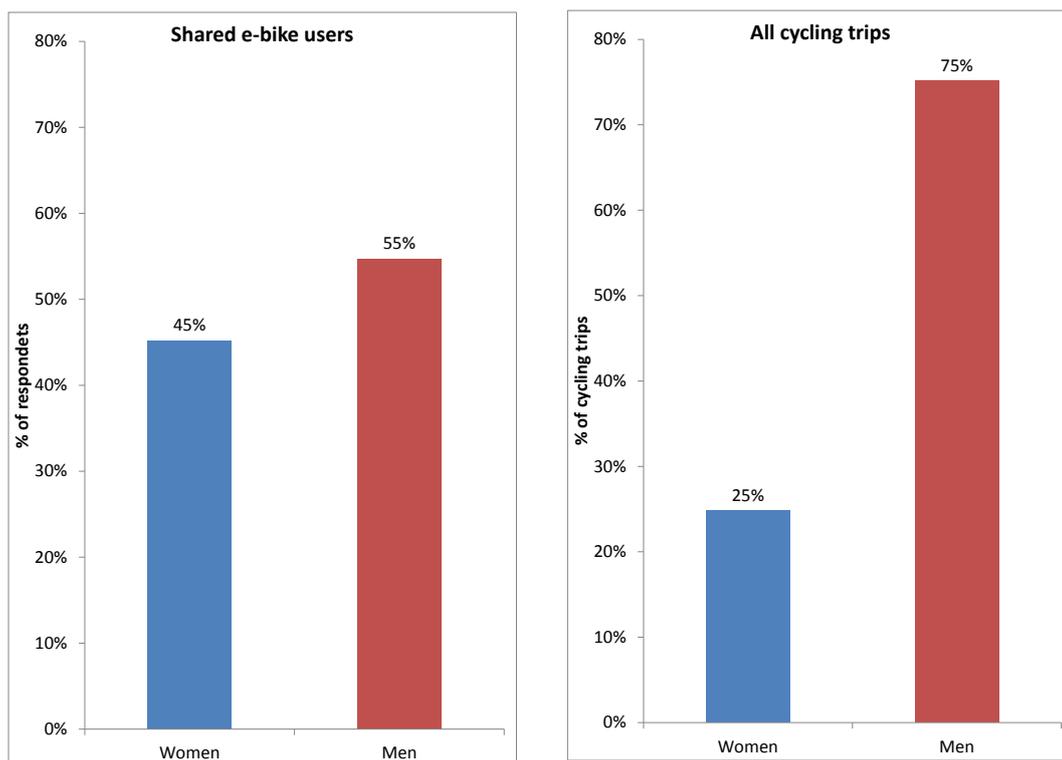


Figure 6: Gender balance of riders

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Shared e-bikes can help to normalise cycling for women, to a greater extent than traditional bikes.

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Qualitative comments and project leader feedback suggest that often women lacked confidence in their fitness and safety on standard bikes. E-bikes appear to help to reassure women by providing the battery assistance which provides a boost with hills and to keep up with traffic flows. As a traditionally difficult group to attract to cycling, e-bikes could provide a valuable tool.

**“I love the freedom of riding my bike around the city, there are no congestion issues and I always have somewhere to park my bike. Even though the bike is an e-bike and gives you that extra boost, I like to put it in the top gears when riding so that I still get a good amount of exercise every day”**

Teresa, Community nurse, Bristol

The age profile of respondents is shown below alongside the age profile of the general UK population from the 2011 Census. It indicates relatively high use of shared e-bikes by people aged between 35 and 64. According to the National Travel Survey (2015) people aged under 40 made more cycling trips (24 trips a year) than people aged over 40 (14 trips a year). E-bikes can therefore encourage other rider groups apart from the younger fitter demographic to start cycling.

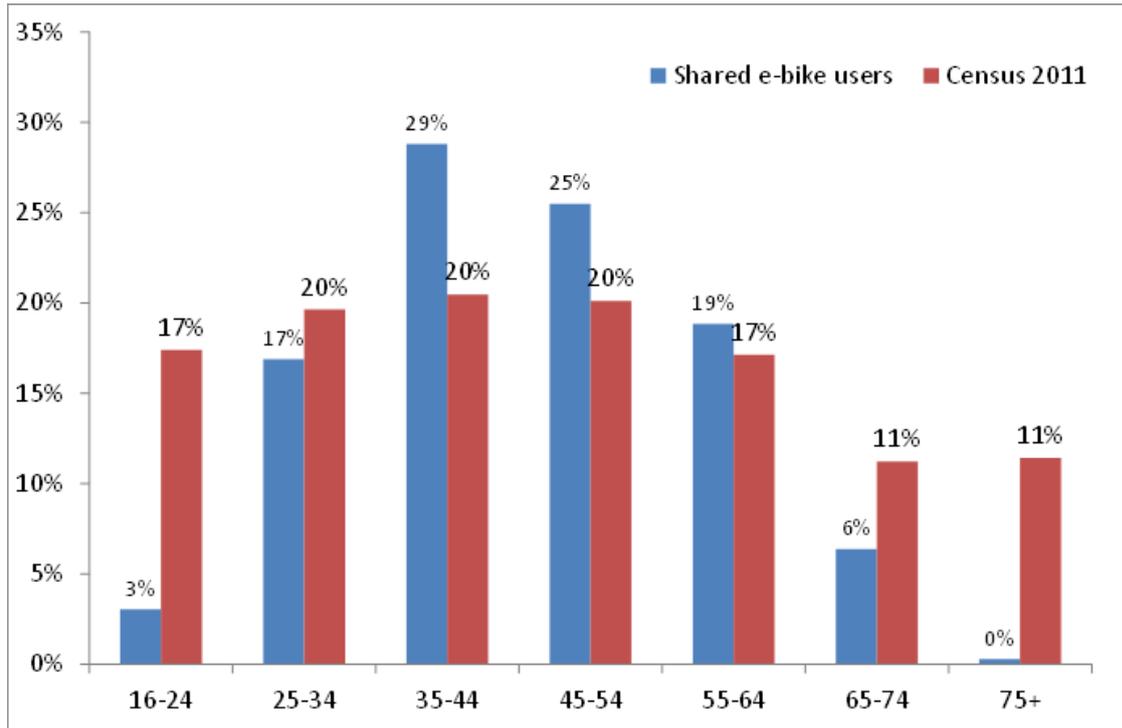


Figure 7: Age profile of shared e-bike riders compared with Census data

**“I travelled the local area seeing the country side in a completely different way, whilst keeping fit. I'm 72 and was a bit apprehensive about the amount of traffic on the roads today, (60 years when I last rode one). But I was surprised how well I coped. It has given me confidence to ride a bike again”**  
 Pete, Rotherham

**“It has given me the love to cycle for pleasure something I haven't done for nearly 30 years seeing places that I wouldn't normally see cycling around the vast canal paths around Sheffield and Rotherham seeing wildlife I wouldn't normally see”**  
 Gerald, Rotherham

### 3.3 Enabling people with health difficulties and physical impairments to cycle

The programme demonstrated that the addition of e-bikes assist to a conventional or adapted bikes can open up cycling to those with health difficulties or physical impairments who are unable to manage too much physical exertion.

26% of regular e-bike riders agreed with the survey statement - “I previously struggled to use a regular bike for fitness/health reasons”. The case studies below illustrates how e-bikes can support recovery from injuries and health difficulties.

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## CASE STUDY: Plymouth Cancer Patient

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One particular lady visiting the Plymouth scheme accompanied by her husband has hired an e-bike on 4 occasions. The first time she explained how she was recovering from cancer. On each occasion she has thoroughly enjoyed the ride and has definitely gained in fitness and health. On her 5th visit she decided to hire one of our regular bikes and was very pleased with how well she managed, explaining on return that she had completed a particular trip which we could tell her was a 14-mile roundtrip! She is coming back this weekend and is talking about buying a bike as she enjoys it so much. She described how following her illness she never thought she would be able to take part in such a physical activity ever again.

**“This was a good way to get into some exercise following a major operation removing lung cancer at the end of last year”**

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## CASE STUDY: Robert, Red Squirrel Bikes

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Robert used to be a regular cyclist however due to knee injuries he found riding a conventional bike difficult. Robert hired a bike from the Visitor Info Centre in Newport, to join family and friends he was visiting for a ride on the Red Squirrel Trail.



**“Thank you for convincing me to have a go on one of your e-bikes! I used to cycle loads but my knees aren’t up to it nowadays and I can’t ride normal bikes without being in pain. I can’t believe how much the e-bikes make a difference. The power meant I was able to keep up with my family without hurting my knees and enjoy a ride on the great Red Squirrel Trail. I’m going to look in to buying one when I get back home and get back into riding!”**

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## CASE STUDY: Mark, PEDALL New Forest

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**“You don’t realise how much this means to me to be able to continue cycling, it’s just been brilliant, it’s a nice bike and can get up to some speed”**

Mark, PEDALL New Forest

Mark is a PE teacher specialising in teaching children with varying degrees of autism and associated conditions. Recently Mark made use of the e-hand bike whilst recovering from a serious knee operation.

**“I had never experienced using a power assisted bike before but managed to use it vigorously over a period of several weeks. The bike handles incredibly well at speed but is also really at home at a more sedate pace.”**

Mark managed to stay fit whilst injured and develop areas his body that had not seen much exercise during the last few years.

**“It really heightened my respect and admiration for those athletes that compete in the handcycling at the Paralympics. It offers a huge range of potential for those of us that are either temporarily impaired through injury, or permanently disadvantaged due to a birth defect or a condition such as dyspraxia.”**

Mark took the opportunity to introduce the hand bike to some of the students at his school. They were really interested and inspired; building confidence on a stable 3 wheeled bike is a positive route to gaining the confidence to attempt to ride a standard bicycle.

The promotion of cycling in all its forms is a serious theme at Southlands School so following on from trying the hand bike Mark arranged for Paralympic cyclist Darren Kenny OBE to visit. Having ridden the hand bike, he was very impressed with the build quality and overall performance. Darren said *‘It’s a fantastic piece of equipment that can offer many the huge benefits of cycling and also help to convert doubtful attitudes from “Can’t to Can”, amazing!’*



New Forest PEDALL project catered for people to participate who had physical and learning disabilities by offering a range of adapted e-bikes, including a trike and a wheel chair carrying bike. The e-bike assist mean that participants could travel further, experience the National Park and overcome the previously tiring and limiting barrier of gravel tracks.

The New Forest adaptive e-bikes help increase people confidence knowing that assistance is at hand if they get tired and taking out some of the strain as well as enabling them to cycle further

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### CASE STUDY: Amy, New Forest PEDALL

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Amy is a vibrant 32 year old young lady with learning difficulties. Amy is very much her own person and can only be described as someone that loves life and everything it has to offer. She lives independently in her own house in the Lymington area supported 24/7 by an enthusiastic and lively caring team.



A vital aspect of Amy's lifelong learning is being part of the local community; Amy thoroughly enjoys new challenges and opportunities and it is important to Amy that she mixes and socialises with everyone from neighbours and friends to shop keepers and everyone at the local!

Amy likes to learn new skills and is a very positive and enthusiastic person who lives life to the full. When Amy first came along to PEDALL sessions she liked to be chauffeured around in the wheelchair bike, taking in the sights and sounds of the New Forest National Park. Over time Amy started to try different bikes, favouring one of the adult sized pedal karts which has four wheels so is nice and stable. Amy has now started to pedal herself.

Amy needs continual support, care and guidance to help her along the way, she sometimes gets tired and distracted, but don't we all! Using the side by side bike with electrical assist a carer sits next her controlling the steering and braking. Amy helps pedal, taking exercise, improving her fitness and increasing circulation. Using a bike with electric assist means that Amy can cycle further and for longer, exploring more of the New Forest National Park and areas that she'd never be able to get to otherwise.

Amy now regularly rides five miles, loves to see the ponies and enjoys meeting other cyclists that come along.

CASE STUDY: Hazel, New Forest PEDALL

**“I joined PEDALL – New Forest Inclusive Cycling because I love the exploring areas of the New Forest, riding in a group is a nice social activity and the project is run by great helpful people”**

Hazel, New Forest

Hazel was diagnosed with multiple sclerosis (MS) in July 2014. She lived in Dorset then moved to Hampshire to be near her son. Whilst bringing up two children and working fulltime she always kept physically active, taking them outdoors when she could.

The hand bike with power assist is ideal for Hazel as the MS has affected the strength in her legs, severely limiting the amount of walking she can do. However using the e-hand bike Hazel can cycle five miles.

**3.4 E-bikes can help to improve health and well-being**

The health benefits of cycling are well documented. The Chief Medical Officers’ recommendation is that adults should aim to have 2.5 hours of moderate exercise every week to combat the risks of many chronic conditions including coronary heart disease, obesity and cancer. Active travel is a good way to help build exercise into everyday life. The positive impact of e-bikes on health and well-being was demonstrated by the ability of e-bikes to attract people to increase their frequency of trips and cycle for longer travel times and distances. Even with the help of a battery this is providing vital exercise as the government guidance states that overall amount of activity is more important than the type, intensity, or frequency.

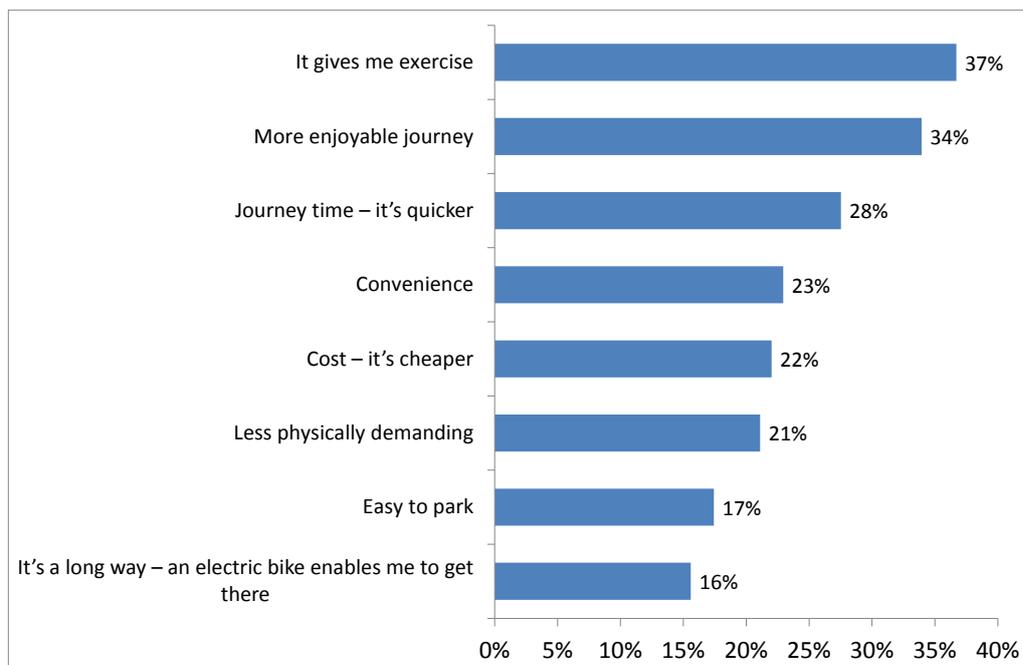


Figure 8: Reasons for choosing the e-bike

The survey results show regular e-bike riders reported that when using an e-bike:

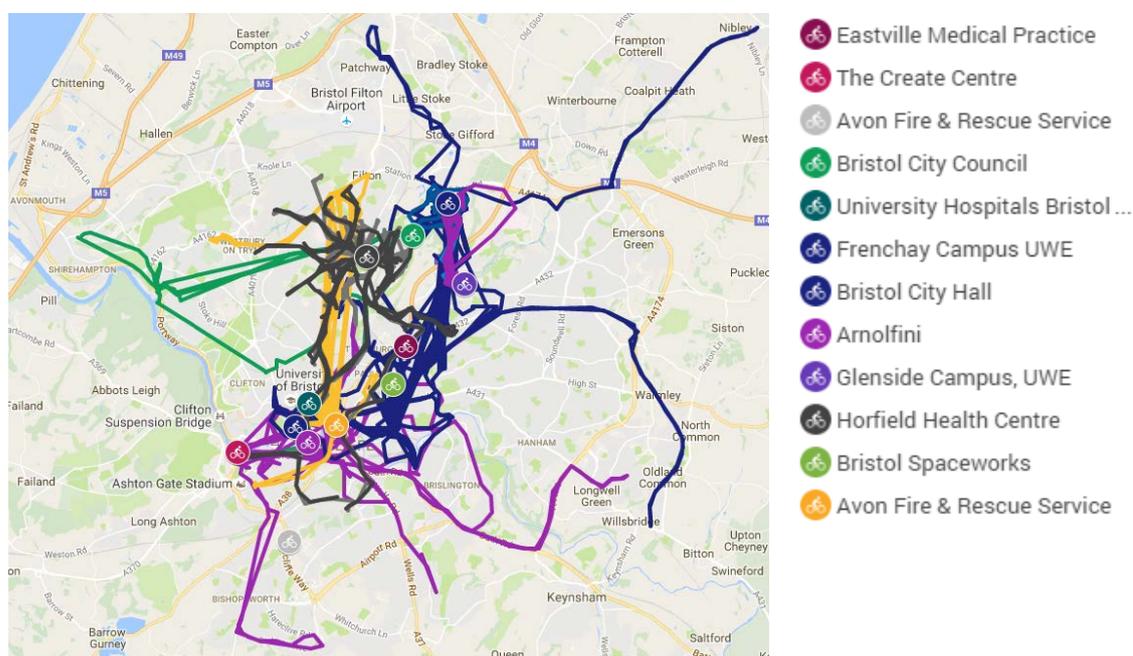
- **58% feel happier**
- **41% feel healthier**

Users were motivated to use the e-bikes as they felt them gave them vital exercise. 37% of survey respondents said the most common reason for choosing an e-bike was that it gave them exercise, followed closely by it making their journey more enjoyable by 34%.

A third of participants in Rotherham who were loaned reported their main motivation was to lose weight. A previous UK study (Behrendt et al, 2014) reported that 59% found an increase in their physical activity after having used an e-bike. The cycle BOOM study demonstrated how cycle training over an 8-week programme for older people keen to re-engage with cycling, can have a positive effect on cognitive processes and wellbeing and perceived physical health.

E-bikes are enabling staff to get exercise during their business trips and health visitor visits in Oxford, Eastbourne and Bristol. In the latter journeys are being made on shared workplace e-bike by Horfield Health Centre staff (highlighted in grey on figure 8 map) and Avon Fire and Rescue (highlighted in the map in yellow on figure 8 map) to attend appointments. Inter-site trips are being made by staff from Bristol City Council and also University of the West of England campuses at Frenchay, Arnolfini and Glenside.

Figure 9: Bristol Co-wheels GPS map



### 3.5 Enabling new types of cycling trips

As well as attracting new riders the addition of electric assist enables new types of trips to be achieved that would not have been done with a standard bike. E-bikes enable faster, longer and hillier trips than conventional bikes which enables them to more closely match the flexibility of car travel. More than half of regular riders previously cycled once a week showing that e-bikes appeal to resilient riders too to carry out new types of journeys.

**“As a road bike rider I do quite a lot of miles on my bike already and I was sceptical about e-bikes, so I wanted to try one. They were completely different to what I thought they would be like. The bikes themselves were very good”.**



### 3.6 Enabling longer trips (distance and time)

The survey responses indicate that 33% of respondents stating that one of their reasons for using an e-bike was to cycle further.

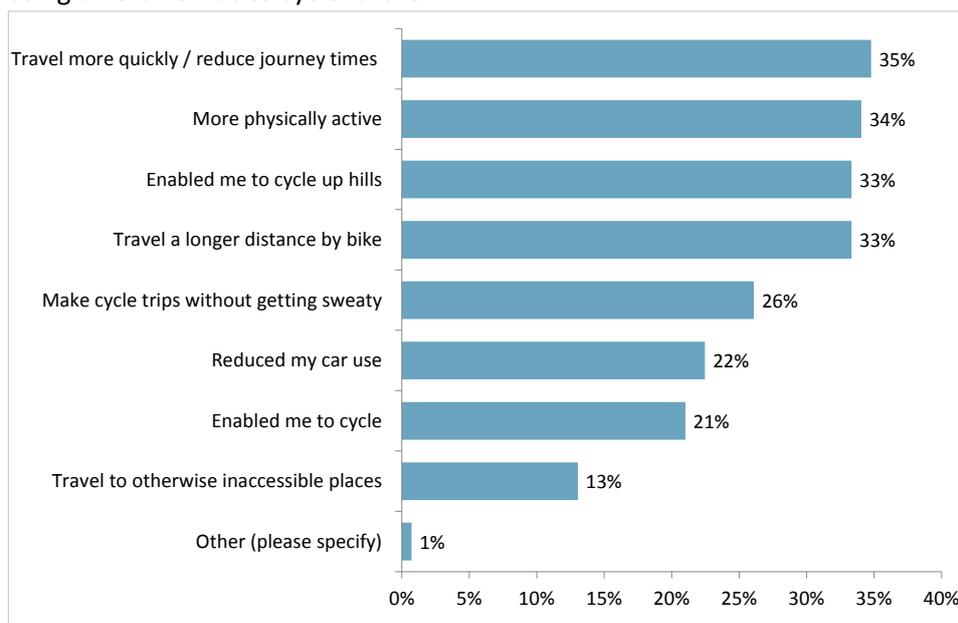


Figure 10: Benefits of an electric bike for regular users

If an e-bike hadn't been available, 47% of visitor riders would have hired a regular bike and cycled a shorter distance. From data provided by survey respondents, the average length of trips switched to e-bikes is 5 miles. This is notably greater than the average length of journeys by traditional bikes as a whole (3 miles, NTS). The graph below backs up these ranges with GPS trip data. The Eastbourne scheme was designed for a specific 1.6m trip linking the station to the university campus which explains why the average is lower in this location.

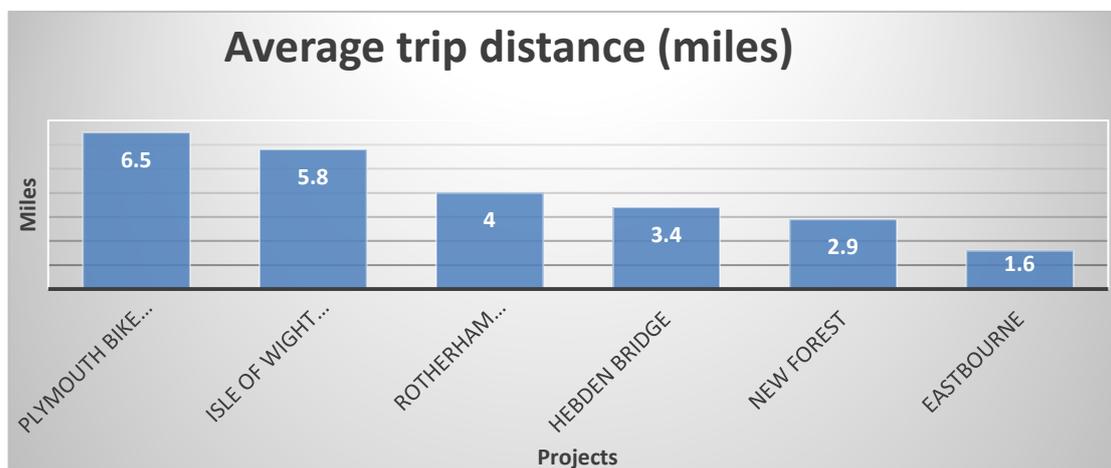


Figure 11: Average trip distance from GPS data

Riders of the e-bikes in Oxford cycled on average almost three times further than on standard bikes of the same system. With a fixed docking station system, distances are typically less than schemes, however given the mix of electric and conventional bikes it allowed for a direct comparison of distance travelled.

OXONBIKE distance comparison	
Bike type	Average distance per hire (miles)
OXONBIKE E-Bike	3
OXONBIKE standard	1.25

Figure 12: OXONBIKE distance comparison

Electric bikes are being used for longer journeys in the Oxford schemes particularly over 2 miles, 91% of standard bike trips are under 2 miles, 49% of hires on e-bikes are under 2 miles (See Figures 12 & 13). The longest distance travelled in a day on an OXONBIKE e-bike was 20.5 miles compared to 8 miles on a standard OXONBIKE.

In addition to longer distance trips, shared e-bikes encouraged riders to cycle for longer in terms of **time**. Despite the tariff increase after 20 minutes for both bike types, 41% of journeys are over 20 minutes on an e-bike in Oxford whilst only 27% are on standard bikes.

Riders can go further on e-bikes in same time, increasing the convenience factor for trip chaining (see section 3.5.3 for how e-bikes are convenient for busy lifestyles).

Distance of trips on <b>OXONBIKE E-Bikes</b>			Distance of trips on <b>OXONBIKE standard bikes</b>		
E-bike OXONBIKE hires	Sample size :135		Standard OXONBIKE hires	Sample size: 91	
Distance (Miles)	Trips	Percentage	Distance (Miles)	Trips	Percentage
0-1	23	17.0	<b>0-1</b>	<b>46</b>	<b>50.5</b>
<b>1-2</b>	<b>44</b>	<b>32.6</b>	1-2	37	40.7
<b>2-3</b>	<b>33</b>	<b>24.4</b>	2-3	6	6.6
3-5	17	12.6	3-5	1	1.1
5-10	13	9.6	5-10	1	1.1
10+	4	3.0	10+	0	0.0

Figure 13: Trip distances for OXONBIKE standard and e-bikes

Bike type	Percentage of trips longer than 20 minutes
OXONBIKE Electric Bike	41%
OXONBIKE standard bike	27%

Figure 14: Length of trip by time

The average distance for tourist schemes was similar, 6.5 miles in Plymouth and 5.8 miles on Isle of Wight, both longer than the National Travel Survey average of 3 miles, further evidence than e-bikes allow riders to see and do more.

The GPS data shows that in an urban context the e-bikes are being used for both business, commuting and long distance leisure trips. The blue and red tracks on Figure 14 show trips to Blenheim Palace, a trip previously considered too far from a standard OXONBIKE.

### 3.7 Enabling hillier cycling trips

In Oxford e-bike riders are making journeys on hilly routes not previously made on standard bikes, 24% of e-bike trips originate from city centre with a destination in the hilly east of the city, only 2% of standard bike trips were on these routes in the same period.

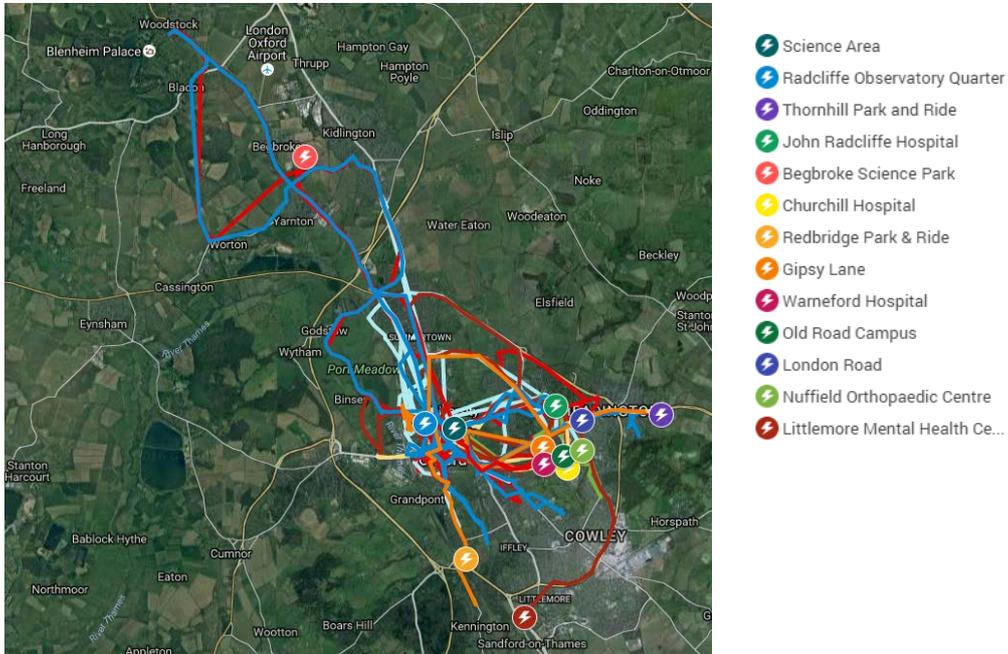


Figure 15: Oxford GPS map

The altitude comparison (See Figure 17) shows that on the same bike share system, e-bikes have been used to overcome the barrier of hills more than the standard bikes, the average altitude gained was 37 compared to 24 meters.

OXONBIKE Altitude comparison of standard bike and e-bike	
Bike type	Average altitude climbed (meters)
OXONBIKE Electric Bike	37
OXONBIKE standard	24

Figure 17: Comparison of altitude climbed by e-bikes and standard bikes

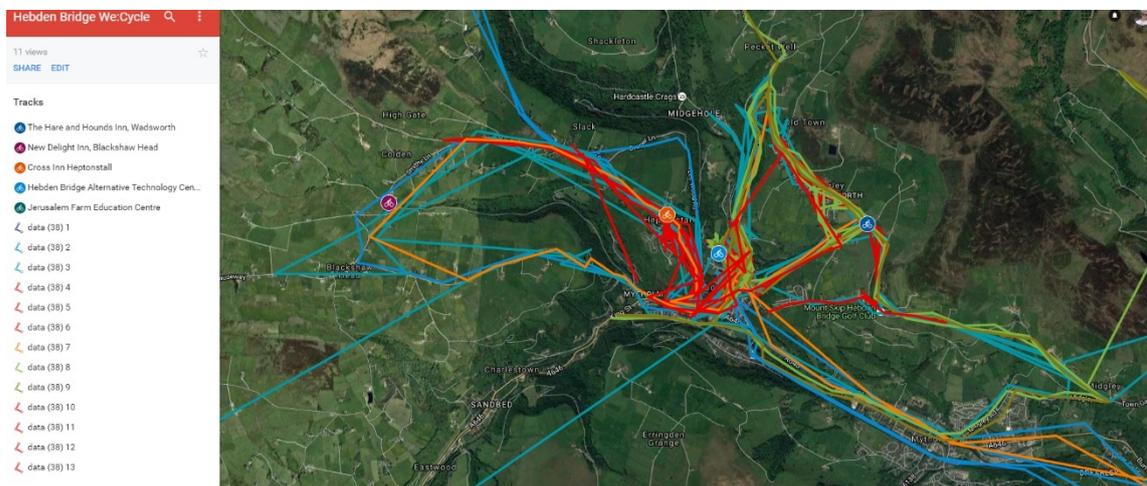


Figure 16: Hebden Bridge GPS map

**“Electric bikes are good as it enables me to cycle up hills without straining. I can go further & I use it on holiday every day”**

Red Squirrel E-Bike rider

**“I’ve been on 3 rides with the Alternative Technology Centre’s we:cycle electric bike scheme.”**

Murray Hebden Bridge:

**“The first thing to say - as someone who does not cycle regularly – is the real difference that an e-bike makes in our area. Hebden Bridge is right in the middle of the Pennines, and, apart from one canal towpath route, almost anywhere you want to go to round here means going up a steep hill. But that’s where the bike is such a game-changer. And I’m 61 and not a shred of Lycra to my name”.**

Hebden Bridge rider

### 3.8 Reducing journey times

Power assisted cycling has enabled people to reduce their journey times and fit more in to busy routines, 35% of regular riders reported using e-bikes to cycle because allowed them to reduce their journey time.

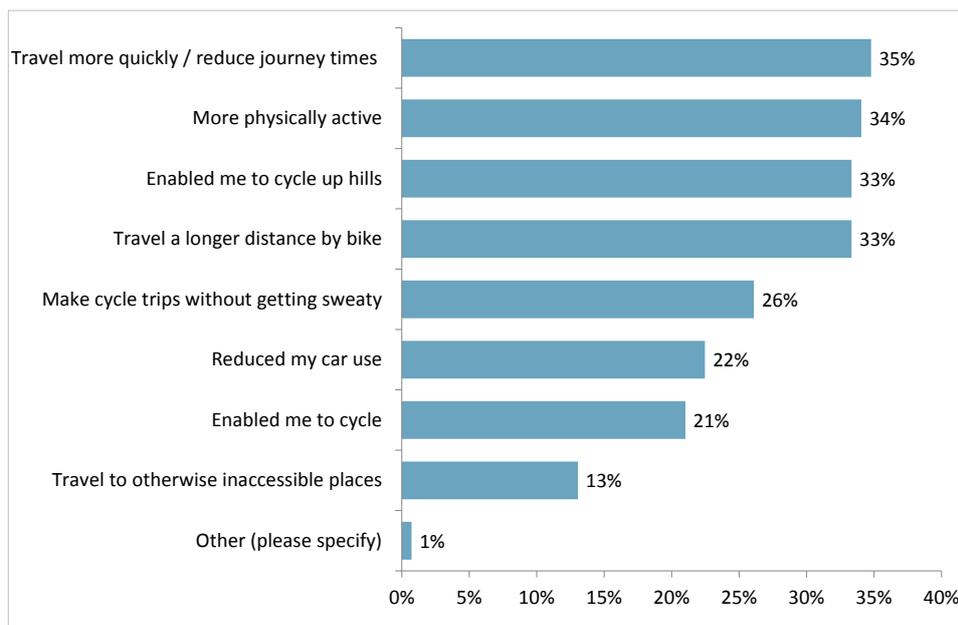


Figure 18: Benefits of using e-bikes

**“I use both the OXONBIKE pedal and e-bikes because I have total flexibility. The price is comparable to the bus, but this is much more flexible and faster. Plus it’s good for my health and the environment. I have used many bike schemes in Europe but this one has by far been my best experience.”**

Levan, Oxonbike rider

The e-bike programme provided examples of enabling people to fit more in to busy schedules by trip chaining. For examples refer to Georgina, Rotherham case study and Bethan,

Oxonbikes accounts (below) for the convenience of accessing meetings on e-bikes provided at the railway station.

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CASE STUDY: Georgia, Rotherham

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**“After having my son, I returned back to work and had to work out how I was going to do the nursery drop off/pick up in the most efficient way. Unfortunately cycling was not an option, as it was too far and up too many steep hills to get there. I’d describe myself as relatively fit, but struggling up hills with a three-year old is not fun. So I used to drive him to the nursery, drive home and then cycle to work, and at the end of the day, cycle home, and get in the car to go and collect him.”**

“It doesn’t sound much, but the increase in our spending on fuel, all the extra time spent stuck in traffic and the worry of always being late was really stressful. I needed to look at ways of how I was going to get around like in the ‘good old days’, pre-kids, but now with a child in tow.

The Raleigh Motus e-bike has really changed my family’s lives.

Now we go everywhere on the bike, and I mean everywhere. I use it every day to take my son to nursery. I cycle to work and to work appointments, I cycle to the shops, and I cycle with my son for his regular hospital appointments. We cycle up into to the Peak District, and have days out catching the train and then cycling home. I’d have never been able to do this before. It’s truly amazing. Everyone are always impressed when me and my son arrive places, as they can’t really tell it’s an e-bike, so we always end up talking about bikes and letting people have a look; parents at nursery, consultants at hospitals, staff at Hallam University, shoppers, colleagues, other cyclists, friends and neighbours, even drivers whilst at the traffic lights!

**Having an e-bike makes everything so much easier, those journeys that took ages on before, are so simple and quick now.** We’d never go into town on a weekend because of time and traffic congestion, but now if we’ve forgotten something, we can literally just ‘pop’ to places without it taking up time and too much energy!

It’s had a huge impact on the way we travel as a family, and has encouraged my son to be a keen cyclist at a young age. Cycling alongside him in on his balance bike on the Monsal Trial was one of my proudest moments, and I wouldn’t have been get there without the e-bike. Everyone should have one.”

**“I have really enjoyed being able to use the e-bike. It makes it much easier fitting in meetings around train times”**

Bethan, Eastbourne

**“For me there are two main benefits, one is that the docking station is near my daughter's nursery, so I could take her by foot (I am afraid to take her by bike) and then just go and rent the Oxonbikes, without any further delays.**



**The second benefit is that I work in the science area of the university and therefore have to climb the Headington hill every day when I go back home. With the e-bikes it is a piece of cake and takes less than 15 mins”**

Anar, (pictured above) Researcher in Oxford, OXONBIKE

The table below compares the time and cost savings from opting for the e-bike shuttle to waiting for the bus. As many students and staff switch between campuses at the University of Brighton along the train line, it is important to have a quick solution for the last 2 miles up hill to the Eastbourne campus.

Electric Bike	Bus
On-demand at rail station Journey time: 10-15 minutes	Every 30 mins then 8-18 minutes
Free after one off £20 sign-up fee	£3.80 daily return

Figure 19: Comparison of time and cost savings for ebike vs bus travel

**"Yes we are using the bike every day. It has greatly simplified our school/work schedule and I have done over 1,000km to date and expect to reach 1,500km before leaving Cambridge”.**

Cargo e-bike on long term hire user, Outspoken Cycles

### 3.9 Ebikes can be a tool to reduce car use

Enabling people to travel further, faster and in hilly areas is opening up cycling to new trips and crucially to the potential to replace car journeys. The programme has indicated the scope for changing travel behaviour: 46% of respondents reported that their regular shared e-bike trips were previously made by car as a passenger, driver or in a taxi. The follow up survey results indicated that 22% riders valued the e-bike as a tool to reduce their car travel.

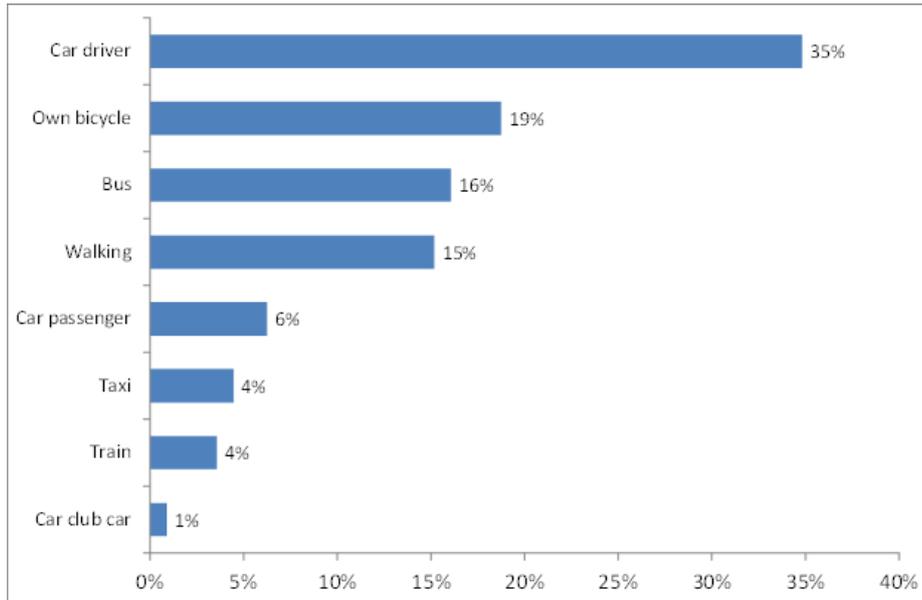


Figure 20: Changes to trips: how trips were previously made

There are many other studies providing evidence of modal shift from car to e-bike.

In Rotterdam, 25 e-bikes were used as municipal vehicles. The conclusion of the initial evaluation is that: “The potential of the E-bike is high among people who now travel by car, especially under car riders with a commuter trip between the 9 and 19 kilometre. 60% think the E-bike is a transport means by which they can fulfil their commuter trip and 40% of the car riders are planning to buy an e-bike in the future. The people who normally commute by car rated the experience with the tested E-bike high and the product almost always met their expectations. However, the willingness to pay the price for an E-bike is a drawback...”

(See PRESTO Cycling Policy Guide: Electric Bicycles).

A shift to e-bikes could reduce externalities of car use; congestion, air pollution and carbon emissions. After factoring in CO<sub>2</sub> emissions produced during electricity generation, an e-bike’s carbon footprint is just 2.6-5 grams of CO<sub>2</sub> per mile (depending on the source of the electricity), compared to 75 grams for most ultra-low emission electric cars and 136 grams for scooters. Co-bikes in Exeter are supplied by Good Energy, a source powering the bikes with zero carbon emission.

Evidence from Rotherham shows that e-bikes have helped some to increase their independence and allow some riders to no longer rely on car travel.

**“About three years ago I never knew how to ride a bike. I got diagnosed with an illness so I had started exercising in the gym and going walking. I came across the electric bike loan scheme and thought I’d give it a go, for a person like me it’s been really good and helped me a lot with the kind of cycling I do. We’re a family of five and have a car, but don’t really like using it if we can help it. I can do longer distances with the electric bike. I used it to go to meetings to or cycle to the tram stop if I needed to go further”.**

Nawaz, Tinsley, Sheffield



Electric bike riders more likely to own a car than the general population, 87% shared e-bike riders own at least one car compared to 74% of general population. By appealing to car owners there is potential to generate mode shift from car to cycling.

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#### CASE STUDY: Hook Norton Rider, Oxon

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**“Compass Bikes gave me a great chance to answer a question - Could an e-bike perform well enough to negate a household getting a second car. Could it be used to get to the local town, pick up some shopping and head back home? All of this, without being clad in lycra or arriving at the location in a sweaty mess.**

**The destination was a very modest 5.7miles away, in Chipping Norton. The sort of journey I would not think twice about doing on a bike. For most people, this is a car journey. Especially as there is big hill going out of Hooky.**

**What are the (bikes) like then? Grin inducing, fantastic and they really do shift!**

**We used ours in tour mode mostly, which kept us moving at a good pace without draining the battery. The display is very intuitive and showed how the range was reduced by using sport or turbo modes. From the moment you set off you can feel the assistance. I like it to a modern diesel car with a good turbo. Hills require a lot less effort than a regular bike, especially if you knock it up to Sport to get more from the assistance.**

**You do have to still use your gears though. Going down the gears while climbing a hill will reduce the torque required for the motor to pull you up. If you like standing and grunting up hills, the motor will just stop. If you like standing up hills though, you probably don't want an e-bike.**

**We deliberately didn't wear bike apparel; I even wore a shirt. Apart from helmets, we looked exactly as if we were going in a car. I took panniers, to emulate going shopping which didn't impede the bicycle at all. We flew out of Hooky up the hill and before we knew it we were in Chippy. I'd say it was a 25 min journey; maybe less. On the return journey we had loads of juice left, so we knocked it up to turbo mode. We came home in 20 minutes, thanks to the**

**extra assistance and some good hills. Both times we arrived not sweaty, but feeling we had done some comfortable exercise.”**

Feedback from University of Exeter (see figure 19) shows the public perception that journeys currently made by car have the potential to be switched to an e-bike.

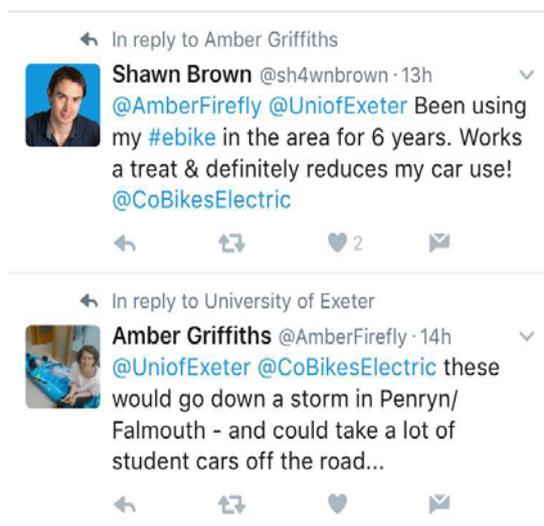


Figure 21: Shawn & Amber, University of Exeter

### 3.10 Providing affordable access to employment, education and social opportunities

The electric bikes in the urban based projects have been used for commuting by a quarter of riders, 28% of riders indicated in their survey responses their journey purpose was travelling to work. Electric bikes supported access for those “Not in Education, Employment, or Training (NEET)”; 18% of regular riders indicated they were in this category and a further 18% were part time workers.

Shared e-bikes have provided access to employment or social opportunities in different ways. The programme has enabled health and shift workers to commute and arrive at appointments at times when public transport isn’t feasible or convenient to reach destinations directly without the use of a car (see case study on Teresa in Bristol).

In Rotherham one shift worker who could only take up a job at an out of town call centre with early starts or late finishes with access to the e-bike. Public transport didn’t run at the times required and they weren’t in a position to buy a car. The option of the e-bike loan enabled them to take on the role.

Operational experience from Plymouth Bike Hire has shown how e-bikes have enabled families and groups of friends to enjoy riding together, often for the first time. For reluctant riders, they have joined family members for rides.

**“My wife never cycled before and now she can and does”**

Red Squirrel Rider

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## CASE STUDY: Teresa, a Community Nurse working for Bristol Community Health

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Teresa recently returned to nursing from a career break and her role includes travelling around the city to visit patients who are house bound and otherwise unable to access normal NHS services. She has been riding an e-bike since April. After her bicycle was stolen from her GP practice, her employer arranged for her to have access to an e-bike so that she could continue her job. She uses the e-bike to attend her patient visits.

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## CASE STUDY: Daniel, 32 – Rawmarsh, Rotherham

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Daniel lives in Rawmarsh in Rotherham and works on a farm in Ravenfield. As a farm hand managing pigs and cattle he needs to be at work early in the morning, usually by 6am. Buses in the area don't run early enough and would often involve catching up to three different ones.

The area is hilly and Daniel's route to work is one long incline that is too hard to cycle up, especially day in day out before doing a physically demanding job. Daniel loves his work, but getting there was getting to be too much of a struggle, when his Aunt Pat saw an advert for the free CycleBoost e-bike loans.

His Aunt, Pat, said:

**"I never thought he'd take to cycling, but loaning this e-bike has really changed his life, and not just because he can get to work easier; he's lost lots of weight too, so he's much healthier than before."**

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22% of regular riders determined their reason for choosing an e-bike was because it was cheaper than the alternative mode. The shared aspect enables people to travel for effectively the same price as bus travel, overcoming the purchase barrier to cycling and particularly electric assisted cycling.

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Prices in Oxford (see Figure 23-25) show that shared electric bikes are a cost-effective form of travel. A return bus ticket from Oxford city centre to Headington is £3.60 and the comparative price for an OXONBIKE e-bike is £2 per day with a free 20 minutes for casual riders, the trip on an e-bike typically takes 15 minutes.

A membership tariff exists for £52 providing no daily charge and free usage for 20 minutes, comparatively an annual bus ticket for Oxford is £489.

Exeter's Co-bikes' annual membership tariff cost £60 with £0.75 charge for every 30 minutes of use (see figure 27), a city bus pass costs £502 annually (see figure 26). Depending on levels of usage this represents a considerable cost saving.

33% of people loaned an e-bike in Rotherham to save money, illustrating the high travel costs and how shared e-bikes were being trialled to test if they were a cost-effective solution for commuting.

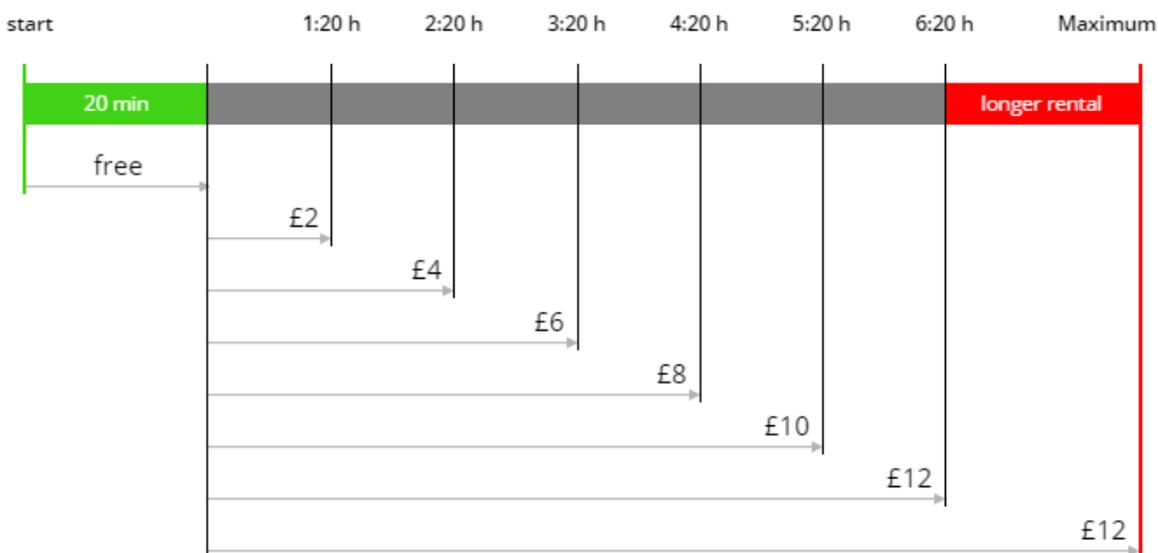


Figure 22: OXONBIKE E-Bike tariff

Oxford City Centre – Headington Travel Price comparison	
The purpose of sharing was to increase affordability; riders only pay for usage as a cheaper alternative to purchasing.	
OXONBIKE E-BIKE	Bus No.8
from £2 per day	£3.60 return
First 20 minutes free £2 for next hour	
Annual ticket £52 Free 20 minutes	Annual ticket £489
Typically, 15 minutes direct	Service every 6 minutes 11 minutes journey

Figure 23: Oxford City Centre – Headington Travel Price comparison

NAME	DETAILS	SUBSCRIPTION FEE	FREE PERIOD PER RENTAL	MINIMUM CREDIT TO RENT	SUBSCRIPTION LENGTH
pedal bike casual use		£1	2 min	£1	1 year
pedal bike annual membership		£26	30 min	£1	1 year
e-bike casual use		£2	2 min	£2	1 year

Figure 24: OXONBIKE Casual & Annual Tariffs

Options	Coverage	Discounted price
Exeter Megarider	City of Exeter including Cranbrook	£504.00

Figure 26: Exeter annual bus pass

Membership	Pay As You Go
<p><b>£0.75</b> /per 30 min</p> <p>Annual Subscription Fee: £60                      Hire rate (per 30 minutes): £0.75                      Hire rate (between 10 - 24 hours): £20                      Deposit: £10</p>	<p><b>£1.50</b> /per 30 min</p> <p>Annual Subscription Fee: None                      Hire rate (per 30 minutes): £1.50                      Hire rate (between 10 - 24 hours): £30                      Deposit: £10</p>

Figure 25: Exeter tariffs

**“It has taken a while to build up my level of fitness, but now I cycle to and from work and ride at the weekend whilst out doing my shopping. I didn’t cycle before and I wanted to try one before I bought one, I ended up saving £56 per month on bus travel and lost 2 stone in weight!”**

Craig, from Maltby, near Rotherham

### 3.11 Electric bikes can contribute towards economic goals

The programme findings indicate that electric bikes can encourage new people into cycling and existing cyclists to try new trips. The health benefits of attracting new cyclist have been estimated as £370 per cyclist pa (DfT guidance for 2016/17 on 2010 prices). Each cycling trip is estimated to have a value of £0.54 pa including benefits from reduced congestion, accidents, carbon and improved air quality, based on DfT guidance.

Looking more specifically at the different contexts within the programme other potential economic benefits have been identified.



### Visitor economy

Visitors have used e-bikes to visit various attractions and destinations across the Isle of Wight (see Figure 27/28), with the most popular being: The Needles, Cowes, Red Squirrel Trail, Carisbrooke Castle, Alum bay, Shanklin, Sandown, Bembridge Harbour, Owl and Falconry Centre, Appledurcombe House and Gurnard. This GPS evidence shows the impact that e-bikes can have on the local visitor economy, highlighting the extent of trips that pass by visitor attractions.

**“Very fun and easy to go large distances to see more of the island”**  
Red Squirrel Bikes Rider

The survey demonstrated that only a quarter of people would have visited the same attraction (by regular bike or other mode) if the e-bikes had not been there. The remaining 75% would

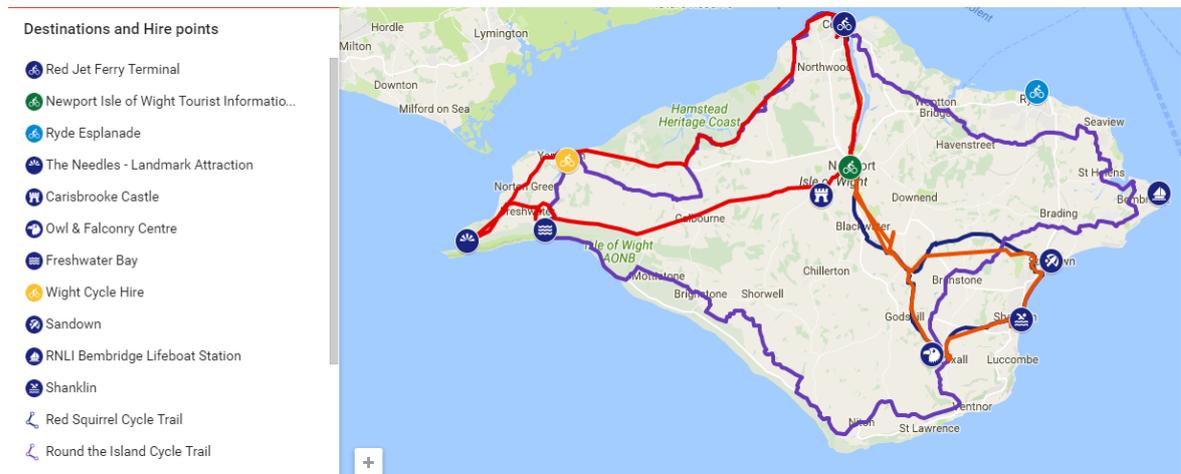


Figure 27: Isle of Wight GPS selected trips map

have done other activities suggesting the e-bikes are a valuable tool in linking people to a variety of leisure opportunities.

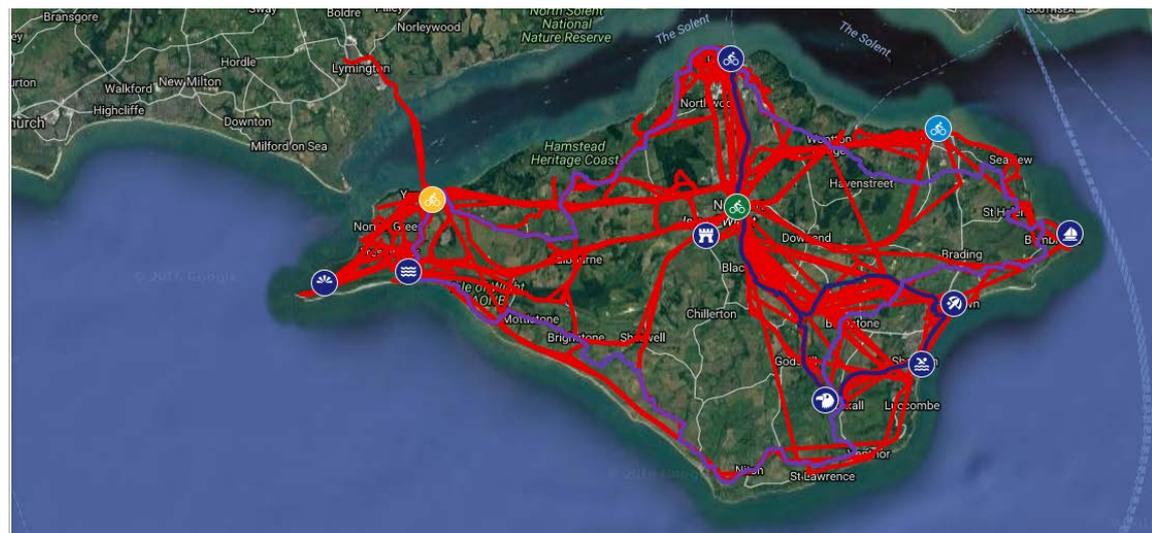


Figure 28: Isle of Wight GPS all trips map

The longest trip of the entire programme was 36 miles from Cowes to the Needles (See red journey track on Figure 28).

## Cargo deliveries

**“I gave up my car a few years ago and these cargo bikes really fit a market in Cambridge - carrying stuff that won't fit in an ordinary bike but you'd feel a bit silly getting a van for. I should add that it's enormous fun too!”**

Outspoken's first Cargo Bike Hire Customer

Outspoken's cargo bikes have been hired to transport goods for local businesses as well as being used to improve productivity and the well-being of their own staff.

An exercise to compare the performance of delivery riders using a cargo e-bike and manual cargo bike was undertaken over a two-week period. This study identified that the rider was 5.5% quicker doing the same run on the electric cargo bike.

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### CASE STUDY: Local economy, Sue, Cambridge

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**“It was chaos when we arrived at the venue with car drivers trying to unload their items and blocking the access points. We were able to cycle right up to the entrance quickly unload without any stress. I will definitely be using the cargo bikes for all future local events.”**

Sue, Cambridge

Sue has recently started a small business (“Soggy Bottoms Seat Covers”) making cycling accessories for bicycles including bike seat covers and basket rain covers. The products were launched at the Mill Road Summer fair 2016, an annual event held in an area of Cambridge with a large number of independent shops. For the summer fair there was a large amount of stock and display items which needed to be transferred to the event and the organisers made it clear that parking and access would be a problem.

Sue hired an electric assist cargo bike from Outspoken for the evening. All the items were transported in one trip using the cargo bike and a standard bike.



### 3.12 Increased sales of electric and pedal bikes

The projects have raised the profile of e-bikes and have both directly and indirectly led to sales of electric and standard bikes. Isle of Wight bike shops seen sales increase by between 35-65%.

Three in ten visitors said they were more likely to purchase an e-bike after using one (29%). The proportion of regular riders saying they would be more likely to purchase was much higher with eight in ten saying so (82%). This may be due to their travel needs or having greater opportunity to test the bikes.

It is interesting to note that in this limited sample the survey showed that 13% of regular riders have purchased an e-bike and a further 17% proceeded to purchase a standard bike. For these people trying an e-bike may have helped them overcome their worries about their fitness allowing them to realise they can cope without electric assist, hence the e-bike is a useful introductory tool.

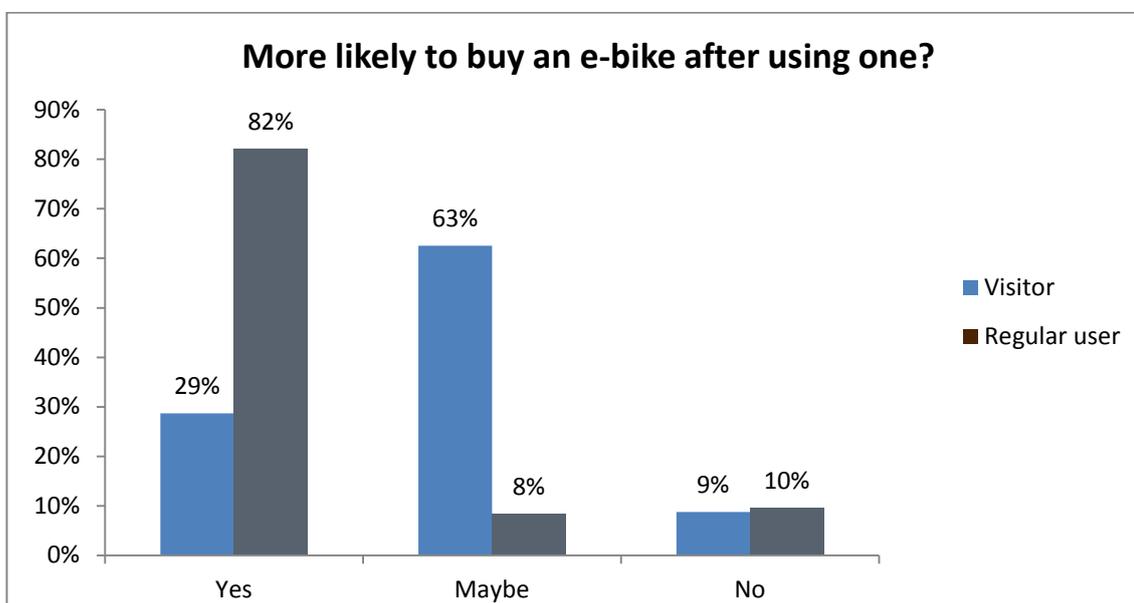


Figure 29: Interest in purchase of an e-bike

Rotherham: 35% of people intend to buy an electric or conventional bike after taking an electric bike on a “try before you buy” loan. The evidence in Figure 28 supports the fact that loan schemes have a higher conversion rate of sales than visitor e-bike hire as those engaging with the schemes are already contemplating purchase.

**“I have greatly enjoyed using the bike and I will definitely be purchasing one to commute. The Rotherham staff were very friendly and helpful, getting the bike was convenient and it was a great experience overall’**

Erica, Advanced Manufacturing Park Boeing employee, Rotherham

**“The period of loan - one month was far too short. Had it been for at least 3 months then I might have considered being unable to live without it and purchased one’**

Rotherham rider

**“We are definitely going to buy a pair of E-bikes from Raleigh”.**

Plymouth rider



### **3.13 Summary of typical users of e-bikes**

The programme concluded the appeal for e-bikes is wider than was originally expected. There was an expectation by some that the market might be limited to: older generations, people travelling in hilly areas and people with health difficulties.

It was actually the case that there was a variety of reasons for choosing an e-bike for people of all ages and situations.

- Unconfident new or returning cyclist particularly female riders,
- Retired leisure riders,
- Commuters wishing to travel faster and arrive at work fresh,
- Commuters wishing to travel longer distances or in hilly terrain,
- Shift worker needing flexible low cost 24 hour travel
- Time constrained people fitting in multiple activities,
- Car drivers looking for a flexible, efficient, healthier alternative,
- People who cannot use a conventional bike due to a physical health difficulty,
- Delivery riders.

## 4. Scheme Design, Marketing and Financial Sustainability

At the outset, each of the projects carried out initial market research and designed their e-bike scheme to fit the travel demands of the potential riders in the area. They also identified partnerships to ensure success. Along the way many of them have adjusted their offer to account for new intelligence whilst also exploring new opportunities. The majority of the projects are already showing potential to become strong sustainable schemes. A few still have challenges to overcome. This section presents some key areas of consideration when developing similar schemes and their lessons learnt.

### 4.1 Urban On-street Public Bike Share: Oxford (Oxonbike) and Exeter (Co-Bikes)

On-street public bike hire using self-service docking stations are available in 17 towns and cities around the UK, including London, Liverpool and Reading. However non in the UK previously have offered e-bikes. This programme allowed the testing of the impacts of adding e-bikes as a mixed (Oxford) and pure electric (Exeter) fleet. Both models appear to be have the right ingredients to be successful, although developing strong public bike share schemes requires a number of factors to be in place, which are explored below.

#### Building on existing customer base

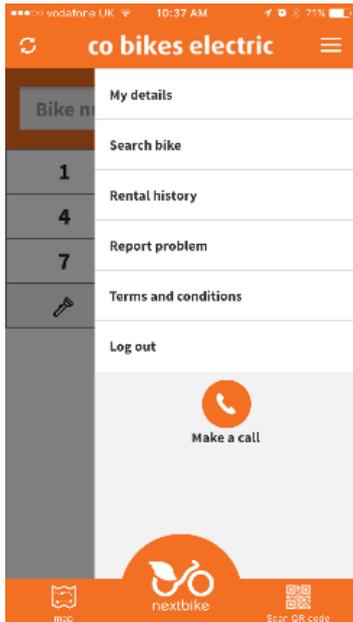
The Oxford Oxonbike bike share scheme was an existing project which added e-bikes to its fleet. The Exeter Co-bikes project is a car club (Co-cars) adding e-bikes to its now multi-modal offer. Both schemes had an existing customer base but were also able to attract new riders through the addition of e-bikes.



**“It would be fantastic if I could hire a bike using the same smartcard as a car”**

Exeter Co-Cars Car Club member

The schemes had a strong emphasis on serving employees of the council, universities and business parks, by providing e-bikes through docking stations this had the advantage of reaching out to a wider population than employees, offering the wider public an easy access self-service scheme.



### Public transport links, Smart Cards and Apps

The easy to access on-street schemes have a useful role to play in providing last mile trips for public transport. Both projects have placed bikes close to rail stations and bus stops to capture this market. Other projects, outside this programme, have found the introduction of integrated public transport passes a valuable tool (e.g. Reading Borough Council are placing e-bike access on the same smart card as public transport services). Co-bikes have a Smart Card and an App which accesses both the car club vehicles and the bikes. The introduction of Apps for locating and accessing bikes has had a positive effect on take up in other cities such as London and Oslo.

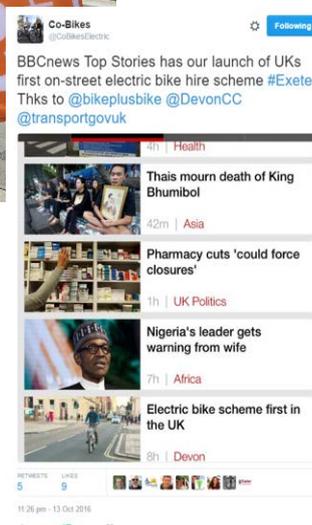
### Marketing strategies

On-street schemes have the advantage of being visible and attracting usage from passing trade.

Both schemes had a strong emphasis on building awareness for the new e-bikes with organisation partners through stalls offering try outs.

Co-Bikes had a successful press and social marketing campaign (see Tweets). By announcing early the launch was coming, this generated interest in spreading the message through a network of contacts at University and employers such as the Met Office and generated a sense of suspense.

Co-bikes employed a PR agency for the launch which was able to generate interest leading up to the launch from local and national press. There was a strong emphasis on local coverage with prime time weekday evening TV exposure on BBC Spotlight, radio airtime on Radio Devon and a video feature on the Express & Echo site.



### Financial sustainability

The projects have a diversity of business models funding their operations. Public bike share schemes are reliant on a combination of revenue income from riders, public funding, support from organisational partners, and in some cases advertising or sponsorship (see Bikeplus Guidance on developing a Successful Bike Share Scheme). It has been indicated by Oxonbike that whilst it is too early to learn the implications of e-bikes on their long term business model, both schemes have been successful at attracting new members and investment from both public and partner sources.

Oxonbike and Co-Bikes have designed a new slightly higher tariff for the e-bikes.

	Casual rider E-bike	Casual rider standard bike
<b>Oxonbike</b>	£2 per day	£1 per day
<b>Co-Bikes</b>	£1.50 per half hour	£1 per half hour*
	Membership E-bikes	Membership standard bikes
<b>Oxonbike</b>	£52 per year and 20mins free	£26 per year and 30 mins free
<b>Co-Bikes</b>	£60 per year and £0.75 per 30mins	£60 per year and 30mins free*

(\*based on the supplier Nextbike tariffs as Co-Bikes don't offer standard bikes)

In Oxford there has been a preference for casual pay-as-you-go tariff over the investment of an annual subscription which is seen in many other bike share schemes. The uptake won't be fully understood until later in the year or in 2017 as the market in Oxford is partially driven by the academic year, therefore there is an increase in usage in October where other schemes are becoming quieter.

### Practicalities of site choice

Where possible the two schemes placed e-bikes on privately owned land as it was considered cheaper and faster than establishing electricity supplies on council owned highway sites

Railway stations are a popular generator of last mile journeys, so e-bike docks have been installed at Oxford's principal railway station and at Exeter Central. The process of reaching agreement with electric suppliers and Network Rail has been bureaucratic and lengthy, and providing electric supplies on existing Network Rail property has proved difficult. Integrating a dock into new railway station plans is more straightforward, as has been the case with Marsh Barton, due to open in Exeter in 2017. Railway stations due upgrades have delayed progress at Exeter St. Davids.

## 4.2 Private Workplaces Schemes: Eastbourne, University of Brighton & Bristol Co-Wheels

The workplace pool bike model is a tried and tested option for supporting staff travel and offering e-bikes strengthens the offer. The two projects in this programme have done well to overcome this barrier and develop popular sustainable schemes.

### Travel needs

The University of Brighton, and Co-wheels in conjunction with their partners had two aims: to support inter-site and business trip needs which were currently not being well served by public transport, and to encourage cycling. They each placed e-bikes in locations which sought to support the transition away from car dependency. By providing e-bikes in a shared context they made mode shift affordable, attractive and convenient to access.

### Easy Access

The work place schemes focused on attracting riders from within their institutions who currently travel on less sustainable (car) or less active modes (bus). In order to compete with the “convenience” of the car, the e-bikes need to be easily accessible both in terms of position close to where they are needed and in terms of the method of unlocking. The University of Brighton scheme in Eastbourne placed bikes at the rail station for staff commuting or switching campus by train. The e-bikes were close to the entrance of the station in a lockable cycle storage unit and bike locks both opened with codes. The scheme is switching to a new smart lock system to unlock the e-bikes by an App.

The Co-wheels corporate model in Bristol had an ambition to place bikes in self-service lockers but this wasn't possible logistically due to problems gaining planning permission, instead bike keys are placed amongst staff or at nearby reception desks.

Bike lockers are currently not recommended for projects aiming for wider public use in urban settings as they hide the bikes from the public gaze, they may be a useful tool in a workplace or closed community setting.

### Financial sustainability

Both schemes were supported by the employers who benefit from their employees accessing the workplace pool e-bikes. Co-wheels identified the need to be able to support the health and economic benefits with evidence to attract such support in increasingly challenging financial times. University of Brighton charged staff £20 to join the railway station scheme, for the longer term rental scheme – fees are paid up front and are on a sliding scale relative to the rental period. Both payment systems have been acceptable to the riders and compare well to the cost of other modes. The university are currently negotiating the future management of the Eastbourne scheme with the private bike share provider – APP Bike. The success of the scheme has led to investigating a roll-out of the scheme across Eastbourne.

### 4.3 Tourism projects: Isle of Wight Red Squirrel Bikes, Plymouth Bike Hire and Hebden Bridge We-Cycle

Developing tourist based projects created more challenges as by their nature the audience is seasonal and affected by factors such as the weather although the Plymouth and Isle of Wight schemes had strong visitor engagement. Each of the projects looked at ways to diversify utilisation by attracting use for businesses or utility trips. This model needs further time to establish before conclusions can be made.

#### Serving untapped demand

Both the Isle of Wight and Plymouth projects found that the addition of e-bikes expanded their current cycling offer. Managers of the schemes report that the majority of riders have been from an older or less fit demographic who were also generally less experienced cyclists. Many hirers were part of a family or group which included fitter cyclists who could now ride with those unable to use standard bikes. Aside from visitors, the next largest rider group has been ‘try before buying’, again generally retired people. These riders have expressed an interest in having their own e-bikes but wanted to test them out before committing to a purchase.

There was also interest from 30-45 age group if they have children to tow along in trailers or tag-alongs. It has been observed that there may also be a demand for longer distance rides for touring holidays and that it could be useful to offer charging leads or a better network of charging points.

#### Marketing and importance of partnerships

As the main audience for the bikes is an older demographic the tourism projects felt that traditional methods of Facebook and Twitter marketing may not be as high a priority. The Red Squirrel project found it best to reach their riders through print advertising in Isle of Wight holiday brochures and guides. As everyone arrives on the Island by ferry these companies became an important partnership for promotion for Isle of Wight.

Both Isle of Wight and Plymouth had begun looking at ways to expand their offers. They offer route guides e.g. for the Red Squirrel Cycle Route and Plymouth offer lifts to off road cycle track in Dartmoor. Isle of Wight have marketing promotions with local visitor attractions and are considering joint ticket promotions and route guides.

We-Cycle in Hebden Bridge had two market targets; members of the local community and secondly visitors to the area. For the tourist market they intended to lease e-bikes to local Bed

and Breakfast and campsites owners. They were supported by Calderdale Council tourism department however there was not a great response as businesses were nervous about making a financial commitment in a difficult economic climate whilst the scheme developed. We-Cycle decided to combine the two target markets and placed the 'e-bike hubs' in the hill top community pub car parks where there was adequate level space for the lockers, they were reasonably accessible but secure at the same time, and there was someone (the landlord) of the pubs who would be there 24/7 to keep an eye on the e-bikes, charge batteries etc. The e-bikes were available for the local residents to use and visitors could also rent them through the landlord of the pubs.

The offer has been mainly taken up by local residents for leisure and utility trips, and some work needs to be done encouraging accommodation providers to market the e-bikes to their guests – preferably as part of the whole visitor package next season. It may be important to find a way for the accommodation providers to avoid taking on too much financial risk but gaining some incentive for promotion.

In Hebden Bridge We-Cycle contacted several hill top communities and held try-out sessions meetings in the villages, alongside leafleting and social media.



### **Financial sustainability:**

All of the tourism based projects are dependent on alternative revenue support to maintain financial sustainability due to the seasonal fluctuations in demand.

Red Squirrel Bikes is arranging a pilot *Bikes in Business* scheme in partnership with the chamber of commerce to make otherwise unused bikes available for medium term hires to local business for employees to use for commuting and short business trips. Similarly, Plymouth Bike Hire are exploring using Smart Lock technology to place e-bikes around the cities for residential, business and student use.

One option which has been done in other projects which wasn't explored in this programme is to sell off the second hand bikes, or mothballing them over winter months to reduce costs – if e-bikes are bought at bulk discounted price each spring and then sold in autumn at a second hand retail price then there will be a similar income to reinvest each year.

### Popularity of off road trails

Operational experience from Plymouth indicates that the majority of rides are on off-road trails, the journey data shows the popular trips on the off-road paths to Plymouth Hoe and Saltram Castle (see Figure 31).

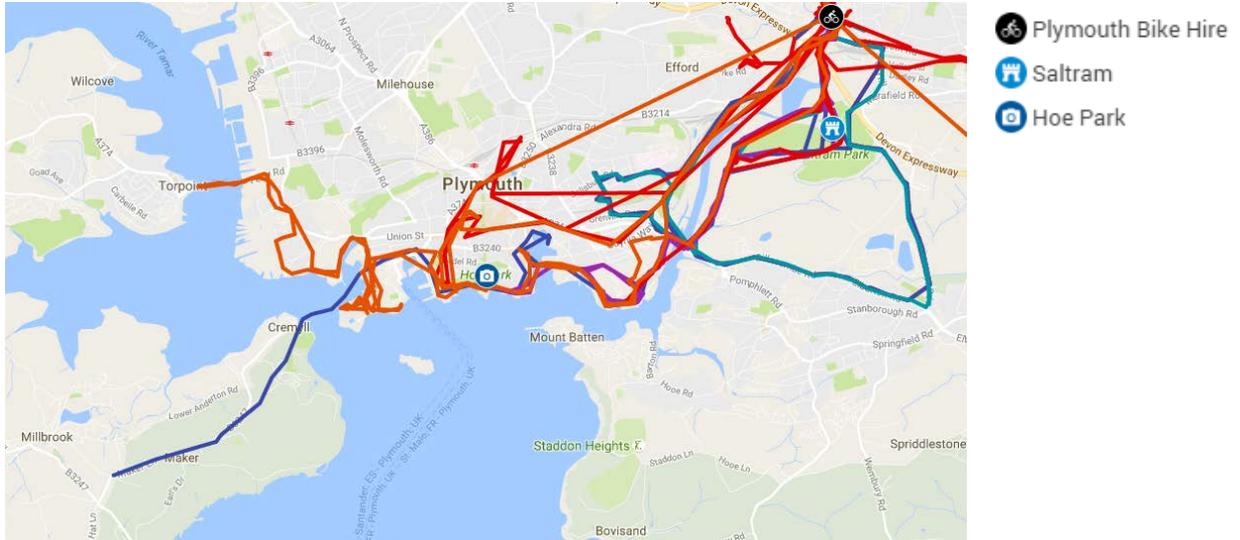


Figure 31: Plymouth GPS Map

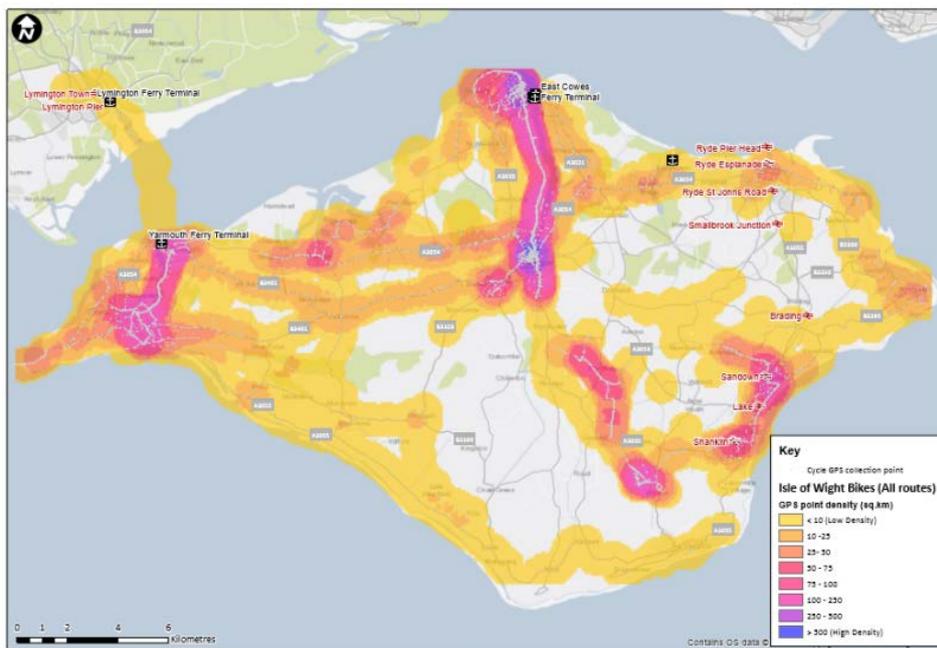


Figure 30: Isle of Wight GPS heatmap

Riding on off-road is popular, the routes people have chosen in a leisure context have (see figure 30) of the Red Squirrel Trail, Yarmouth Freshwater trail and off-road route between Cowes and Newport have proven to be popular, as people prefer to cycle on off road cycle paths.

## 4.4 Socially Focused Schemes

### Rotherham's Journeymatters Loan Bikes

Bike loans schemes packaged with cycle training and accessories have previously been proven to be a good method for converting potential cyclists, the addition of e-bikes appears to widen the pool and increase success. These schemes are not supported by any revenue income, it is 100% reliant on grant funding. However, in this project developer contributions towards the cycle hub and bike hire are being investigated in exchange for site visits and support from the bike loan service. The project has investigated potentially charging for the services on offer at the cycle hub, although there are concerns in an area with significant levels of multiple deprivation.

The mobile cycle hub allows the e-bike hire service to work alongside other complimentary services such as cycle training and Dr Bike check-up and repair. This has helped to increase interest in the e-bikes. The hub also visits town centres and parks. General promotion has also been undertaken through adverts in local newspapers and through social media.

The project has been successful due to having a compelling offer, strong brand and good links with a number of high profile businesses in Rotherham including Capita, Royal Mail and Next.

With this scheme, success should be based upon conversion to sales as well as initial take up. Although this has been high at 35%, the project staff felt this could be higher if they had offered e-bikes which retail at the lower end of the price range. Currently the majority of bikes available to hire in Rotherham retail at around £1,500 to £2,000. After the hire period some participants would like to purchase an e-bike of a similar quality though cannot afford to do so. Previously Bikeplus have tried some lower cost e-bikes though they have been less reliable. However, there are now a number of bikes that have recently entered the market which retail at around £1,000 and have improved components and electric motors in comparison to previous lower cost models.

### Compass Bikes, SE England

Compass bikes was set up by Sustainable Ventures to test the offer of shared e-bikes for staff and residents at social housing units in areas of deprivation. Hire of the e-bikes was provided for free to enable riders offer a flexible, healthy and affordable alternative to public transport, taxi or car ownership. The aim was to demonstrate the value of such a scheme to housing associations in order to attract ongoing revenue support but with no secured contract they will finish operations. The project has attracted considerable usage by staff and residents for leisure, utility and business trips. It established there is a demand but the barriers of cost and managing operational responsibilities are yet to be overcome. By trialling the Compass Bikes project in a range of locations with variable socio-economic characteristics, organisational set ups, and geographies, the project has explored the value of shared e-bikes for a wide range of journey types and customer segments, demonstrating e-bikes can serve different needs for different individuals.

## 4.5 Specialist Schemes

### Cargo E-Bikes, Cambridge and Norwich

The cargo e-bike scheme demonstrated the value of electric assist to delivery companies but struggled to create the right model to encourage shared use by the wider population.

The three delivery cargo e-bikes and e-trikes have been used on a daily basis since October 2015 by Outspoken Delivery, undertaking daily deliveries in and around Cambridge and Norwich. The electric assist on the cargo bikes and trikes enables greater rider productivity. Riders can work longer than if they were using standard bikes reducing issues of 'burn out' and allowing the riders to raise their income (previously Outspoken could only offer part time hours due to the effort required).

The cargo e-bikes were also offered to local business and public for hire. The level of enquiries received was far fewer than anticipated. Possible reasons why this was so:

- The requirement for training gave the impression that potentially the cargo bikes were difficult to ride;
- Some people were intimidated by the size of the bikes and did not want to be seen as not being able to handle or ride the bikes. This may be a gender issue with women much more reluctant than men to try out an e-cargo bike;
- A local supplier of e-cargo bikes offered a try before you buy service with basic instruction for no cost;
- Hire cost £15 for 3hrs. £20 for the day compared to the cost of a Zipcar in Cambridge which is £5 per hour, (although there is a membership fee.);
- Businesses in Cambridge and Norwich already have established cargo bike delivery companies able to provide ad-hoc services at competitive delivery rates
- Visitors to Cambridge wanted to be able to pick up the e-bikes from Cambridge station.

Outspoken are choosing not to continue with public hire of the e-cargo bikes due to lack of revenue generated but recommend to others that it could be successful if they had:

- Chosen easier to ride electric assist cargo bikes for public use, (bikes not trikes);
- Incorporate rider training into the hire cost – perhaps rename training to familiarisation;
- Provided a more convenient location to collect the cargo bikes from;
- Partnered with a retailer(s) who have got experience with e-cargo bikes and electric assist issue;
- Concentrated on long term hire or leasing.

Outspoken will however continue to use the e-cargo bikes for their own deliveries and have had success leasing non cargo e-bikes to local businesses.

### **All Ability Cycling, New Forest PEDALL**

PEDALL has successfully offered electric assist on adapted bikes for both guided group rides and private hires. This approach has allowed the project to widen its appeal from the existing conventional bikes. It has attracted reluctant riders through group sessions which focus solely on people who have physical or learning disabilities, and resilient riders who are recovering from injuries and seek to improve their recovery and maintain fitness. Previous surveys showed that people with a disability or those with a family member with a disability feel more socially isolated, so the sessions have been popular as an opportunity to socialise and meet new people. The electric assist has helped carers and family members not to have to work as hard physically or overexert themselves, making it a more enjoyable experience and increasing the distance/type of terrain that they can cycle.

All PEDALL sessions are free, the costs are covered by the New Forest National Park Authority, supplemented by external grants. A dedicated shared cycle hub and storage area with standard bike hire provider Cycle Experience has enabled a strong partnership to promote the service.



A strong online presence with a unique project site and featuring on both the New Forest National Park site and national websites e.g. Cycling UK has led to bookings.

One challenge is the lack of cycling skill and knowledge of carers when coming to hire e-bikes, developing training is being considered.

As part of this programme a set of guidance for riders and cycle trainers has been produced see. <http://www.carplus.org.uk/projects/shared-e-bikes/>

## 4.6 Choice of E-bikes, Rider Support and Maintenance

### On-Street Docking Station Projects

Oxonbike have found that the introduction of e-bikes into the existing conventional bike network has introduced more operational procedures, particularly for battery monitoring and redistribution where e-bikes are docked in non-charging points. However, this additional effort is not excessive and resources were increased in anticipation of that effort. Voltage is used as a measure of charge, this is difficult to convert into a meaningful distance left to travel so needs further investigation.

### Maintenance

All projects emphasised the importance of third party partners to support charging and maintenance /repairs. Partners have either been local bike shops, community groups, bike focused charities or in some cases volunteers. Some commented of the importance of offering sufficient training on the electrical aspect of the e-bike maintenance to their local support team as this can be intimidating. Partnership arrangements with local mechanics with knowledge of the specific models and systems proved valuable for Compass Bikes allowing for relatively speedy turn around when maintenance issues arose.

With the exception of the specialist docking station e-bikes the remaining fleets were stored inside or under shelter. Consumer e-bikes are typically stated to be rain proof and can be used in all weathers - but being left outside uncovered full time will not be good for their condition mechanically as for any bike. Projects considering using e-bikes with smart locks on-street need to consider locating them under shelters.

Getting cold should not be a problem as such for the batteries (in fact they hold charge better when cold) but several manufacturers warn not to charge batteries from freezing - they should be at room temperature.

In Plymouth, some bike thefts resulted in a more thorough and proactive approach to security. Prior to the e-bikes there were no thefts.

### **Bike Range Choice**

Some schemes chose a range of e-bikes in order to offer them as sales to customers but this then had implications for ease of understanding the fleet, maintenance and general preparation. Providing bikes with sufficient height range is a factor to consider as some projects used two different supplier to accommodate smaller riders.

### **Rider Training**

Several of the project such as Eastbourne and Journeymatters offered 1:1 cycle training as part of the package. Riders often found this a reassuring way to begin cycling again after a gap. Riding an e-bike can be especially daunting and requires a little extra knowledge to manage the controls and the extra power. The Association of Bikeability Schemes (TABS) was employed as part of this programme to create a training guide for cycle trainers which includes guidance and top tips for riders themselves.

### **Charging Networks**

Most trips were well within the range of the typical battery, and so charging points were not strictly necessary. However the tourism projects, in particular, saw the value of developing a network of cafes, hotels and visitor attractions actively offering re-charging of batteries. The incentive for the businesses was that they benefited from the central marketing, and potential sales of goods/activities whilst people waited to 'top-up' their batteries. The riders brought the charge cable with them if they were hiring for more than one day so the partners only needed to offer a socket. It is key that partners are fully briefed though as some areas found there are varying levels of customer service at charge points with staff at charge locations being unaware that they were advertised as an e-bike charging location and turned riders away. Ideally, the charge point network would involve a number of key attractions, who could offer discounts or incentives for visitors who arrive on an e-bike.



## 5. Future strategic development and recommendations

The Shared Electric Bike programme alongside other research has indicated there is a significant role for e-bikes in encouraging a new audience to cycle who previously didn't wish to or couldn't travel by conventional bike. This means that e-bikes have the ability to support new types of trips to be converted to cycling, and enable faster, hillier and longer journeys by e-bike. E-bikes have supported a transition from car trips and contributed to a range of social and environmental policy areas.



This section brings together the findings in two ways. Section 5.1 outlines strategic development for e-bikes that would lead to maximising their benefits. Section 5.2 extracts specific recommendations that would make the strategic developments happen.

### 5.1 Future strategic development

#### 5.1.1 The Importance of Sharing

Offering e-bikes in shared context has specific benefits compared to supporting private ownership alone for reasons of cost and convenience.

Half of riders in commuter settings said they are using the e-bikes at least once a month (39% once a week) and although 82% of regular riders have said they are more likely to buy only 12% have done so, so far indicating there is a role for bike share for on-going convenient cycle hire as well as “try before you buy”.

This report explores the value of shared e-bikes in supporting access to employment, education and social opportunities. One key aspect to fulfilling this ambition is ensuring access to the e-bikes is both affordable and easy to access.

In addition many journeys taken by the e-bikes were either travelling between multiple sites (such as the University of Oxford) or last mile trips from public transport (such as Eastbourne campus). In these situations it may not be possible or easy to use a personal bicycle so there is added convenience to placing bikes in shared pools to support multi modal travel.

#### 5.1.2 Placing E-bikes where People Work

The programme has indicated that there could be environmental and social benefits to supporting use of e-bikes for: commuting, last mile trips from transport interchanges and inter-site journeys. By providing access to e-bikes where people work, it is providing a healthy (without exertion), time efficient, congestion busting, low cost and convenient mobility tool.

Concentrating on commuting and business trips is a quick win for promoting and facilitating e-bike uptake.

**Last mile trips:** Facilitating partnerships between transport operators, businesses and local authorities to provide easy access shared e-bikes at transport interchanges as a last mile solution in areas with significant traffic between a transport hub and a business district is one way to maximise these benefits.

Staff travelling from **Eastbourne Rail Station** to University of Brighton Eastbourne campus can use e-bikes located in a shelter at the rail station for a convenient active commute or inter-site travel.

**Exeter** co-bikes enable travel from multiple railway stations; currently Central station plus St. Davids, Digby & Sowton and Marsh Barton to the business park. Facilities at the University of Exeter are to follow.

**Oxonbikes** offers docking station bikes at Oxford railway station and Thornhill Park-and-Ride for staff travelling to the two universities and John Radcliff hospital. This involves returning up a steep hill.

**Business and Inter-site trips:** Employers which have split sites or a need for regular work related trips, could offer a pool of shared e-bikes with easy rider access. This could be done in conjunction with a bike share operator particularly where there is a city wide scheme in place. At sites too small to warrant the investment of docking stations the testing of new smart lock options which enables pool bikes to be accessed via an app for convenient fast access could be investigated.

**Bristol City Council** social care team use a pool of e-bikes to travel to appointments in the community.

In Oxford Staff at **John Radcliff Hospital** travelling use the e-bikes from the docking station for fast and easy travel to the Churchill and Warneford Hospital.

**“Try before you buy” loans:** In workplace environments employers could provide e-bike fleets for short term personal trials by employees wishing to commute to work by bike and sign post them to the Cycle to Work Scheme or provide longer term leasing or loans.

**Leicester Wheels to Work** offers e-bikes for £10 a month to those trying to get to work, education or apprenticeship where there is no or limited public transport.

**Outspoken** in Cambridge is leasing bikes to local companies. *“The recent introduction of the e-bikes has also proved to be a welcome addition and are proving very popular with staff, we have a few employees who are seriously considering e-bikes as an alternative mode of commute to their cars, which is a success to say the least!”*

**Rotherham Journey Matters** uses a mobile hub to visit all local employers to supply staff with e-bikes on 1-3 month loans. Staff are then given vouchers and are sign posted to the Cycle to Work Scheme for tax efficient purchase of their own bike.

### 5.1.3 Placing E-bikes where People Live

Non-commuting trips starting from home often require cross-town or multiple stops, and tend to be carried out by car. E-bikes can often rival the car in these situations enabling time efficient, flexible journeys, with a range of additional advantages such as avoiding traffic queues and car-parking fees etc. For those not able to afford or wishing to have the expense of a car, a shared e-bike could be a good substitute.

The village of **Hook Norton in Oxfordshire** was provided with two e-bikes by Compass Bikes to complement the existing car club. Villagers used the bikes for utility and leisure trips and were pleased to see how it could be a tool to reduce their car use.

**New developments and social housing:** Where new housing is being provided it is an ideal opportunity to plan in the addition of e-bike pools or e-bike docking stations instead of extra car parking. Where there is a city bike share scheme this could involve supporting the addition of extra docking stations and/ or providing free memberships.

**Slough Borough Council** began by requesting that developers funded Slough Cycle Hire docking stations and memberships for all new sites but the response from residents has been so positive the developers are now voluntarily asking to add bikes all their schemes.

**Orwell Housing Association** in Ipswich, Lowestoft, and Felixstowe offered their staff and residents free usage of the Compass electric bikes for journeys including care workers attending appointments.

**Older People:** There is an opportunity to support the health and mobility needs of older generations by exploring the inclusion of e-bikes in accessible housing and retirement villages.

The **Cycle BOOM** project which researched cycling in older age reported that “the ageing body throws up new challenges for cycling but new and rapidly evolving cycling technologies have the potential to promote and prolong cycling among the older population and make cycling enjoyable. Power assisted cycles (‘e-bikes’) and other technological innovations should be developed, promoted and supported as part of the health and sustainable mobility agenda”

One recommendation suggests “implementing recently revised Building Regulations relating to accessible, adaptable dwellings based on the Lifetime Homes standard which could support cycle users as well as those using other mobility aids such as wheelchairs and mobility scooters, for example, by enabling convenient movement between the street and the dwelling”

[www.cycleboom.org.uk](http://www.cycleboom.org.uk).

**Rural areas:** In dispersed communities with less public transport there is an opportunity to explore the role of e-bikes and community sharing schemes to support rural communities with their accessibility needs. Access to an e-bike could be of particular benefit in rural areas with its ability to more closely mimic the car, allowing for: flexible journey times and routes, carrying loads, tackling hills and travelling longer distances.

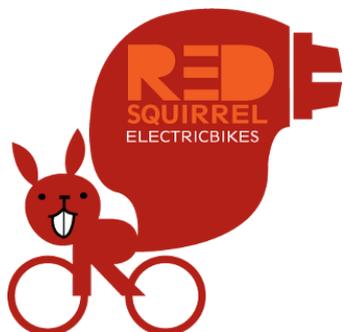
#### 5.1.4 Placing E-bikes Where People Visit

**Widespread availability:** E-bikes can provide an opportunity to encourage new people to enjoy the mental and physical benefits of cycling in the countryside. By developing partnerships with tourism bodies, local authorities, the National Parks, accommodation providers and e-bike manufacturers it would be possible to improve the availability and accessibility of e-bikes in areas ideal for leisure riding.

**Red Squirrel E-bikes** offer visitors arriving on the Isle of Wight by ferry immediate access to cycle hire (including e-bikes) and direct links to off road cycle paths suitable for all.

Plymouth Bike Hire offer e-bikes to explore both Dartmoor National Park and visitor destinations including Plymouth Hoe and Saltram Castle.

**Targeted marketing to attract new riders:** Good practice in marketing should be shared and strong partnerships encouraged to maximise potential to reach new cyclists.



Red Squirrel e-bikes created a strong brand, messages, joint marketing with Red Funnel Ferries and attractions.

**All ability cycling:** The addition of electric assist to adapted cycles there is the potential help people with more severe and complex needs enjoy the benefits of cycling. By sharing the work of PEDALL and working with local groups there is the opportunity to roll out of the programme to all regions through all ability cycling groups.

PEDALL had a positive response to providing adapted e-bikes for try-out sessions and independent hire in the New Forest <http://www.pedall.org.uk/>.

### 5.1.5 Using E-bikes for Delivery Services

**The use of cargo e-bikes for last mile delivery services in towns and cities:** In towns and cities there is already a move to reduce congestion and pollution by switching last mile deliveries to bike. The addition of e-bikes and cargo e-bikes to the fleet allows for more efficient trips of larger loads with less physical impact to the rider. Spreading best practise from the programme along with seed funding would allow operators and cities to accelerate development.

**Outspoken Delivery** has increased staff productivity and well-being by reducing staff fatigue, couriers are now able to work full time hours without the risk of burnout.

Delivery riders were 5.5% quicker doing the same run on the electric cargo bike.

### 5.1.6 Ongoing development of a robust evidence base

The results are drawn from the first year of data collection. Given that many of the projects were becoming established as well as the data collection methods being developed and tested, it has only provided a partial picture of the outcomes of the e-bike projects.

We know from the Carplus Annual Survey of car clubs that a robust evidence base of outcomes and impacts is of critical value in informing policy and development prioritisation, and for directing public and private investment. We cannot stress enough the imperative for impartial monitoring and evaluation to continue across the whole sector of e-bike and bike share wherever there is some form of public sector involvement.

We would advocate a rolling annual survey of outcomes which is linked to associated surveys (e.g. the car club survey, TfL's surveying of bike share, a National Travel Survey etc). Within the annual timeframe, there should also be the quarterly or monthly updating of the scale and distribution of bike share and e-bike availability as well as associated best practice advice.

## 5.2 Key recommendations

The key recommendations from the programme are:

### 5.2.1. Make e-bike (and pedal bike) availability the norm at rail stations, travel hubs and accommodation networks across the UK

This would mean that last-mile or first-mile journeys by e-bike would become a reality for commuting, business travel and in visitor areas. It would not only contribute to local congestion reduction and healthier travel, but would unlock the associated benefits of “capturing” the longer approach journeys from car to public transport.

This would require expansion and enhancement of initiatives such as Plusbike and the ATOC-led cycle-rail developments to include e-bikes, as well as new coordinated partnership development including hotel and other accommodation chains.

### 5.2.2. Bridge strategic development and delivery with the health sector around e-bikes

There are significant physical and mental health benefits of e-bike use, importantly reaching hard-to-reach sectors of the population. E-bikes work for preventative health as well as aiding recovery from illness.

New lines of communication need to be developed between with the Department for Transport and Department of Health to optimise the contribution of e-bikes to health through informed policy and funding prioritisation. Regional and local public health organisations need to be involved in the funding and delivery of e-bike provision locally.

### 5.2.3. Develop a strategic national programme of try-before-you-buy for e-bikes

Different models of try-before-you-buy are relevant to different contexts, but all have significant value in accelerating uptake in e-bike use.

The requirement at this stage is a bringing together and coordination of the relevant partners and the creation of an effective framework that ensures that the variety of try-before-you-buy models can be applied appropriately and fairly in different contexts.

A national scheme would be a partnership involving:

- Manufacturers (through the Bicycle Association);
- Government bodies (Department for Transport, Department for Business, Energy and Industrial strategy) – to provide the necessary top-down strategy and momentum
- Bike shop networks – to service the scheme;
- Cycling organisations and other rider-facing networks (such as for employers) – to provide the fine-grain rider-facing front for the schemes.

### 5.2.4. Open up funding from the OLEV (Office for Low Emission Vehicles) to include e-bikes alongside electric vehicles.

E-bikes should be seen as an important part of solution in the move towards the development of ultra-low emission transport. With many of the advantages of the car in-terms of flexibility and suitability to hilly and longer trips, e-bikes even more than ultra-low emission vehicles can offer a method to improve air quality and reduce carbon emissions. Offering e-bikes in shared

schemes provides access to a great number and offering them alongside shared electric car club vehicles would provide the extra benefits of cross fertilisation of membership demonstrated in other schemes.

### **5.2.5. Update the cycle-to-work scheme so that it encourages people to acquire (higher value) e-bikes**

This could be by increasing the value threshold above £1000 or allowing and promoting a “top up” above £1000 from the rider or employer.

We are aware that discussions are already taking place about this, but the evidence of outcomes and opportunities outlined here strengthen the case for making sure that the utility this already valuable facility is optimised to help deliver the added benefits that flow from e-bikes.

### **5.2.6. Evidence and further research**

The programme has demonstrated the role of robust evidence in informing delivery. We therefore recommend that the monitoring and evaluation that has been established during this programme is continued.

This has been designed to complement, extend and be compatible with associated travel behaviour surveys such as Carplus’s annual survey of car clubs and the TfL bike share surveys. We know from the experience in the car club sector that robust and commercially impartial evidence is of significant value for Local Authorities that are increasingly involved with bike share and e-bikes.

### **Two areas for further research have also emerged through this programme**

- In “closed community” residential accommodation (such new housing developments or student accommodation) our research has *indicated* potential for e-bikes to contribute to accessibility, especially to jobs and services locally for those on lower income. This is also supported by similar studies from overseas. More work would need to be done in the UK to better understand how to capture these benefits and the form of appropriate business models. The potential scale in these sectors is very large, hence the imperative for further research.
- Shared e-bikes contributing to accessibility in more rural areas. Several of the projects indicated the potential for shared e-bikes to work for local residents accessing services and opportunities – although these outcomes were not the focus for the projects. For instance, the leisure-focussed both Compass Bikes in Hook Norton and the Hebden Bridge We-Cycle project revealed examples of trips replacing car use and supplementing public transport for commuting, utility and social trips. In a climate of restricted rural transport services, it is valuable to gain a clearer understanding of the potential for e-bikes to increase accessibility and reduce car dependency.

## 6. Appendices

### 6.1 Project contact details

Project Name	Website	Project manager and email
Oxonbikes, Oxford	<a href="http://www.oxonbikes.co.uk">www.oxonbikes.co.uk</a>	Edward Wigzell - <a href="mailto:edward.wigzell@admin.ox.ac.uk">edward.wigzell@admin.ox.ac.uk</a>
Co-bikes, Exeter	<a href="http://www.co-bikes.co.uk">www.co-bikes.co.uk</a>	Mark Hodgson - <a href="mailto:mark@co-bikes.co.uk">mark@co-bikes.co.uk</a>
Co-wheels, Bristol	<a href="http://www.co-wheels.org.uk/ebikes">www.co-wheels.org.uk/ebikes</a>	Toby Collis' - <a href="mailto:toby.collis@co-wheels.org.uk">toby.collis@co-wheels.org.uk</a>
Eastbourne, University of Brighton	<a href="http://www.activecyclingprojects.com/app-bike">www.activecyclingprojects.com/app-bike</a>	Anne Mandy: <a href="mailto:am86@brighton.ac.uk">am86@brighton.ac.uk</a> –management passing to Simon White <a href="mailto:info@activecyclingprojects.com">info@activecyclingprojects.com</a>
Journey Matters, Rotherham	<a href="http://www.journeymatters.co.uk">www.journeymatters.co.uk</a>	Andrew Shearer - <a href="mailto:Andrew.Shearer@rotherham.gov.uk">Andrew.Shearer@rotherham.gov.uk</a>
Compass Bikes, SE England	<a href="http://www.sustainableventures.co.uk">www.sustainableventures.co.uk</a>	Anna Mitchell - <a href="mailto:anna.mitchell@sustainableventures.co.uk">anna.mitchell@sustainableventures.co.uk</a>
Red Squirrel Bikes, Isle of Wight	<a href="http://www.nutsnotto.co.uk">www.nutsnotto.co.uk</a>	Zoe Stroud - <a href="mailto:zoe@visitwight.org">zoe@visitwight.org</a>
Plymouth Bike Hire	<a href="http://www.plymouthbikehire.co.uk">www.plymouthbikehire.co.uk</a>	Andrew Thompson - <a href="mailto:plymouthbikehire@gmail.com">plymouthbikehire@gmail.com</a>
We:Cycle, Hebden Bridge	<a href="http://www.wecycle.org.uk">www.wecycle.org.uk</a>	Polly Webber - <a href="mailto:polly@alternativetechnology.org.uk">polly@alternativetechnology.org.uk</a>
Outspoken Delivery, Cambridge, Norwich	<a href="http://www.outspokencycles.co.uk">www.outspokencycles.co.uk</a>	Gary Armstrong <a href="mailto:team@outspokencycles.co.uk">team@outspokencycles.co.uk</a>
PEDALL, New Forest	<a href="http://www.pedall.org.uk">www.pedall.org.uk</a>	Andy Brennan – <a href="mailto:info@pedall.org.uk">info@pedall.org.uk</a>

## 6.2 Partners and Technical team

The project was developed with support from a high level steering group which comprised of:

Sharon Goodsell, Department for Transport

Philip Darnton, Bicycle Association

Conrad Haigh, Rail Delivery Group

Steve Garadis, Bicycle Association

The project employed a team of specialists to support the appraisal process of bids, procurement of e-bikes, survey and operational experience sharing events:

Matthew Clark, Associate, Steer Davies Gleave

Ian Bewick, Principal Consultant, Steer Davies Gleave

Isobel Stoddart, Freelance Sustainable Transport Consultant

Paul Robison, Electric Travel CIC

Peter Eland, Technical Manager, Bicycle Association

Pete Zanzottera, Sustainable Travel Consultant

## 6.3 GPS monitoring details

The e-bikes were fitted with GPS units, this provided distance, altitude and route data.

In Oxford a control sample of 16 conventional bikes was used to compare how riders trip patterns were different to e-bikes. The data sample was 91 standard OXONBIKE trips and 135 on e-bikes.

The data was filtered with a time/date and GPS unit to extract the 'official' trips from the anonymised booking data (see figure 34), this ensured that redistribution trips didn't distort the output.

The total figures is the recorded output, this is smaller than actual figure accounting for times when the GPS units weren't recharged, but provides a guide to the distance travelled and significantly provides insight in to average trip length.

ID	From	To	Distance(miles)	Elevation gain(meters)
C048	01-09-2016 16:42	01-09-2016 17:00	0.29	0.3

Figure 32: GPS data output example

ID	Customer ID	Bike ID	Bike DB ID	Bike type	Rental location	Rental time	Return location	Return time	Duration	Mship
95084	3428	C048	65	e-bike	05 Old Road Campus	12/10/2016 17:56	03 London Road	12/10/2016 18:01	00:05:19	e-bike annual

Figure 33: Booking data example

## 6.4 Journey and booking data for projects from launch to end of October 2016

Project & Prices***	Funding received	Members/riders	Hires/Journeys	Avehire period (hours)**	Distance travelled (miles)*	Ave trip length* (miles)	Electric bikes
<b>Oxonbike, Oxford</b> £2/day (30mins trips)	£54,000	1709	366**	0:35	414	3	22
<b>Compass Bikes</b> FOC	£46,000	126	523**	3	1187	2.1	18
<b>Red Squirrel Bikes, Isle of Wight</b> £30-35/day	£70,000	120	120**	6	2032	5.9	20
<b>Eastbourne, University of Brighton</b> £20 registration /FOC	£36,000	25	407*	-	586	1.7	20
<b>Plymouth Bike Hire</b> £20/day	£25,000	79	79**	5	677	6.5	20
<b>Rotherham</b> Journey matters FOC	£40,000	230	9008*	0:26	19,395	4	30
<b>New Forest PEDALL</b> (Membership)	£17,000	90	90**	2	-	2.9	3
<b>Exeter Co-Bikes</b> (£1.50/30mins)	£65,000	162	66	0:55	291	-	23
<b>Hebden Bridge</b> (£3/hour)	£40,000	20	102*	3	350	3.4	13
<b>Outspoken Cycles, Cambridge</b> (£20/day)	£38,000	24	24**	1 month loan	199	-	7
<b>Bristol Co-wheels</b> FOC	£37,500	82	917*	-	2,300	2.5	10
<b>Total:</b>	<b>£468,500</b>	<b>2667</b>	<b>11,702</b>	<b>-</b>	<b>27,431</b>	<b>-</b>	<b>188</b>

Figure 34: Full project data

\*Recorded from GPS data

**\*\*Recorded from booking data**

**\*\*\*Prices and hire rates are not directly comparable due to very different nature of the projects and different start dates.**

Where there is no booking filter, the GPS trip data has been defined by journeys lasting longer than 3 minutes and a new trip is defined by 30 minutes dormant.

All the data during transport is removed from the calculations. Journeys with speeds above 35mph for over a minute are also filtered out.

## 6.5 References

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Cycle Boom Research: Jones, T., Chatterjee, K., Spinney, J., Street, E., Van Reekum, C., Spencer, B., Jones, H., Leyland, L.A., Mann, C., Williams, S. & Beale, N. (2016). Cycle BOOM. Design for Lifelong Health and Wellbeing. Summary of Key Findings and Recommendations. Oxford Brookes University, UK.  
[http://www.cycleboom.org/wp-content/uploads/2016/09/cB\\_Summary\\_Report\\_Sept2016\\_Digital.pdf](http://www.cycleboom.org/wp-content/uploads/2016/09/cB_Summary_Report_Sept2016_Digital.pdf)

National Travel Survey 2015: The outcomes have been compared to the 2015 National Travel Survey and 2011 Census to indicate how shared electric bike usage differs to trends for personal bike usage.

DfT webTAG guidance. <https://www.gov.uk/guidance/transport-analysis-guidance-webtag>

UK Bike Share Riders Survey 2016: The recently published UK Bike Share Riders Survey has been compared to inform the difference between conventional and electric bike riders in a shared context.

Smart E-bike research: Behrednt, F., Cairns, S., Raffo, D. 2014. Smart E-Bike Research. University of Brighton, UK.

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