

CYCLING SCOTLAND

AFFORDABLE ACCESS TO BIKES: RE-USE & CIRCULAR BUSINESS MODELS



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EXECUTIVE SUMMARY

Overview

This report has sought to identify bike re-use and circular business models across Europe and Scotland, through desk-based work and stakeholder engagement. This work describes best practice at the moment and the potential for growth as well as more sustainable opportunities in the future. Affordability and the role of social enterprises, the supply chain and Original Equipment Manufacturers (OEM) are an important part of this.

A wide range of whole bike, component re-use and circular business models are well established now in Scotland, as they are in many other parts of Europe. The sector in Scotland is comparable in many ways in terms of the type of activities and services being offered, with many countries that may traditionally have been considered to be further ahead e.g. the Netherlands, Belgium etc. A key difference is the number of bikes and accessibility/proximity to second-hand bike businesses.

Engagement took place (one to one conversations) with 40 organisations across Europe (including Scotland) to discuss different business/operating models, costs, prices, training, spare parts, the importance of public funding, and a wide range of opportunities and challenges. The stakeholders engaged in this project identified the importance of social enterprises in delivering bike re-use, leasing/subscription and bike sharing projects, as well as being valuable providers of social benefits by employing people who otherwise may find challenges getting into employment. They are also important providers of training for both staff, volunteers and, generally, members of the public. In doing so they are building human capital and fostering a culture that increasingly views bikes as being an important means of both transport and recreation.

Manufacturing and the Supply Chain

An aspect of the bike sector, where Scotland is underperforming, compared to many other European countries, is in bikes/parts manufactured. Although there is limited data, we estimate that if Scotland had the same ratio of jobs in bike and/or component manufacturing per capita as the EU or Portugal, there would be 630 or 3,559 manufacturing jobs respectively. The number of actual jobs is likely to be less than 100.

This places Scotland at a disadvantage when trying to access increasingly stretched global supply chains for spare parts and may impact on the ability of the sector to support high growth circular business models such as long-term leasing, where having access to stocks of commonly used spares is important for keeping bikes on the road, as well as for resale at the end of the leasing period.

Engagement with Scottish OEMs (small-scale and/or start-ups) has identified a number that have plans for bike assembly, or the assembly of high value components, providing an opportunity for growth and job creation. Discussions with these businesses have identified collaborative opportunities where the assembly of new whole bikes or components can be delivered in a way which supports re-use, circular business models and the provision of job opportunities.

Funding and Viability

The international experience is that reuse organisations have a wide-ranging social purpose supported by grant funding. The predominant social purpose is providing work experience and employment for those challenged in finding work. The difference between these organisations and Scotland is that funding is more secure and long-term.

There were more examples internationally of bike reuse being part of larger organisation structures such as large repair shops and linked to municipal waste collection systems. This provides economies of scale that assist in making the bike re-use aspect of operations more viable, at the same time providing flexibility in terms of how staff and resources are deployed.

Commercially viable businesses in Scotland involved in re-use focus on higher value bikes and components, or in the case of social enterprises, re-use bike projects form part of a wider operation involving other items/material streams (with the associated economies of scale).

The Third Sector organisations working on bike re-use, as currently structured, are likely to continue to need some form of grant support to continue to provide their existing services.

There is currently a heavy reliance on the bike re-use social enterprise sector to provide affordable access to bikes. The challenge for this sector is the low margins associated with low value bikes (and components) that many of these organisations deal with, making a commercially viable operation based on their resale a difficult proposition. The viability of social enterprises focussed specifically on bike re-use could therefore be improved with access to more, better quality bikes.

Company leasing is a significant, new and growing opportunity. Maintaining leased bikes, managing them in a circular way at the end of their lease is a way of making them last, with the potential for sales income after the leasing period. This could make enterprises more sustainable and, through volume leasing, provide significant income streams.

Collaboration and the development of networks has been identified as a driver of change, awareness raising and capacity building. Understanding how networks have effectively worked in other areas is important, and a significant example is that of Sustainable Food Places, which works across procurement and other areas. A sustainable cycling charter/framework (including access to affordable bikes) that learns from this, for local authorities and other organisations to sign up to, could be an important driver.

Managing Resources More Effectively and Reducing Waste

The Third Sector provides an important social purpose in the provision of affordable travel, but also in the re-use of bikes and components that would otherwise be recycled for scrap value or go to landfill. A potential challenge in the future for organisations collecting bikes concerns the quality of those uplifted from Household Waste Recycling Centres (HWRCs). If higher value bikes are targeted, then to avoid landfill disposal of the remaining bikes, systems need to be in place that ensure that those not uplifted are taken to the appropriate scrap metal containers, where they can then be recovered for scrap value and used in recycling markets.

Company leasing schemes have the potential to rationalise the use of resources (avoiding waste), with a narrower range of bikes, more common parts, more consistent operating procedures, easier maintenance.

In terms of e-bike batteries, one company based in England is establishing a network across parts of Scotland for their collection. Added value is likely to take place at this company's operations in terms of shredding, with metal recovery then taking place at smelters in continental Europe such as Umicore. No Scottish-based added value opportunities have been identified in this respect.

Extended Producer Responsibility regulations in France are now being considered to as a potential behaviour change mechanism. It is understood that the Clearing House (the organisation managing the system and payments) will pay the organisations that participate a fee of 1.50 Euros per bike, but the traceability/reporting requirements may involve too much administrative bureaucracy and prove to be a disincentive to the smaller co-ops (in terms of participation). In Scotland the Revolve¹ certification scheme exists for re-use businesses. The potential for other, national re-use schemes (other than a subsidy for children's bikes etc) have not been identified during this project.

This report has highlighted research that suggests significant numbers of bikes are being hoarded. Better information for householders on where to take them and that they will be reused may bring more of these bikes into circulation.

Spare Parts

The international supply chain issues for new bike parts are a challenge for many organisations, however, the majority of the re-use organisations in Scotland engaged with are managing to continue selling second-hand bikes by using the stocks of components they have built up over the years. There are some limitations in this respect, with a number of businesses either wanting to use only new parts, or for particular items, most organisations will only want to use new (e.g. chains).

Many bike businesses/organisations engaged with are interested in growing their operations, with bike disassembly for spare parts being viewed as both a lucrative one, as well as an approach to mitigate against the supply chain challenges. However, the availability, at an affordable cost level, of trained staff able to take bikes apart for components and/or rebuild them when required is a challenge. In Belgium, the example a social enterprise gave, when faced with this problem, was an innovative collaboration with a local prison. With 1,400 bikes soon to be collected from a business leasing service provided to one multi-national company, the organisation does not have the staff to disassemble such a volume, received in what will be a short period of time. With prison inmates doing the disassembly the problem is mitigated, and the organisation in turn will be able to access and use spare parts that it is currently finding difficult/impossible to source from overseas, in the short-term.

A key opportunity for many Scottish businesses is the development of a recovered spares model, where these are sold with a warranty e.g. by the company recovering and selling the parts. This is something which is happening already, but it is also one where there would appear to be significant room for growth. In terms of e-bikes, three key parts are the big opportunity – the motor, battery and electronic display and

¹ <https://www.zerowastescotland.org.uk/revolve>

the provision of a battery cell replacement service in Scotland. Servicing/fitting the parts could be delivered through a mobile service.

Training

Discussions with stakeholders in different European countries has identified a mixed bag of training opportunities. As in Scotland, there are different types of training packages and audiences, for example organisations provide training to communities (adults, children/schools, businesses), sometimes on a charged basis. However, when referring to training here this concerns the development of skills (capacity building) with employees, trainees and volunteers. In the Netherlands there are regional vocational training centres that provide national qualifications involving bike mechanic skills, but which also go beyond this, to provide a more holistic bike business training opportunity. Bike businesses also provide training directly, using a combination of certified training schemes and/or on the job training. In Belgium and France, the stakeholders engaged with commented that training was typically delivered on the job, and this was the case whether it was delivered in a social enterprise, or a large OEM such as Decathlon.

Approaches across Europe vary from regional vocational training centres that provide national qualifications involving bike mechanic skills (as well as more holistic business skills), for training schemes and/or on the job training. There is no single/dominant view on how training within the sector in Scotland could be improved. The stakeholders who felt improvements could be made to the current set-up suggested that the development of modern apprenticeship scheme and or more holistic training would add value. That these could positively promote the sector as being one where people could create a career for themselves. Dumfries and Galloway college are starting a course in Autumn 2021 which could be looked to for a potential future model.

Affordability

Social enterprises internationally and in Scotland are providing bikes as part of their social purpose (providing training and employability opportunities), but also to offer bikes at affordable levels. An increasingly popular movement in Belgium is the provision of bike libraries, where children and adults are provided with bikes for an annual lease, based on circa £1.00 to £1.40 per month.

In the Netherlands the Children's Bicycle Plan is based on the belief that "every child has the right to a bicycle in order to participate in society". The plan involves members of the ANWB (the Dutch Royal Touring Club) who collect bicycles and then collaborate with existing bicycle repair shops around the country to refurbish the bicycles. A number of opportunities have been identified from this, and one of the key ones is that:

"... refurbished bicycles do not necessarily need to be given away, but rather lent out on a long-term basis. Doing so creates a circular system that helps prevent bicycle shortages."

Where affordability is a challenge in Scotland, indicative costs have been estimated in this report to suggest the potential scale of government support, to allow free bikes to be provided for children, as well as discounted costs for adults. It is estimated that this level of support could cost around £200 per bike.

Affordability of cycling is a significant social issue in Scotland indicated by the number of social enterprises for which this is their primary purpose. Furthermore, the SNP and now Scottish Government, pledged in its 2021 manifesto to provide free bikes to children who cannot afford them. Our study (see Section 9) has discussed how a circular business model based on leasing could potentially deliver more affordable bikes as well as delivering a circular economy business model.

The costs of this scheme would be around £200 per bike, but the social return on investment shows that it is likely this can be justified in particular when considering the supply chain benefits, user and societal benefits (see Section 9).

Standard model bike-sharing (not long-term leasing) schemes as developed in Europe and increasingly in Scotland do not offer an affordable alternative (except in limited, small-scale settings such as Bikes for All, although to date it has not necessarily been the intention of the scheme operators to do so.

Aberdeen City Council has selected Sharebike and the Big Issue as joint operators of its bike-share scheme, the extent to which affordability is a key factor in the design of this scheme is not known by the authors, but it is one that could be further investigated.

COVID-19

COVID-19 does not appear to have had long-term negative impacts on most of the Scottish organisations engaged, however there are a number of challenges with some engaged, which has seen the furlough of staff for example continue up to the present. An example of a significant impact of COVID-19, which is not

yet seeing a considerable improvement is with one large bike sharing scheme in Belgium, where the concerns about transmission of the disease have driven many people to want to own their own bikes rather than use shared bikes. It was commented that this had resulted in the scheme, which previously had very high utilisation levels, being operated at around 50% of its capacity. This has resulted in the social enterprise having to reduce its staff levels in line with the change in demand.

The Scale of the Growth Potential

The engagement with 16 Scottish organisations has identified opportunities for growth in employment and in bikes/components recovered, as well as in fostering more circular business models, the latter including subscription schemes.

The potential for an additional 50 jobs in bike/component recovery and around 100 in a large subscription service were identified and these could in turn contribute to a further 35 and 70 jobs respectively (indirect and induced jobs).

Many Scottish bike businesses have ambitions to grow their operations, for example, between 50% and 100% in terms of the numbers of bikes repaired and resold, as well as providing more focus on the recovery of components for resale, with a warranty and providing services through mobile mechanics. An added benefit of the latter is that this could also complement a future roadside service which provides cyclists with confidence to get out and use bikes. The limitations for some, in terms of realising this growth, relate to storage and processing space, and the costs associated with this. Added to this are challenges in terms of the availability, at an affordable cost level, of trained staff e.g. able to take bikes apart for components and/or rebuild them where required, etc.

Many businesses/organisations are also interested in growth which is based on a diversity of developments, including the potential to provide a service through healthcare providers and other referral organisations. Social enterprises in particular are well-positioned to provide benefits in this respect, which in turn can also generate a sustainable income stream. This is very much the model used by social enterprises in countries such as the Netherlands and Belgium.

Social Return on Investment (SROI)

There are many social returns on investment in circular bike models involving re-use, and access for all is possible. Countries such as France, Belgium and the Netherlands are taking forward circular business models to support accessibility and affordability, with a special focus on children, with different leasing schemes (including bike libraries) being developed to provide free and/or heavily subsidised bikes. These managed subscription/leasing services assist in delivering quality, avoid waste and encourage utilisation of the bikes in the schemes.

The potential for providing free bikes for children in Scotland, where there are affordability challenges, has been considered, along with the potential for heavily discounted adult bikes. The potential costs of providing second-hand bikes for this purpose has been estimated at circa £200 per bike, resulting in what could be considered a relatively high cost per direct beneficiary (£200). However, spread across all bike users in an equitable system this can be seen to be very much lower e.g. £20 per whole-system user if 10% of the population are faced with the affordability challenge. For a children's scheme, involving 10,000 and 100,000 bikes, the cost of the subsidy would be between £2 million and £20 million per year with a range of social benefits in terms of health and well-being being supported.

Conclusions and Recommendations

Theme	Conclusion	Recommendation
Funding and Viability	<ul style="list-style-type: none"> Research finds that international reuse social enterprises have wide-ranging social purposes supported by grant funding. Internationally, a predominant social purpose is to provide experience, training and employment for those challenged in finding work. A key difference between a number of international organisations and Scotland is that funding for the former is more secure and longer-term. Internationally and Scotland, a significant challenge for a number of social enterprises is the low margins associated with the low-quality bikes and components that make a commercially viable return and business operation difficult. In Scotland, formal collaborations involving a charter/framework for organisations to sign up to, in terms of shared goals (e.g., bike accessibility) could be an effective driver of change. 	<ul style="list-style-type: none"> More work is required to understand: <ul style="list-style-type: none"> How the viability of third sector organisations can be improved in terms of providing bike-re-use services, and How subsidies/support funding, if appropriate, can be targeted in the longer term to achieve the delivery of affordable bikes, training and managing resources effectively Secure data on the levels of bikes sales (new and second-hand) in Scotland - to aid understanding on how and where to focus future support. Carry out work to understand the value of a charter/framework for local authorities, the private, not for profit, voluntary sectors etc to sign up – for delivering change.
Managing Resources More Effectively and Reducing Waste	<ul style="list-style-type: none"> Research suggests significant numbers of bikes are being hoarded. Leasing schemes have the potential to offer a more rationalised range of bikes, with greater parts availability and efficiencies – therefore less waste, lower costs of access using high quality second-hand bikes. Better information to householders on reuse pathways may bring more bikes into circulation. Stolen bikes collected by police authorities in Scotland - re-use and sales generation where return to owners is not possible. Extended Producer Responsibility regulations in France are now being considered as a potential behaviour change mechanism. 	<ul style="list-style-type: none"> Awareness raising is required for householders on where to take their old bikes so that they can be reused and stay in circulation e.g. through repair, refurbishment from existing/future bike shops. This could be an important role for an organisation like Zero Waste Scotland which has specific remits to communicate to consumers opportunities for more circular behaviour. Explore opportunities to deliver more bike maintenance training - to encourage long-term use and to discourage people from giving up their bikes in the future. Improve systems at HWRCs to ensure bikes not uplifted for re-use are taken to the appropriate scrap metal containers, to be recovered for scrap value and used in recycling markets. Encourage public organisations to play a useful role, supporting the development of company leasing schemes, running pilots and initiating access schemes. Further work should be carried out to ensure that stolen/abandoned bikes are donated, e.g. from police authorities across the country, to bike enterprises for re-use. Further work should be taken forward to identify how Scottish businesses can generate maximum value from second-hand e-bike batteries in the future. More work is required to consider how potential Extended Producer Responsibility regulations could drive a more efficient bike re-use market in Scotland.

Training	<ul style="list-style-type: none"> Approaches across Europe vary from regional vocational training centres that provide national qualifications involving bike mechanic skills (as well as more holistic business skills), for training schemes and/or on the job training. There is no single/dominant view on how training within the sector in Scotland could be improved. Stakeholders noting improvements could be made to the current set-up suggested that the development of modern apprenticeship scheme and or more holistic training would add value. 	<ul style="list-style-type: none"> Understand potential support to develop apprenticeships similar to Dutch regional vocational training centres across Scotland. Existing initiatives for developing modern apprenticeships across Scotland should be explored identifying interest across colleges more widely. Where this interest is confirmed, those organisations currently involved could be invited to join a project team that works with other colleges, on the creation of a template that could be rolled out more widely. The potential of organisations such as CRNs, and initiatives such as Zero Waste Scotland's Revolve programme to support further developments in training should be considered.
Spare Parts	<ul style="list-style-type: none"> International supply chain issues for new bike parts are a challenge for many organisations. Majority of re-use organisations in Scotland contacted continue selling second-hand bikes by using existing/legacy stocks of components. Majority of bike businesses/organisations contacted are interested in growth, with bike disassembly for spare parts being viewed as both lucrative and mitigating against current supply chain challenges. Availability, at an affordable cost level, of trained staff able to take bikes apart for components and/or rebuild them when required is a challenge An area with significant room for growth is the development of a recovered spares model, where these are sold with a warranty. In terms of e-bikes, three key parts are the big opportunity – the motor, battery and electronic display and the provision of a battery cell replacement service in Scotland. 	<ul style="list-style-type: none"> Further work could be carried out to understand how to support the growth of whole bike assembly businesses in Scotland that in turn create a more rational supply chain for spare parts; and Opportunities should be considered by support/funding organisations to understand how the provision of a battery cell replacement service could be developed and delivered - to maximise benefits to businesses in Scotland and taking into account recent research in this area e.g. as undertaken by Zero Waste Scotland.
Delivering Affordable Options	<ul style="list-style-type: none"> Affordability of cycling is a significant social issue in Scotland indicated by the number of social enterprises for which this is their primary purpose. Report finds that a circular business model based on leasing may deliver more affordable bikes as well as meeting circular economy objectives. Report contains detail on potential opportunities and implications with respect to providing affordable bikes for adults as well as free bikes for children. 	<ul style="list-style-type: none"> Further work required to develop a cost model associated with a subsidised system that makes bikes available free of charge to children where there are affordability issues, and at a discounted level for adults - to include leasing as this supports circular economy objectives.

Supporting Growth	<ul style="list-style-type: none"> Engagement with 16 Scottish organisations has identified opportunities for growth in: <ul style="list-style-type: none"> Employment; Bikes/components recovered; Fostering more circular business models (including subscription schemes). Report finds potential for an additional 50 jobs in bike/component recovery and around 100 in a large subscription service were identified and these could in turn contribute to a further 35 and 70 jobs respectively (indirect and induced jobs). Limitations for some, in terms of realising growth, relate to storage and processing space, as well as associated costs. Challenges exist in terms of the availability, at an affordable cost level, of trained mechanics to take bikes apart for components and/or rebuild them where required. 	<ul style="list-style-type: none"> Economic development agencies should consider the potential to support businesses to develop circular business models, increasing the number of people buying and leasing bikes. The potential to create a “national network” of places where people can drop off their bikes for reuse should be explored, to include HWRCs with separate containers provided. Further engagement with the sector to look at how better collaboration could help to open up wider opportunities for third sector organisations to support each other including options such as shared space for storage, selling etc. Organisations such as Zero Waste Scotland (e.g. comms teams) and CRNS to develop case studies, including podcasts, videos etc of successful bike reuse models to encourage more similar schemes in Scotland.
Company Leasing Schemes	<ul style="list-style-type: none"> In countries such as Belgium, people get the opportunity to use a bike in a leasing formula with their company as well as getting a fee/km they cycle to work, to cover the maintenance cost of the bike 	<ul style="list-style-type: none"> The Scottish Government (Transport Scotland) to consider supporting company leasing schemes in Scotland through support to businesses.
Collaboration	<ul style="list-style-type: none"> Membership organisations for small bike shops involved in re-use, repair, training etc, such as L’Heureux Cyclage in France provide a collaborative and engaging support opportunity Local authority HWRCs can be an important source of bikes for re-use, as well as providing challenges to some organisations in terms of the quality of bikes collected. However, the availability of bikes from HWRCs is not consistent across the country. 	<ul style="list-style-type: none"> Understand more about collaborative, co-operative membership models such as L’Heureux Cyclage in France – with the aim of developing a Scottish bike re-use co-operative organisation. There would be value in an organisation such as Zero Waste Scotland carrying out work to identify how many HWRCs have specific bike donation containers and to understand what potential there is for improved practices – to enable local social enterprises and other businesses to work collaboratively with local authorities to extract maximum re-use value from unwanted bikes. Investigate the potential of the Zero Waste Scotland local authority recycling fund (£70m) to support future collaborations of local authorities, social enterprises or other business to work together to extract maximum re-use value from unwanted bikes.

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1.0 INTRODUCTION

1.1 Background and Aims of the Project

Scotland has over 200 schemes which aim to provide community access to bikes through provision of bike share schemes, libraries, or through provision of affordable products for consumers, particularly those in low-income brackets, by offering bike recycling and re-use programmes.

In 2020 Cycling Scotland commissioned work which is available in the “Access to Bikes²” report, with the following recommendations:

- Financial security is needed when running an access to bike scheme, to ensure that these can continue and, where necessary, expand;
- Clear objectives are required for access to bike schemes;
- Data on bike recycling and re-use needs to be collected (to inform how this needs to develop); and
- Access to bikes needs to increase, for people who are self-employed, low paid or not working and for children. Storage should also be taken into account.

Building on these recommendations, the aims of this project are to:

- Consider how to develop affordable access to bikes;
- Consider the skills and employability opportunities associated with manufacturing, retail and recycling industries; and
- Describe the existing national, regional, city and local landscape for bike and componentry recycling activity and provides data to ensure that future options are set out robustly – to drive a sustainable increase in affordable access to bikes across Scotland.

The above aims are timely, with the Scottish Government, in its 2021 manifesto, stating:

“To encourage our youngest citizens, we will provide free bikes for all children of school age who cannot afford them and ensure every child in Scotland leaves school with the ability to cycle safely. To make owning a bike an option for everyone, and reduce transport poverty, we will make loans and grants available for the purchase of pedal cycles and for their repair.”

The specific objectives of this project were therefore:

- To document which repair, re-use and/or recycling services are available now, and could be in the near to medium future;
- Describe the potential role of new bikes/spare parts manufacturers/supply chain in building capacity;
- Describe potential outline business models that could deliver future growth in affordable cycles and the suitability of different levels of investment.
- Consider potential income streams as well as costs – if appropriate an indicative cost benefit analysis (CBA) approach may be employed; and
- Provide examples of potential SROI outcomes for refurbishment supply chain development e.g. in terms of direct and indirect jobs and turnover/profitability.

A focus of the work involves consideration of how important it is for community bike business networks to be maintained and to describe means for further collaboration with social enterprises and other community-based organisations directly serving community needs – a priority of this involves identifying options on how to stimulate engagement with all of the other wellbeing and low carbon schemes which are on offer (and for this to be sustainable over the long term). Because cycling, bike use and ideas about accessibility are evolving rapidly, this report should be read as being representative of the situation in September 2021, and it is anticipated that the picture could look quite different in the very near future.

1.2 The Methodology

The methodology involved delivering the tasks summarised below:

- Understanding the International Perspective - carry out desk-based research on the current European/international bike re-use landscape and identify organisations delivering good practice for engagement;
- Describing the Scottish Perspective: carry out desk-based research on the current bike re-use landscape, and identify Scottish organisations for engagement;
- Stakeholder engagement - prepare questions (see Appendix A) for different stakeholder groupings, the latter being:

²Cycling Scotland, source: <https://www.cycling.scot/news-and-blog/article/bike-schemes-growing-but-gaps-in-access-remain>

- Strategic organisations;
- Re-use businesses in Scotland;
- Re-use business in the rest of Europe;
- Whole-bike, component manufacturers and retailers;
- Stakeholder engagement – carry out one-to-one interviews (face-to-face using MS Teams, Zoom);
- Analysis of interview data;
- Investment analysis and outline cost benefit analysis (CBA); and
- Social Return On Investment (SROI) Analysis

2.0 BACKGROUND TO THE BIKE SECTOR

2.1 Overview

In the 2018 Cycling Scotland report, “The Value of Cycling to the Scottish Economy” it was estimated that around 900 people were employed in bike manufacturing in the UK, and that in Scotland specifically:

“... although there are no major bike producers there are small, niche manufacturers of bikes and accessories who are creating specialist, high value products, including custom made and bespoke bikes.”

Data is available from Cycling UK³ on the number of new bikes manufactured and bought at a UK level (not shown separately for Scotland). Cycling UK emphasise that making estimates is not a straightforward process - the source that has been used is the Confederation of the European Bicycle Industry (CONEBI).

The data available for new bikes is summarised in the table below, with an estimate made by the authors of this report for sales in Scotland on a per capita basis (8.2% of the UK population).

Table 1. Data on bike sales and manufacturing.

	2019	2018	2015	2006	2005
UK manufacture - standard + e-bikes	137,000	117,000			135,000
UK total bikes sales - standard + e-bikes	2,613,000			3,920,000	
<i>Standard bike sales</i>	2,512,000				
<i>e-bike sales</i>	101,000		40,000		
Scottish sales - on per capita basis	213,666			320,540	
<i>Standard bikes sales</i>	205,407				
<i>e-bike sales</i>	8,259		3,271		

Other data related to prices and sources of bike parts are provided by the sources above:

- The 2019 average price of a cycle in the UK was around 300 Euros (£263 based on an exchange rate of 1.14 Euros to 1.00 Pounds Sterling);
- The UK produces about 1.72% of European bicycle parts and accessories. Italy is the biggest producer at over a quarter.

The information above is significant to this research project because it not only provides indicative information on demand, but also gives an idea of the extent to which re-using bikes and parts, using different models, have the potential to offer more affordable and sustainably supply chain opportunities.

It should be noted that no data for second-hand bike sales has been found for Scotland or the UK.

³ <https://www.cyclinguk.org/statistics>

2.2 Employment in Manufacturing

Figure 1 shows the distribution of jobs across Europe in 2019 (from the EU Mobility Atlas 2021 report) across the whole bike and component manufacturing sectors. This report indicates that in the period 2016 to 2025 the number of jobs in the sector, in Europe, will more than double (growth of 232%). The report states that:

"About 60 percent of the bicycles and Electrically Power Assisted Cycles (EPAC) sold in the EU are also produced here. In 2019 there were more than 60,000 direct jobs in the European bicycle industry."

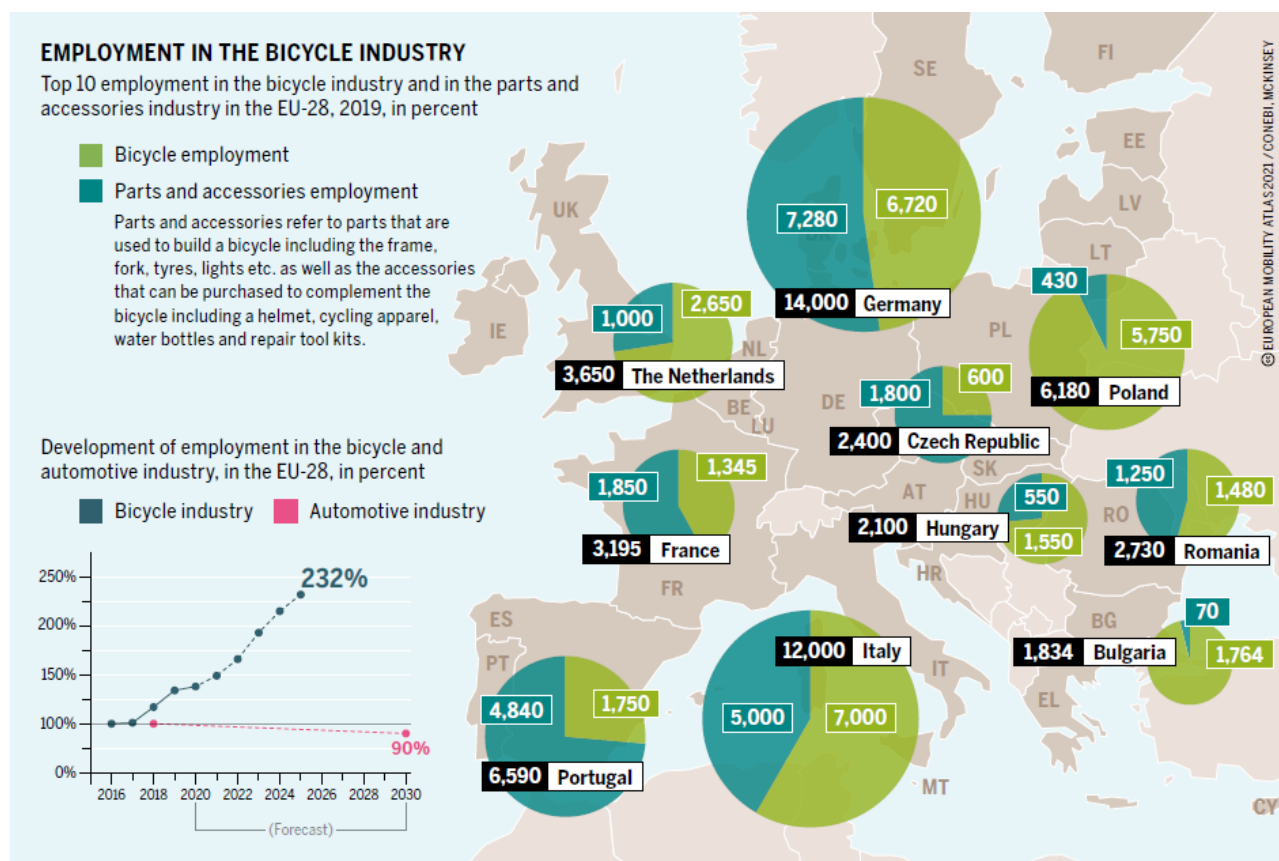


Figure 1. Extract from the EU Mobility Atlas 2021 report showing the top 10 employment areas for the bike industry in Europe.

On a per capita basis, the above means that in 2019 there was just over one direct job (1.2) per 10,000 people across the EU employed in the new bike manufacturing sector (whole bikes and components). If Scotland had the same level of employment this would translate to 630 jobs, or if it had a similar ratio to Portugal (6.6) 3,559 jobs. The actual number of jobs in Scotland associated with bike manufacturing is understood to be significantly smaller than either of these, with companies like Shand, for example, employing less than 10 people⁴. It seems reasonable to assume that the number of employees in the country working in new bike manufacturing is less than 100 (the ratio of jobs per 10,000 population would therefore be a maximum of 0.2).

Although this research project is focussed on re-use and circular business models (making things last), the above is significant because supply chains, the skills base, and opportunities for collaboration mean that developments in the new bike sector have important influences on the second-hand sector.

2.3 Second-hand/Re-used Bike Sector in Scotland

Although there is limited data on the scale of the second-hand bike market, the view of one OEM from discussions in the course of this project indicated that the second-hand bike market could be as large as the new bike market, in the way that this has developed with the automobile industry. Research published by the Bike Club in 2021⁵ estimated that there could be over 38 million unused bikes in the UK (including 12.5

⁴ <https://singletrackworld.com/2016/12/a-look-inside-shand-cycles/>

⁵ <https://www.bikebiz.com/the-bike-club-adds-new-bikes-to-stock-as-it-gears-up-for-summer-of-cycling/>

million unused children's bikes). Again, on a per capita basis, this could translate to 3.1 million unused bikes in Scotland (including 1.0 million children's bikes).

A wide range of online selling systems are available for the sale of second-hand bikes and parts. In addition to these, social enterprises are an important part of the supply chain in not only recovering second-hand bikes for sale at more affordable prices than new, but in providing a wide range of training, employment and services which deliver on the aspirations of Scotland's "Making Things Last – A Circular Economy Strategy". They currently do this by not only adding value to unwanted bikes, but by participating in bike sharing, leasing/subscription schemes, where bikes need to be maintained and kept in good working order for continued use.

However, there are other synergies and opportunities for developing the sector, and these are described in more detail in the following report sections, describing what is happening both in Scotland and other European countries.

3.0 DESK-BASED REVIEW & STAKEHOLDER ENGAGEMENT

3.1 Overview

The desk-based review identified more than 50 organisations, and subsequent discussions with the strategic stakeholders identifying many more of interest. In total:

- Organisations emailed directly - 75
- Responses – 45
- Completed interviews – 40 (53% of those emailed)

The split of the stakeholder types interviewed is provided in Table 2.

Table 2. Split of interviews by stakeholder type

Stakeholder Types		No of Interviews	Comments
Strategic organisations		11 ^a	Mix of Scottish/rUK (5) and international organisations (6)
International Organisations	re-use	5	From Belgium, Sweden, Austria and the Netherlands
Scotland organisations	re-use	16 ^b	Geographical spread covering Dumfries and Galloway in the south, to Peterhead in the north-east (none in the Northern or Western Isles)
Whole bike & componentry companies, including retailers		8	Includes major players such as Decathlon and Halfords. A number of Scottish businesses (one established) and others in early stages, or demonstration/pilot stages.
TOTAL		40	

a) Includes Antwerp Municipality scheduled for 30/7/2021

b) 2 of these were completed remotely, online

Questionnaires were developed to guide discussions with stakeholders, however, the aim was not to use these as a structure to be followed rigidly, since the approach which it was felt would be most effective and open would be one which was conversational in nature – this therefore required that the interviewer had to be to genuinely listen and be prepared to be flexible. This approach was felt to be particularly important when talking to international stakeholders where English is not the first language.

The interviews took place face-to-face (MS Teams or Zoom) with the exception of two (online questionnaires completed). These questionnaires are shown in Appendix A.

Strategic Scottish and international stakeholders were engaged with, and a summary of these and the type of information shared is provided in the following table.

Table 3. Summary of strategic organisations engaged with

Stakeholders	Purpose of Organisation	Type of Information Shared
Scotland & UK:		
Community Resources Network Scotland (CRNS)	Represents over 160 members most of whom are charities or social enterprises managing local waste resources. They run recycling, reuse, repair, composting, waste reduction and waste education activities.	Provided organisation's views on the type of strategies and work required to facilitate a bike industry based on circular principles. Newsletter issued to membership to inform about the project, and how to engage. Emails were also directly sent to 40 members known to actively collect/accept bikes for resale.
DMBINS	Resource hub for mountain biking in Scotland	Provided contacts within the re-use and bike industry as well as providing personal views on the type of strategies and work required to facilitate a bike industry based on circular principles.
Mountain Centre of Scotland	Bike of Centre for innovation and excellence - support businesses developing world-class products and services.	Provided contacts within the re-use and bike industry as well as providing personal views on the type of strategies and work required to facilitate a bike industry based on circular principles.
Cycling UK	Membership organisation supporting cyclists and promoting bicycle use.	Shared information on the cycle repair scheme which it delivered on behalf of Transport Scotland.
Forth Environment Link	Charity connecting people and place on actions related to the Climate Emergency.	Shared information on the bike medic scheme which it helped to set up. Also commented on the value of a charter/framework to drive effective change, which local authorities and others sign up to (learning from initiatives such as Sustainable Food Places).
France: L'Heureux Cyclage	Membership organisation for small bike co-ops based in France - promotes and enhance their activities.	Provided a view of the Bike re-use, repair and training sector in France, through the experiences of 150 members, including the impacts of the French extended producer responsibility (EPR) regulations on the bike re-use sector.
Netherlands: The Dutch Cycling Embassy	Network of public/private organisations who wish to share expertise on what builds & supports cycling culture.	Provided a wide range of social enterprises and vocational training centre delivering services related to bike re-use.
Flanders: Waste Management Agency (OVAM)	Wide remit of environmental compliance as well as supporting the implementation of circular business practices.	Shared information on research, understanding and schemes related to circular business models for bikes in Flanders, and how this has been evolving.
Europe: Cycling Industries Europe	Represents the supply chain, from bicycle and parts makers to bike sharing, cycle logistics, online services, financial services, infrastructure, tourism and consultancy.	Shared views on circular business models, including e-bike batteries, and made an introduction to Decathlon in France.
Europe and USA: RREUSE	International network representing social enterprises active in re-use, repair and recycling	Shared research findings from across Europe on bike re-use, including case studies and recommendations related to fiscal drivers and EPR.

Individual discussions with stakeholders are not described in this report, for commercial confidentiality purposes, unless specifically agreed. However, the full list of organisations engaged with is provided in Appendix B.

4.0 EUROPEAN PERSPECTIVES

4.1 Overview

The following sections provide a general overview of bike re-use and circular business models being operated in Belgium, the Netherlands and France – and are summaries of the views provided in stakeholder interviews (informed by desk-based work).

4.2 Belgium

4.2.1 Growth and Evolution of the Cycling Re-use Sector in Recent Years

New bikes sales in Belgium are understood to be around 470,000 bikes each year⁶ with 51% of these e-bikes. In 2020, it is believed that low inventories (associated with the global pandemic and changing demand levels) limited the sales of both traditional bikes and e-bikes⁷. No information has been found on second-hand bike sales.

There has been huge growth, with social enterprises, in particular, leading the way in terms of bike re-use, repair and new bike assembly in some cases. Reuse organisations are very significant in terms of geographical spread and size,, with an example of the latter being that one such organisation may employ as many people as 10 to 20 new bike shops combined. For example, one of the stakeholders engaged, Groep Intro, is a social enterprise with 100 to 150 paid employees working across a range of cycling services. The minimum wage is paid, which is similar to the real Living Wage in Scotland.

The collection of abandoned bikes is a significant source for the social enterprises which then repair these, if needed, and service the bikes prior to resale.

There are around 50 original equipment manufacturers (OEMs), or wholesalers of bikes in Belgium selling lots of racing brands, but also more standard city brands. One of the racing brands offers a repainting service, to change the colour of pre-owned bikes. Often the frames and parts are made in the far east, and brought to Belgium for assembly, although increasing numbers of countries, such as Portugal and eastern Europe are looking at developing the parts themselves, replacing the far east supply chain. Carrefour, Aldi and Lidl are potentially getting involved in taking bikes back, in store. What happens next? This is not clear yet. A feature of OEM operations in Belgium is that social enterprises provide assembly/new build functions (this is not advertised) for them, in addition to second-hand bike repair, maintenance etc

Social enterprises also provide leasing services, often as part of wider social services support programmes, with funding from government. There are many sharing/leasing models often involving bikes being available at bus and bike stations, for the last mile journey to work. Also, there is the leasing of bicycles for home to work purposes. A lot of people get the opportunity to use a bike in a leasing formula with their company as well as getting a fee/km they cycle to work, to cover the maintenance cost of the bike.

4.2.2 Importance of Re-use for Accessibility

The culture in Belgium has developed to the extent that bikes are now readily accessible/affordable and it is understood that re-used bikes, bought from local shops (often a social enterprise) will cost around £100 (or 115 Euros). Typical, good quality, new city bikes are expected to cost circa £500 (575 Euros), with premium brands and higher performance bikes, as in Scotland, significantly more expensive than this. Students and young people will often be the buyers of second-hand bikes (fully kitted out with mudguards, lights, rack). It was mentioned new e-bikes are now costing around 1,200 euros compared to 3,500 a couple of years ago, creating change, but the re-use of these, and prices is not well understood at the moment.

Feedback from stakeholders is that bike sharing schemes are not anticipated to grow significantly over the next five years. For example:

- It was estimated that there are between 10,000 and 15,000 standard bikes in public bike-sharing schemes, i.e. 1.0 to 1.5 bikes per thousand people;
- The number of bikes is not going to grow above 20,000 bikes in the future;

⁶ <https://www.o2o.be/en/news/2139/>

⁷ <https://www.bike-eu.com/market-report-belgium>

4.2.3 Spares

Prior to COVID-19 spares were easily sourced and inexpensive, and so were just purchased new when needed. During the pandemic and lockdown this has become an issue, where Social Enterprises, for example, which have managed to create stores of old parts are at an advantage - since the supply chain from the far east was so seriously interrupted. This is now being increasingly discussed, however, storing spares is a problem, from a space perspective, for many organisations. No brokerage or formal collaborations are in place.

For businesses doing repairs, selling second-hand bikes etc, the global challenge associated with accessing spare parts is mitigated by the quantity of components they recover. However, one organisation indicated that it was likely to run out of new spare parts in the next 2 or 3 months and therefore have a new circular project to begin recovering second-hand components. They currently lease bikes to a large multi-national company with a site which is so large, with so many buildings, that 1,400 bikes are leased to it by the social enterprise, for employees to use to get to the different locations. The leasing deal covers a number of years, after which the social enterprise takes the bikes back, with replacements provided. Because these are a simple bike, with only one gear (cost 250 Euros to buy, when buying in bulk) they are not in huge demand for resale. So, as a result, the plan is to do two things – (i) dismantle these for parts, for use in the organisation's day-to-day work, and also (ii) to offer the bikes free of charge to schools, for their training of children and general use. These leased bikes will be sent to a local prison which will then do the dismantling - to provide the capacity and free of charge labour.

4.2.4 Formal Training Systems & Standard

Cycling is seen as an important sector for the provision of training for many people, including those with challenges getting into work, including ex-offenders, learning difficulties etc. Some organisations are quite large and operate in multiple locations, are well organised, and provide apprenticeships, but nothing more formal than this in terms of national certification schemes etc.

4.2.5 Collaboration Models, Bike Sharing and Leasing

These have developed through a range of public-private-social economy partnerships. Many/most, if not all of the social economy organisations have funding from public sources (percentages vary), as well as generating their own revenues through sales, leasing and providing services as part of a larger development.

For example, the largest bike sharing scheme (4,300 bikes, all pedal) is the Antwerp-Velo (with information on how it works at: <https://www.velo-antwerpen.be/en/about-velo>). The local authority facilitated this in 2012 by setting out where docking stations and routes should be provided. The Velo tender and contract had specific/explicit clauses for the delivery of the programme to include social enterprise(s) in the delivery model. However, it is understood that it was the private sector that made all of the investment, with the international company, Clear Channel, setting the project up and the social enterprise Levanto (now Groep Intro) sub-contracted to initially provide maintenance and repairs, as well as logistics support, the latter in terms of moving bikes to and from the required docking stations. The maintenance and repair was subsequently taken in-house by Clear Channel. The system has been used mainly by adults going to work or college/university.

For the Velo system reliability and accessibility of bikes, for people who wanted them, were the key criteria for the municipality in awarding the contract, not "affordability". Different views have been expressed by the stakeholders engaged with regards to the affordability of the Antwerp bike sharing programmes. For example, the view from one private company was that bike sharing is expensive, which people do not always realise until they see their bill at the end of a month e.g. Blue Bike⁸ - 3 Euro/day; Velo 50 Euro/day; Mobit - 1 Euro per minute. However, another view from the public sector was that with the municipality's subsidy (meeting more than 50% of the Velo project's operational costs) bikes were being made available at an affordable level. For example, the annual subscription of 55 Euros works out at just over one Euro per week, for a bike ride of duration less than 30 minutes.

In a further development, for the outskirts/surrounding areas of Antwerp, the municipality, in 2021, awarded a contract to Donkey Republic, to set up a new bike sharing scheme, a free-floating one (no docking stations) using bike locking and software (like Mobit/Sentinel-Tec). The tender/contract had explicit clauses related circular business models - to extend life, repair bikes etc. It is understood that the project will be split 90% for ebikes (1,650 e-bikes) and 10% standard bikes. The implementation will take place over two phases, with the emphasis of the first being the introduction of e-bikes. Stage 1 is all e-bikes.

⁸ Blue-bike, public transport, bike sharing: <https://www.blue-bike.be/en>

This is happening in a landscape which has changed significantly in the last couple of years. It is now a much more confusing, varied one, with many businesses having seen the opportunity - with Mobit⁹, Cloud Bikes, Poppy, Donkey Republic, Step (electric scooters) all having entered this space.

It was commented that there has been a lot of vandalism and stolen/lost bikes in the sharing scheme, but there should never be more than 5 to 10% of bikes out of action (Clear Channel had schemes in Barcelona and France which have stopped).

The bike sharing schemes that the interviewees had been involved with were delivered through 3 different models:

- (i) Tender put out to the private sector for operation of a scheme - but not profitable;
- (ii) Public run - the municipality runs the scheme, buys the bikes, and a private operator provides the digital solution; and
- (iii) Public-private - the Belgian Blue Bike delivery partner is paid by government per ride.

The Blue-bike scheme involves bikes being located at train and bus stations, to allow commuters to make the “last mile” journey to work by bike. 1,200 Mobit bikes are in operation at 7 or 8 Belgian locations, in free-floating schemes. Mobit, using Sentinel Tec software (smart locking and location system), works on basis of earning a fee per month from the municipality (local authority). The model involves them earning 25,000 Euros per annum for every 200 city bikes i.e. one-third of the income is from ride fees and two-thirds from the municipality. It is understood that Mobit will not be expanding beyond the 1,200 bikes, this related to the levels of profitability associated with such schemes.

4.2.6 Public Funding and Support for Cycle Re-use, Including Sharing & Leasing

Significant levels of public funding do go into re-use activities, including support for social enterprises delivering cycling products/services. The majority of costs (80%) at one large organisation are paid through subsidies/grants, for their social purpose. The other 20% comes from a combination of second-hand bike sales, providing logistics support to a bike sharing scheme, and also the income for providing and maintaining bikes as part of company leasing schemes for employees. The scale of this subsidy is related to the nature of the social services provided, rather than short-term issues for example related to COVID-19.

4.2.7 The Most Significant Change to increase the re-use of bikes?

The big opportunities involve developing circular models, with leasing a part of this, making things last, recovering components etc. A view expressed is that the bike sharing model is not really for children in the range 6 to 16 years of age– this is too expensive. Instead, it is looking at bike libraries as a way forward e.g. for a fee of 15 to 20 Euros per year for a child’s bike, where they are then given a replacement the next year, for the same annual fee. In effect this is a low-cost leasing system. This is now very much a developed system in Antwerp, but less so across other parts of Belgium, however, it is getting bigger and bigger.

Company leasing is another significant, new and growing opportunity. An example was given of one company which wants to lease 400 bikes from the social enterprise, using free-floating technology, for staff to use across their site. These are bikes similar to those mentioned earlier, with one gear, and which cost only 250 Euros each to buy new (a bulk price). Maintaining these bikes, managing them in a circular way at the end of their lease is a way of making them last.

It was estimated that there is a total of 4,000 to 5,000 pool bikes, but this is not anywhere near enough for “last mile” journeys where other modes of public transport are used. Universities can be a significant user in this respect e.g. the University of Ghent has around 300 pool bikes, and the University of Leuven has more than 500 pool bikes. This was described as a significant opportunity, which could keep bikes in circulation for longer, and ultimately, at the end of service, being available for resale.

The Antwerp Velo project has been hit badly by COVID-19, with people wanting their own bike rather than touching/sharing bikes used by other people (risk of infection). It is currently operating at 50% of capacity, which is significantly lower than it was before. Groep Intro had 50 staff working on this scheme across two shifts before COVID-19 and this is now down to 25.

The introduction of technology (apps/software, smart locks etc) in the logistics sphere (bike sharing) is not only driving the growth of free-floating sharing schemes, but also the way in which logistics services are being delivered by sub-contractors/partners such as social enterprises. Previous manual methods associated

⁹ Mobit private bike sharing: <https://www.mobit.eu/>

with understanding where bikes need to be, their physical movement etc are being replaced by such technology¹⁰, which reduces the number of employees required to manage this.

4.3 Netherlands

4.3.1 Growth and Evolution of the Cycling Re-use Sector in Recent Years

In 2019, the vast majority of new bikes sold in the Netherlands were either city bikes or e-bikes. That year, approximately 330,000 city bikes were sold, with the total for e-bikes more than 420,000¹¹ (41.7% of sales). On average, people spent 2,067 Euros on an e-bike, with the average price paid for a traditional new bike at 1,243 Euros, up slightly on 2018¹². Traditional city bikes had a 33% share of the market and children's bikes 11%.

In terms of re-use and second-hand bikes these provide an alternative to the new bike market and are considered more affordable and attractive in particular by many people in lower income groups, and younger people, including students. The popularity of cycling is such that this has now developed to the point where many people have multiple bikes, stored at different commuting points. There are repair and second-hand bike shops at almost every corner – these having grown and evolved naturally.

Recent developments include leasing projects by companies such as Swapfiets, with others such as AFAC collecting and redistributing abandoned bikes, with others developing software, such as Abel Sensors, to identify when bikes have been abandoned.

4.3.2 Importance of Re-use for Accessibility

The sector that is involved in managing second-hand bikes, sharing and leasing schemes, is very important for inclusion and training of targeted groups, and for making bikes affordable. In particular, in terms of the latter, this is extremely important for younger people and students, with a typical price for a new bike being around 600 Euros and a new city bike being circa 150 Euros to buy.

One of the stakeholders commented that they are involved in a scheme run by government which gives bike vouchers to deprived families. The bike shop gets the voucher, contacts the family and helps them to acquire a bike. In 2015, the Dutch Royal Touring Club (ANWB) launched the Children's Bicycle Plan, announcing that "every child has the right to a bicycle in order to participate in society". The plan involves members of the ANWB who collect bicycles and then collaborate with existing bicycle repair shops around the country to refurbish the bicycles. The summary booklet for the plan¹³, prepared by the Dutch Cycling Embassy, Tour de Force and Mobycon summarises three of the key opportunities associated with this:

"First is the potential for job creation. Repairing the bicycles does not necessarily have to be done by volunteers. For young people who have dropped out of school or are having trouble accessing the labour market, these initiatives may provide them the opportunity to learn valuable skills and could be further expanded to provide them with more bicycle-related job opportunities."

Another opportunity lies in the fact that refurbished bicycles do not necessarily need to be given away, but rather lent out on a long-term basis. Doing so creates a circular system that helps prevent bicycle shortages."

A third opportunity is creating a community hub where bicycle-related activities are organized in the same place where the bicycles are issued or loaned. This could include bicycle lessons for children and parents and any follow-up activities that arise from this. Other combinations may also emerge that strengthen the initiatives as a whole."

4.3.3 Spares

As is commonly being experienced around the world, one of the impacts of COVID-19¹⁴ is that it is difficult to get parts – these are not readily available and there are lengthy delays. Some organisations have not felt the impacts until fairly recently, because they have significant storage space and had built up a lot of stock, and in one case the business also had ad hoc arrangements with other local repair organisations which were helpful.

¹⁰ An app specifically mentioned in this context was Bico.AI which analyses bike use and predicts demand etc.

¹¹ <https://www.statista.com/statistics/620866/sales-volume-of-new-bicycles-in-the-netherlands/>

¹² <https://www.dutchnews.nl/news/2020/02/e-bike-sales-continue-to-soar-total-bike-bill-hit-e1-2bn-last-year/>

¹³ <https://mobycon.com/wp-content/uploads/2021/03/A-Bicycle-for-Every-Child-Approach-Booklet.pdf>

¹⁴ The Suez crisis was also described by one stakeholder as having a prolonged, negative impacts on the supply of spares.

4.3.4 Formal Training Systems & Standards

There are a number of training programmes run by social enterprises which a range of people can sign up to. In addition, the organisations also train volunteers and staff, on the job, but also often in partnership with a number of vocational training institutions that exist across the Netherlands. Called Regional Training Centres (ROCs) these are partnerships of educational institutes in “secondary vocational education” (MBO) and adult education¹⁵. More than five hundred MBOs have been merged into approximately 50 large regional training centres and the intention, with these vocational training centres, is to offer competence-based learning, narrowing the division between learning and working. Depending on the location, the following activities are offered, which go beyond basic bike repair training, providing a more wholistic programme:

- Repairs
- Maintenance company bicycles
- Selling of 2nd hand bicycles
- Assembly of bicycles
- Shared bikes
- Bicycle shed management
- ANWB children's bicycle plan (see previous description)

The ambition is to eventually have approximately 10 “Cycle Hubs” at training centres, these being training companies where training and guidance are central, delivered within a fully-fledged bicycle shop, making it possible to learn from practical work, on the job. It is understood that there may be four hubs currently active, with 10 being considered to provide good national coverage – the aim being to provide “two-wheeler” training and/or reintegration processes (to assist people who may find accessing employment and training challenging). With the Netherlands having a population of 17.3 million, the equivalent per capita for Scotland would be to have 3 such centres (this is not a comparison of the number of people regularly using bikes).

Two specific examples of bike training are provided below:

- The Tweewieler Academy (two-wheels academy): this has a teaching programme for students over 4 months where they learn to become a bike repairer (receiving a recognised diploma), with the academy incorporating a Cycle Hub. Candidates gain work experience in combination with a training course with the aim being to always allow the participant to move on to the regional business communities. Students are working in a bike repair store for 3-4 days a week and for the other 1-2 days they have practical training at the academy.
- Secondary schools: In addition, training at national level is provided for bike mechanics at secondary schools. For example, the municipality of Amsterdam pays for secondary schools to provide their own training packages, to take on children with special learning needs. These are very wide ranging in age and the aim is to not generate insecurity in the participants in terms of standards.

For illustrative purposes, an extract from the ROC Netherlands description of a Bicycle Technician “two-wheeler technology course is provided in Box 1.

Box 1. Bicycle technician¹⁶

MBO training

Duration of training: 2 to 3 years

Level: 2

Sector(s): Two-wheeler technology

As a bicycle technician you can work in almost all two-wheeler companies. You will mainly work in the workshop.

As a bicycle technician you carry out maintenance work on a bicycle and you repair defects.

Nowadays there are more and more bicycles with an electric motor or with another motor. You are also able to make a diagnosis for these types of bicycles. In complex situations you will be supported by an experienced colleague or a manager. Depending on the company you work for, you can also perform other tasks. For example, you can think of the handling of warranty and insurance. You can also support your colleagues in the sale of bicycle parts and accessories and speak to people who have a complaint.

Education content

¹⁵ <https://www.tweewieleracademy.nl/zij-instroom-fietstechniek/zij-instromen-en-omscholen>

¹⁶ <https://www.roc.nl/default.php?fr=details&id=3698>

During the bicycle technique training you will learn everything about tinkering with a two-wheeler. You learn how to perform maintenance and simple repairs. You will get lessons to get to know all systems, including electric bicycles, which are becoming increasingly popular. In addition to the knowledge you gain, you will have the opportunity to apply your knowledge in practice and to repair the real bicycles by means of mounting parts. You will also learn how bicycles are prepared for delivery.

4.3.5 Collaboration Models, Bike Sharing and Leasing

The collaborations that are in place in the Netherlands are those described previously where training and inclusion programmes are in place for the second-hand bike sector. Supporting this, there are also organisations (similar to those in Belgium) that remove abandoned bikes e.g. in the city of Nijmegen this is the Algemene Fiets Afhandel Centrale¹⁷ (AFAC) – in effect a “lost and found” service where people can try to find a missing bike. Unclaimed bikes can then become an important source of second-hand bikes for the social enterprise sector.

No collaborations have been identified between the re-use/social enterprise sector and OEMs including those focussed on spare parts, nor have bike sharing schemes involving partners/sub-contractors such as Groep Intro in Belgium been identified for the Netherlands through enquiries, discussions or a desk-based review. Nextbike do have a sharing scheme in one Dutch city, however it is relatively small (smaller than the one in Glasgow).

The private company Swapfiets started operating in the Netherlands in 2014, providing a leasing system on a subscription basis, with the Financial Times described it as the 10th fastest growing company in Europe in 2021. After registration online or on a Swapfiets app, users can get their bike within 24 to 48 hours at a location of their choice. The company operates in more than 50 cities and has 35,000 members in Amsterdam now and more than 200,000 internationally, including the Netherlands, Germany, Belgium, Denmark, Italy, France and the UK (London)¹⁸. A driver for the business model is that the bikes provide a sense of ownership to the customers because they have their exclusive use and are given a unique key and lock. The risks from the daily wear and tear are taken on by the company which will provide repairs or a replacement bike within a specified period of time (48 hours). At the time of writing monthly subscription fees (in London) range from £14.90 per month for a seven-speed bike, to at least £75.00 per month – these are comparable to prices in the Netherlands. No information is available on re-use activities, or social enterprise collaborations. However, the company has stated in a press release (March 2021) that it aims to have fully circular bikes by 2025, however there are limited details provided on how this is going to be achieved.

4.3.6 Public Funding and Support for Cycle Re-use, Including Sharing & Leasing

The funding of social enterprises comes from a combination of grants/public funds, bike sales (new and second-hand), leasing and involvement with other initiatives (including charging fees for training courses, to the wider public). One large organisation engaged with commented that of a 600,000 Euro turnover per year, 200,000 Euros comes from the government Health Care Services to employ people described as having psychological problems, another 300,000 Euros from the sale of new bikes and around 100,000 from sale of repaired bikes. One third of the reused bikes sold are through the Government voucher scheme. The new bikes sold provide the income needed to be commercially viable. This turnover supports 60 trainees paid the minimum wage by Health Care Services. There are also 6 FTE employees with half of these bike mechanics and the other half health care workers.

As described earlier, large numbers of bikes are abandoned, and the Government employs a commercial entity to collect these, which are held in a large yard. Bike shops and social enterprises then pay circa 30 Euros for each of these. Organisations select the best bikes which when reworked and/or resold gives a re-use rate of 75%. Between 400 and 500 standard bikes are collected/dropped off with them per year (with 150 of these for students). Standard bikes are typically sold for between 175 to 220 Euros and a number of e-bikes are also sold, these without any kind of significant repairs.

¹⁷ Translates to General Bicycle Handling Centre.

¹⁸ <https://www.bike-eu.com/market/nieuws/2020/06/e-bikes-continue-to-penetrate-the-french-market-10137975>

4.4 France

4.4.1 Growth and Evolution of the Cycling Re-use Sector in Recent Years

In discussions with Cycling Industries Europe, it was commented that bike re-use initiatives in France have been considered an example of best practice, with other countries (The Netherlands, Belgium etc) learning from what has been happening, and then developing their own services from this.

There were 2.6 million new bike sales in 2019 (2% less than previous year), including 388,100 e-bikes representing 15 percent of the total sales value.¹⁹ Although the number of bikes reduced compared to 2018, the growth in the e-bike market meant the average price grew, to 566 Euros from 493 Euros. As with other countries considered, no information on second-hand bike sales is easily available. However, although it is now a significantly old research project, in 2013, the organisation L'Heureux Cyclage carried out research on the re-use and repair sector. In the report, it was commented that the French owned 26 million bicycles, of which more than 9 million have not been used in the last twelve months. At that time it was estimated that each year, nearly 2 million adult bikes were purchased new in France. At the same time, the research estimated that around 1.5 million bikes were destroyed/disposed of each year.

Local initiatives to re-use end-of-life bicycles have therefore emerged and in many locations supported by social and economic regeneration objectives of the country. There are a number of associations supporting social enterprises and bike shops in France, for example, L'Heureux Cyclage, the Collectif Vélo Île-de-France, the Mieux Move à Bicyclette (MDB), etc. These have been identified as being significant players in providing local re-use options for bikes across France as a whole and have had growing memberships over the last couple of decades at least.

Bike re-use projects (services, products) are often delivered by bike shops, often referred to as co-operatives (co-ops), which have grown significantly in France - with a grass roots programme supported by national, regional and local government.

L'Heureux Cyclage commented that in 2000 they only had 10 bike co-op members and by 2020 the number had increased to 350. In 2008, L'Heureux Cyclage was formed, to be a network for "participatory and solidarity-based bicycle repair, with the aim of promoting and enhancing bike repair shops". In 2018, 57,500 bikes were recovered for repair or to be disassembled for spare parts. To recover so many bikes, the bike shops have voluntary and salaried staff, with 270 full-time equivalents (FTE) employees. In the 2019 L'Heureux Cyclage "Bike Shop Panorama Report" it was stated that 34% of jobs are precarious and therefore are subject to a high turnover – this in turn prevents the maintenance of specific skills within the co-ops.

In the case of MDB, this association has been active since 1974, with more than 1,900 members in Paris and in all the regions of Ile-de-France involving a network of local branches. A key objective of the organisation is teach everyone to ride a bike, to repair their bikes in their workshops etc. The Collectif Vélo Île-de-France brings together 38 cycling associations in the Ile-de-France region in around 100 municipalities and represents more than 4,000 members.

The introduction of the French Extended Producer Responsibility (EPR) regulations has the potential to influence the way that the smaller bike shops deliver services, with an indication that there may be a growth in larger social enterprises entering the cycling sector. It is understood (from the stakeholder) that the Clearing House will pay the organisations that participate a fee of 1.50 Euros per bike, but the traceability/reporting requirements may involve too much administrative bureaucracy and prove to be a disincentive to the smaller co-ops (in terms of participation).

4.4.2 Importance of Re-use for Accessibility

Accessibility and affordability was described by L'Heureux Cyclage as being very important in terms of its objectives e.g. re-used bikes are typically sold by the co-ops for between 40 Euros and 120 Euros each and are often targeted at communities with lower incomes, where there are immigrants, refugees etc.

An example of how accessibility is fostered is provided by SoliCycle in Paris, a co-op and project which incorporates a resource centre managed by the association Le Poulpe and a solidarity café managed by the association Les Marmites Volantes. The objective of this project is the socio-professional integration of people far from employment through bike mechanic training and public engagement. This co-op provides:

- Self-repair workshop training;
- Sale of re-used bicycles; and
- Recovery of unused bikes for recycling or recovery in the form of spare parts.

¹⁹ https://digimagazine.bike-eu.com/market_reports/france

Access to these co-ops is based on a membership of 20 Euros per year per family. Bikes are then sold for between 10 and 150 Euros.

4.4.3 Spares

All of the Co-ops are using mostly second-hand spares, unless there is no option, but to buy new. There have been no wider networks, and this is not seen as a significant issue, other than the temporary challenges presented by COVID-19.

4.4.4 Formal Training Systems & Standards

Until 2015 bike co-ops could not open unless they had staff trained to a diploma standard (low level compared to degrees) – these having been developed nationally. In 2015, as part of a market liberalisation move, this requirement (standard) was dropped, and the diploma is now worked to by a minority of co-ops.

L'Heureux Cyclage is developing a different diploma now (time of writing), which has the French EPR regulations as an important driver. The diploma is wholistic in nature, covering both bike re-use/repairs, but also covering how to run a bike repair/re-use business. There is likely to be similar developments by other associations and organisations across the country, but these have not been identified.

The training programmes for supporting people back into work are provided for typically 6 months, funded by the state. One example, in Paris, involves seven co-ops providing training for people, to get back into work, with around 50 of these as bike mechanics - the Chantier Insertion scheme at the following link provides more information: <https://etudesetchantiers.org/solicycle-paris-18em>.

The engagement with Decathlon, described below, provided another perspective with respect to training - that doing bike repair is not difficult and that the company provides on the job training without a formal training certification.

4.4.5 Collaboration Models, Bike Sharing and Leasing

Bike co-ops are providing training, second-hand bike sales and are doing so in partnership with local governments, to assist people back into employment, and to make bikes accessible and affordable to many low-income groups, including immigrants and refugees. Also, local bike retailers will often have a voucher scheme, where someone wanting a new bike can trade in their old one and receive value from it. Rather than this bike going for recycling/scrap, shops have contracts with the Co-ops, who take them away for rework and resale.

Decathlon is a major bike manufacturer, with 5 million made in the last year, and were engaged to understand more about their new pilot project, being rolled out in France during 2021, involving a market development for children's bike involving a monthly rental model i.e. a leasing project. Once children require a larger bike their leased bike will be returned, repaired/serviced at Decathlon stores and resold. The pilot is important to check and ensure that the model is going to be as successful as they think it will be. They will then extend it to adults. The bikes resold from the monthly rental scheme will then be sold with a warranty (interviewee was not sure what this would be exactly, but may be up to 2 years).

4.4.6 Public Funding and Support for Bike Re-use, Including Leasing

As an average, government grants meet around 50% of the bike co-ops' costs. These tend to come from central government schemes, but there are also local initiatives. Note that with the exception of the Lille example (below), and the change through the EPR, the co-ops have not been involved in leasing – the focus has been repair for resale and training. Government has been very supportive of costs to get co-ops up and running (capex) but also provides many of the opex, associated with training provision for social impact. Funding for the latter is often in 2 to 3 years programmes, rather than annual, with the large organisations finding it easier to get this funding, since they have more staff, resources etc to secure it.

4.4.7 The Most Significant Change

The major development in France, on the agenda, is the 2022 Extended Producer Responsibility regulations, driven by the EU, but implemented by member countries in different ways. In France this will have an impact on bikes, with targets that are going to be set for their re-use. This will be paid for by the bike retailers etc, who will have to accept old bikes at shops by consumers wanting to buy new. These retailers are looking at setting up their own repair/re-use workshops and resale operations, which could be in competition with the Co-ops. The French co-ops are typically small, employing between 1 and 3 FTEs, with a further 3 to 4 volunteers per employee. Many of these will struggle with the data recording (traceability/measuring) requirements of the EPR, and therefore may not be able to take advantage of this. A price has been set of 1.50 Euros to be paid per bike, to such organisations. If only processing 100 bikes per year, it may be viewed as more trouble than it is worth. Other large not for profits/charities involved in

community support are looking at the EPR and bikes. For example, one organisation in Lille, with a turnover of 5 million Euros (the same size as the total for the 350 L'Heureux Cyclage co-ops) is now looking at getting involved with bike re-use as a part of its social impact work. The Lille local authority is going to provide a contract, to provide high school pupils each with a free bike for one year (10,000 bikes) i.e. like a very large leasing scheme (zero cost to the pupils). This has been committed to and will be implemented later in 2021. They would like bike re-use to be a part of this.

4.5 MISCELLANEOUS

The companies interviewed represented all aspects of services from drop off, collection, re-use, remanufacture, repair and leasing, as well as smart locking and logistics systems (including apps and software). The majority of the international organisations do not undertake cycle repair and re-use in isolation, and are often working as collaborators, sub-contractors etc to larger organisations undertaking a wider ranging activity such as healthcare providers, municipal waste management providers and larger charities. For example, Nutzmüll in Germany, employs people who have "lost their professional connection" in reuse and repair across a number of areas, including furniture, clothes and computers, as well as bikes. The Munich Waste Management Cooperation similarly diverts re-usable items including bikes to two second-hand shops in the city. They employ the services of local social enterprises to undertake the repair and upcycling work. The bike partner is a social enterprise training young people, but again does not restrict its activity to bike repair, but also provides repair services for motorbikes as well as selling new standard bikes and motorbikes.

Similarly, AVV in Denmark a partner company owned by Brønderslev and Hjørring municipalities undertakes bike repair and re-use as part of a large range of waste management activities. The exception to the above was Roetz Bikes who are a social enterprise manufacturing sustainable designer bikes from reused frames and components. They have a focus on a particular market and bike prices start at 579 Euros.

Almost all the organisations identified had some type of social purpose primarily around employing those with challenges accessing work, those with severe psychological or physical challenges, and young or the long-term unemployed. The salaries of these staff were paid (e.g. through grant funding, or directly) by third parties such as the healthcare provider or job centres. Wider costs were generally carried by the larger/lead organisations with which they are associated or they have wider activities to supplement income, such as sale of new bikes.

5.0 SCOTLAND - REPAIR, RE-USE AND RECYCLING SERVICES

5.1 The Current Situation

In Scotland and across Europe there are a range of bike businesses, including social enterprises and profit-making businesses, typically providing some or all of the following (not exhaustive) types of services and products within the cycling sector:

- 2nd hand bikes:
 - Logistics to secure and store unwanted and/or stolen bikes;
 - Processing to identify which bikes will be worked on (repaired, cleaned etc), disassembled (e.g. for components), scrapped (recyclate value) or sold as a job lot to a third party;
 - Sales of 2nd hand bikes, typically between £80 & £150 for adults and £20 to £80 for kids' bikes;
- Providing bike repairs and servicing to individuals (business to consumer, or B2C) and/or other organisations (business to business, or B2B);
- Custom bike building, using either new components or second-hand bikes and/or components;
- Selling 2nd hand components, often with warranties, to other organisations, mechanics or the general public;
- Providing cycle skills training to children, members of the public and organisation employees;
- Skills and training provision;
- Provision of bike libraries;
- Bike sharing and subscription schemes:
 - Bike design, manufacture/assembly;
 - Maintenance and repairs;
 - Logistics support to move, drop-off and collect bikes;
 - Development of docking stations, and increasingly, software and smart locking systems to manage and secure free-floating systems;

- Bike leasing²⁰;
- Sub-assembly design and assembly (e.g. integrated gear and motor systems for e-bikes, frame and suspension units for specialist/premium bikes etc);
- Roadside breakdown services; and
- Bike design and assembly.

The above products and services are often delivered in a diverse range of partnership models, sometimes involving local authorities, private sector businesses (profit-driven), social enterprise etc. Stakeholder engagement involved interviewing organisations working within every category of business model described above, in what is a dynamic, fast-moving sector, and where the operating models pre-COVID are rapidly evolving.

This report and the associated research project undertaken has been delivered with re-use, repair and maintenance of bikes as central and key considerations, with respect to operational models that facilitate more affordable and accessible bikes for the wider population in Scotland. Figure 2 is provided as a way of clearly illustrating the various ways in which businesses working with second-hand bikes, extending life cycle etc, can and are adding value to their operations, while also offering accessible and affordable options, providing training and innovation.

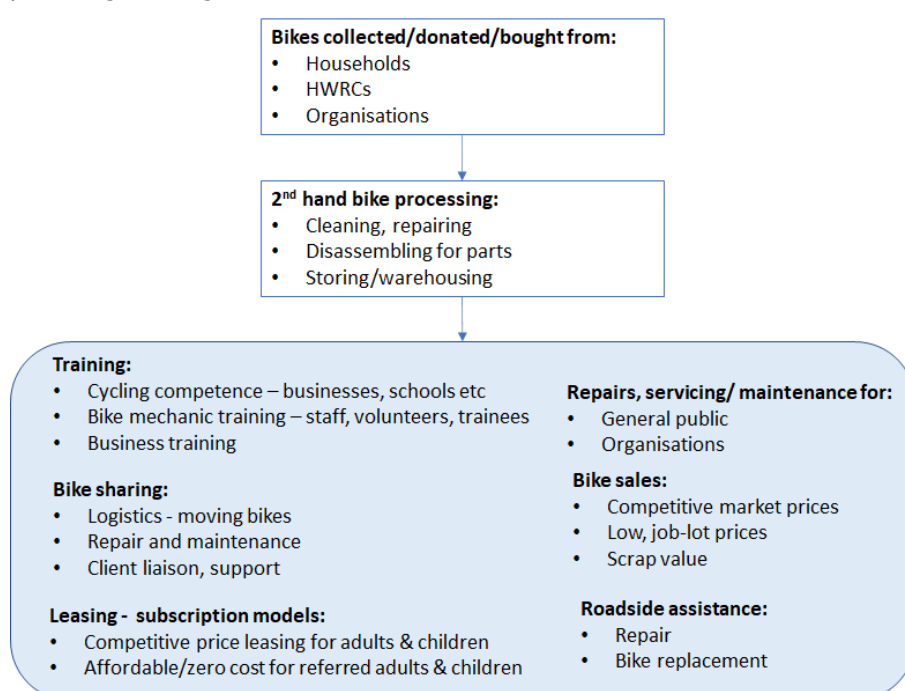


Figure 2. Diagram illustrating a comprehensive range of activities that can add value to organisations working with bikes for resale, extending life, providing skills etc.

This report does not cover the impacts of vandalism that are being experienced by a number of bike sharing schemes in Scotland, and which have similarly impacted on other schemes in a number of European countries. The range of issues associated with this may mean that this is an area that would benefit from dedicated research and engagement with the sector.

5.2 Overview of Metrics for Scottish Stakeholders

Table 4 provides a summary of responses to questions answered by sixteen Scottish organisations providing bike collection, repair, re-use and circular business models - interviewees were asked for data over the previous year, 2020 to 2021, and in some cases data for 2020 was given. Fourteen involved face-to-face interviews (Zoom or MS Teams) and two of the responses provided were completed as online surveys. Eight of the organisations were social enterprises and are identified with an asterisk (*).

The table indicates the scale of their businesses from different perspective (number of bikes, turnover etc) on the basis of data that was willingly shared during the interviews. The table also describes the percentage of bikes that are recovered for re-use, indicates the level of grant support funding, and provides a summary of future plans. Where the data was not secured this is described as NK (not know).

²⁰ Bike leasing also includes bike libraries, with the latter often being provided as a lower cost leasing option. Subscription services are a commercial mechanism to manage and deliver leasing schemes.

Table 4. Overview of data from Scottish organisations - stakeholder interviews

Org.	Type of Bikes	No. of Bikes Donated or Collected pa	Turnover	% Re-used	% Grant Funding	No of Employees on Bikes	How Bikes are Obtained	Future Developments
1.	All	5,000	NK	50%		8 FTEs & 3 PTs	Angus HWRCs	E-bike leasing scheme for Dundee. Embark Dundee, operated by Ride On. Dundee Cycle Hub in partnership with council.
2.	One specific bike type	They have 90 bikes	£140K		65%	6 FTE/PT	Bought new and sold on after significant use.	Leasing and bike assembly business.
3.	All	450	NK	40%	0%	1 PT + 1 Kickstart Trainee	Collected donated and	Grant funding, e.g. from Cycling Scotland for a fleet of hire bikes, is for "additional activity" rather than core business.
4.	Good quality	NK	NK	All disassembled	0%	9 FTEs	Purchased – £144K to 180K pa	Mobile service will create more business and meet growing demand. They will provide parts for e-bikes (motors, batteries, electronic displays), Shemano, Bosch and Yamaha are the brands being considered.
5.	All	700	£60K	93%	48%	3 PT	HWRCs (selected) + donations	Larger premises needed to expand - £15k to £20K pa rent. Would double bikes sold and start a leasing project.
6.	Std & e-bikes	15K to 20K	£100K	10%	< 50%	6 FTEs	HWRCs & donations	Uncertain. 17 staff on furlough at moment and turnover reduced from £500K.
7.	Std	300	£120K	95%	0%	2 FTEs	Donations	£30K to £50K for new premises- giving 50% growth
8.	Std	350		40%	0%	1 FTE	Donated	£25K for new premises, would double bikes processed and sold.
9.	Cargo pedal	900		~100%	0%	4 FTEs	Bought.	N/A

Org.	Type of Bikes	No. of Bikes Donated or Collected pa	Turnover	% Re-used	% Grant Funding	No of Employees on Bikes	How Bikes are Obtained	Future Developments
10.	Cargo & e-bikes	75	Circa £112K ^a	100%	0%	1.0 FTE	Bought	Steady growth on basis of existing model – converting pedal bikes to e-bikes.
11.	All	7,500	£750K	50%	50%	23 FTEs	Donated	Social purpose, training, support.
12.	All	4,500		78%	NK	50 FTEs	Donated and collected	Setting up a subscription service across Scotland, with software to manage this
13.	Std & e-bikes	996	NK	N/A	NK	10 FTE	Bought from German parent company	50% growth is a possibility – 500 more bikes.
14.	All	2,000		35% ^b	0% ^a	1 FTE + 2 Kickstart Trainees	Mostly from police stations, but donations as well.	Yes, aim is to develop infrastructure to process more bikes, recover spare parts and sell these online.
15.	All	55	£10K to £50K	30%	0%	7 FTE/PT	NK	
16.	Std	500	£10K to £50K	40%	0% ^c	NK	NK	

Notes:

a) This is an assumption, based on conversion cost per bike of £895 and bikes sold for £1,500 each.

b) No grant funding prior to COVID-19 – support received for this is now coming to an end.

In summary, for those organisations engaged with, key data related to organisational activity includes:

- The organisations engaged with accepted/collected around 36,450 bikes, of which 45% on average were re-used, a total of 16,277 bikes. This figure excludes Next Bikes and Social Track, which have a total of 996 and 9 bikes in stock respectively, for sharing;
- There was a large variation in the recovery rate of bikes for re-use, ranging from 10% to 100%, with COVID-19 impacts being felt in some cases (reducing the level of bike re-use);
- Public/grant funding levels: Five of the eight social enterprises were recipients of significant grant funding over the previous 12 months - in the range 48% to 65% of turnover (the percentage for one not known);
- 135 people are employed by the organisations engaged, in a mixture of full-time and part-time positions;
- Growth: although there have been challenges as a result of COVID-19, nearly all of the organisations engaged have growth and development plans. This is commented on more later in this report (Section 9.3).

5.3 Spare Parts Supply Chain & IT Systems

5.3.1 Overview

The questions used to engage with stakeholders, to discuss the status and opportunities related to spare parts, and the role that IT systems can play in managing stock (bikes plus spares) are shown below:

- How easy is it to obtain the required parts when repairing and/or remanufacturing bikes?
- What can be done to improve access to affordable spares needed?
- What external resources are already available to provide you with access to spares e.g. any brokerage systems?
- What IT, or web-based systems could be developed to build capacity and provide access to spares in Scotland?
- What new, or expanded, physical infrastructure could be developed in Scotland to assist in providing your organisation with the spares you need?

As mentioned in Section 4.2 questions used were a guide for discussions with stakeholders, rather than a rigid structure to be followed. The overall views of those interviewed are given in Table 5.

Table 5. Overview of Scottish Organisations Views on Spare Parts and IT System Development

Org.	Current Situation	Future Opportunities & Developments
1.	Couldn't survive at the moment without using second-hand parts, though preference is to use new. No brokerage system.	Not sure. The big question for them is how ebike batteries in the future should be managed when these need replaced.
2.	This is a difficult position – prefer to use new parts/spares.	The development of a leasing model, using the same type of bikes and parts will assist. Also, to develop an indigenous bike assembly business.
3.	No difficulties at all ("easy"). Either use what they get from other bikes or use eBay. Most spares used are low quality as they sell bikes on very cheaply - do not deal in high end bikes or if they get them they tend to sell them straight on.	Central access ^a to spares would be useful although whether they use them would depend on costs as they generally manage to access very low cost spares.
4.	Have made the recovery and sale of second-hand parts, with a warranty, their core business model. No longer have a shop front – e-commerce.	E-bikes and the three key parts are the big opportunity – the motor, battery and electronic display. Also servicing/fitting the parts through a mobile service.
5.	No brokerage systems. Buy some parts new, but circa 80% of parts used are second-hand.	More trained people to recover parts from old bikes.
6.	Not easy or difficult. Buy 2nd hand parts, and recover their own. Also buy new.	If they had more mechanics could recover more parts.
7.	Easy. Spares are not usually a problem.	System works well at the moment.
8.	No problem, but do not need specialist spares as only doing low value bikes.	An IT system could be built but the issue is probably more logistics - the costs of getting spares from further afield. Also the resources to put spares on the system, take photo, upload etc.
9.	Difficult, struggling to get spare parts ^b . Use some reused spare parts but as sell bikes under warranty can only use those in good condition and non perishable	IT system - Could work but need guarantee of quality. This will be necessary for those that provide warranty – will not use any type of reused spares. Do not accept low quality bikes such as those bought in Halfords or supermarkets as not worth doing up low quality frames – will not last.
10.	Not really relevant – just fitting ebike batteries and motors	N/A

Org.	Current Situation	Future Opportunities & Developments
11.	Not easy/difficult. Cannot reuse some parts (e.g. chains), but mostly do use second-hand components.	A digital management system supporting an online sales service and marketing.
12.	Easy - never been a problem with careful planning - use 2 hand parts as well as new.	There is an IT system, a Customer Relationship Management (CRM) tool/ app that could be used as a very important and useful management tool, to manage the development of a subscription service (rather than leasing).
13.	Difficult. They do not use second-hand components - want to use parts that will have the longest possible life, and to maximise safety.	Contractual arrangement for spares is not good – paying up front. Changing this would be helpful.
14.	They use reclaimed spares in their refurbishment of second-hand bikes.	Very aware that there could be a big business opportunity disassembling bikes to store and sell parts as part of a digital sales platform.
15.	Not easy or difficult.	Establishing a co-operative of organisations, sharing spares recovered from old bikes. Establishing a procurement co-operative, to buy spares (re-used and new) at more affordable prices. The introduction of a business that recertifies recovered spares, selling these with a warranty ^c . ebike battery cell replacement in Scotland.
16.	Not commented on	Not commented on

Notes:

- a) "Central access" was not defined.
- b) Currently a crisis in the supply chain due to Suez and Covid
- c) This business already exists – Cycletrade.

5.3.2 View on Availability of Spare Parts and Associated Systems

Because the views of a small number of organisations are being represented in this report, percentages are used to summarise the views provided in Table 5 for indicative purposes only.

Shown in Table 6, this indicates the stakeholders' views on how difficult it is securing spare parts at the moment, and their views on using second-hand components.

Table 6. Stakeholder views on securing spare parts and the use of second-hand components

Reply	No.	%
No problems getting spare parts - use 2 nd hand often/mostly	9	56%
Not easy or difficult	1	6%
Difficult position – 2 nd hand parts used widely, but not the preference	2	13%
Second-hand parts used in limited repairs only	1	6%
Do not/cannot use second-hand parts	1	6%
Not applicable or view not given/secured	2	13%
Total	16	100%

A number of comments made about parts and IT systems are provided below:

- If not selling high value, premium re-use bikes then many organisations feel more comfortable using second-hand parts when refurbishing for resale or carrying out repairs;
- There are some components which organisations only want to use new components, such as chains, because of the wear and tear associated with these; and
- One organisation will only use new spare parts, because their view is that these are required for health and safety reasons for their bike sharing service.

The complete disassembly of all bikes for spare parts is the business model for one of the stakeholders, who has also moved all sales to an online platform. These are sold with a warranty, and the company is experiencing significant growth and demand, selling to second-hand bike shops, householders and other business across Scotland and the rUK.

In terms of IT systems, apps and brokerage systems, there was no widely held view or consensus about current opportunities specific to spare parts alone. However, one stakeholder commented that the pressures being experienced with spare parts would be mitigated by a business involving two separate, but complementary business models – one involving the assembly/manufacturing of whole new bikes and the other second-hand bikes. In this case, when evaluating the bikes received for the latter (second-hand bikes), the supply of new, replacement parts could then be provided by the operations associated with new bike assembly. This is similar to the example provided by Decathlon in France, which is beginning a pilot in 2021 to lease out children's bikes – this will use one particular brand of bike, and when spares are required these will be available as part of a production approach that is also set up for new bike manufacture/assembly.

Engagement with the organisations above has identified views on the following factors influencing spare parts infrastructure:

- Preferences and confidence in the quality/performance of spare parts;
- Infrastructure and operational requirements to build spare parts capacity;
- IT systems, apps that support improved management of spare parts; and
- Business models that support improved access and opportunities.

The point with regards to preferences has already been discussed in this section. The other factors are considered later in this report, when describing holistic business models for the sector in the future.

5.4 Training and Certification Schemes

5.4.1 Overview

In Scotland, there is currently a Cycle Maintenance qualification at Scottish Credit and Qualifications Framework (SCQF) level 4 (6 SCQF credit points). This is one level below that which the Modern Apprenticeship begins. Figure 3 provides an extract which describes the different levels and apprenticeships.

SCQF Levels	SQA Qualifications			Qualifications of Higher Education Institutions	Apprenticeships & SVQs
12				Doctoral Degree	Professional Apprenticeship
11				Masters Degree, Integrated Masters Degree, Post Graduate Diploma, Post Graduate Certificate	Graduate Apprenticeship Professional Apprenticeship SVQ
10				Honours Degree, Graduate Diploma, Graduate Certificate	Graduate Apprenticeship Professional Apprenticeship
9				Bachelors / Ordinary Degree, Graduate Diploma, Graduate Certificate	Graduate Apprenticeship Technical Apprenticeship SVQ
8		Higher National Diploma		Diploma Of Higher Education	Higher Apprenticeship Technical Apprenticeship SVQ
7	Advanced Higher, Awards, Scottish Baccalaureate	Higher National Certificate		Certificate Of Higher Education	Modern Apprenticeship SVQ
6	Higher, Awards, Skills for Work Higher				Modern Apprenticeship Foundation Apprenticeship SVQ
5	National 5, Awards, Skills for Work National 5				Modern Apprenticeship SVQ
4	National 4, Awards, Skills for Work National 4	National Certificate	National Progression Award		SVQ
3	National 3, Awards, Skills for Work National 3				
2	National 2, Awards				
1	National 1, Awards				

Figure 3. Diagram showing the SCQF levels and where modern apprenticeships apply²¹

Entry to the Cycle Maintenance unit would normally require learners to have attained the skills, knowledge and understanding required by a National 3 Cycling Maintenance Unit. Engagement with stakeholders included asking for views on the importance of modern apprenticeships when considering the types of training that the bike sector feels will add value to its further development. These discussions took place by also asking whether there was a need and opportunities for collaboration that might create a Scottish based accreditation, led by the reuse sector, for the sale, reuse and repair of second-hand bikes.

5.4.2 Stakeholder Engagement Results

The questions used to engage with stakeholders, to discuss the status and opportunities related to training and certification schemes are shown below:

- What systems and standards are you aware of that are currently in place, at a national level, to drive forward the sector, providing high quality training?
- What do you think are the strengths and weaknesses of the current systems and standards?
- How should training standards or frameworks be developed in Scotland? e.g. are you aware of standards and/or systems in other countries that you believe should be considered for Scotland?

The overall views of those interviewed are given in Table 5.

²¹ <https://scqf.org.uk/support/support-for-employers/understanding-qualifications/>

Table 7. Overview of Scottish Organisations' Views on Training and Certification Schemes

Org.	Current Situation	Future Developments
1.	Currently provide training for staff to meet a range of OEM standards associated with using their spare parts. For example, if they are using Shimano bike parts there is a 4-day training course. Velotech and Cytech also have their own courses, with the former costing £480. However, this is subsidised for companies such as Angus Cycling Hub.	The existing training schemes and associated standards provide enough of a mix - no new schemes that would add complexity are desired.
2.	Not discussed.	A Scottish-based accreditation system would be a great development, but not with "re-use as the focus". It just needs an emphasis on how to develop bike mechanics through skills development and training. A college-course to be developed for this
3.	No specific training requirements, but would like to be able to train up young people. Operate to the Revolve standard, train up volunteers where they can; where volunteers have skills they use them in line with the Revolve procedures. Training is very difficult as it is so expensive. Courses are about £2,000 with the travel and accommodation for 10 days adding to this considerably.	They are currently setting up a course with Dumfries and Galloway college, 1 day per week for 10 weeks that provides an accredited qualification which is free to them. This will start in the autumn 2021 and they see it as opening new opportunities. They have provided the bikes for the college to use.
4.	They looked at how to get people through apprenticeships, but could not find anything for bike mechanic	They would be interested in a modern apprenticeship for bike mechanics – with support for this.
5.	Having trained mechanics they believe it is important for throughput, accessing spares, and making people feel that they have a valuable skill - no comment on the preferred skills delivery mechanism. Also important for them is skills in how to run a bike business, customer facing, marketing, accounts admin, management etc.	They are aware that they could potentially have issues if someone ever tried to sue them. No insurance requirement, but this is why the Velotech/Cytech course was undertaken.
6.	SCVQ levels 1 to 4 (latter is a SVQ), e.g. through City and Guilds.	They commented that the current SVQ is about maintenance, but too shallow for businesses like theirs. Velotech and Cytech are more focussed on new builds. A modern apprenticeship packaged and targeted at remanufacturing of bikes, including ebikes, is needed.
7.	They provide on-the-job training and can see that if qualifications (e.g. apprenticeship) would get more people interested and into cycling this would be a good development.	More important for them is attitude and commitment – a new employee had to be trained on the job, and because of their personal attributes it has been a positive engagement.

Org.	Current Situation	Future Developments
8.	They are happy with the Velotech approach which is hands on.	If they are able to support more young people into work in the future they might need to look at City and Guilds. The Revolve portal provides useful training on aspects like customer care etc.
9.	They often get people with bikes that have been repaired but was not done well enough. They use Cytech for training and consider this the best industry standard, but needs to be backed by workshop support.	The focus should be on assessing ability in the workshop rather than simply doing a theoretical course.
10.	For ebikes, their view is that the trend is towards integrated components likely to be linked to manufacturers, so they generally have to go back to manufacturers for repair.	They believe courses may need to be linked to manufacturers for the reasons given opposite.
11.	Cytech & Velotech are training systems they work to - good enough. They are one of four Velotech Centres in Scotland.. For community learning and support they are delivery partners for the Venture Trust, a residential scheme involving in-house training. The funded training programme resulted in 4 extra employees (mechanics) in April 2021 - another 4 next year (2022).	They are happy with the status quo.
12.	Cycle mechanic, City & Guilds framework, used for trainees at the moment.	A modern apprenticeship would be a positive thing. They are looking to encourage the roll-out of the existing City & Guilds framework for a 1-year apprenticeship currently only available in England. The fact that there is something available in England is great news, as even if it needs to be tweaked to suit the needs of the industry in Scotland, it is much more affordable than starting from scratch.
13.	Not commented on.	Not commented on.
14.	They work to Velotech gold and have two Kickstart placements - on the job training.	They would be interested in providing further training opportunities through an enhanced bike centre.
15.	Not stated	They support a Scottish-based quality standard for the repair of, service and sale of, second-hand bikes – this monitored and awarded by a third party, NOT linked to a formal training certificate or accreditation for individuals.
16.	No comment	No comment

Views on training are not available for two organisations engaged, and another two indicated they had no preferences in terms of:

- Formal delivery mechanisms for training, since attitude was the most important factor, accompanied by on-the-job training; or
- Courses may be better linked to manufacturers' needs.

The views expressed by the stakeholders are summarised in the table below, based on fourteen responses (three added further information bringing the total number of responses to seventeen).

Table 8. Stakeholder responses on training preferences for the future

Happy with current systems	Modern apprenticeship / accredited training course - bike mechanics	No preference	Wider and/or More Holistic Training	Other Considerations More Important	TOTAL
4	6	2	3	2	17

Those organisations indicating that they are happy with the current systems were in a minority position. Of the three that indicated a "wider training and/or more wholistic training" offering would be a positive development, one stakeholder added that this should be as part of a modern apprenticeship development. The three views expressed included:

- There is a need for training on remanufacturing, since Velotech and Cytech are more focussed on new builds;
- There is a need to understand how to run a bike business, be customer facing, understand marketing, accounts admin, management (within the modern apprenticeship); and
- It would be a positive development to have a Scottish-based quality standard for the repair of, service and sale of second-hand bikes- monitored and awarded by a third party. However, NOT linked to a formal training certificate or accreditation for individuals.

Other related stakeholder feedback was that:

- Dumfries and Galloway college are setting up a course in partnership with them, to provide an accredited training course; and
- A modern apprenticeship, bicycle mechanic, would be a positive development, and with an apprenticeship available in England²² this would mean that developing one in Scotland would be more straightforward (do not need to start from scratch).

6.0 THE POTENTIAL ROLE OF OEMs & RETAILERS

(NEW BIKES/SPARE PARTS MANUFACTURERS & SUPPLY CHAIN IN BUILDING CAPACITY)

6.1 OEM Developments in Scotland and rUK

A number of companies (mostly in Scotland) interested in developing new, whole bike and/or component assembly business plans were engaged – most of these were organisations in the early days of developing their business plans, however, a number (2) are already operating. Examples of the key questions used for these discussions are shown below for indicative purposes:

- Have you considered developing your business in the pedal bike or ebike re-use market?
- Is there any opportunity for your company to trade or collaborate in the re-use sector - providing affordable access, through re-use of cycles from sales and leasing projects?
- Circular Business Models - are you interested in working collaboratively with the re-use sector? Do you have a circular business model?

The results from these interviews are summarised in the table below.

²² <https://findapprenticeshiptraining.apprenticeships.education.gov.uk/courses/339>

Table 9. Summary of stakeholder views involved in new bike and component initiatives in Scotland

Org.	Current Status	Circular Business Models for the Future
1. SB&C	Aims to develop a reshoring business in Scotland – two models, with one focussed on remanufacturing	Model where a remanufacturing line works in tandem with a new bike manufacturing/assembly line. The former taking second hand-bikes, evaluating them, replacing old parts with new, repainting and selling as a high-quality remanufactured bike with a warranty. This line could be a good place for people to develop their skills, with the potential to transfer over to the higher throughput new bike assembly/product line.
2. EL	Working in partnership with Specialise UK, it does not involve re-use - it is collection for recycling - ebike/scooter batteries pre-processed (granulated/shredded?) before being sent to Germany and Belgium.	It is early days to understand how much of Scotland will be provided with coverage.
3. IBL	The Imagine Project (2015/2016 to end of 2019). A kids' bike (looks like an adult bike but smaller) built on circular principles, on a leasing basis - bikes as a service. It was thought that people on lower incomes might be interested in this model, but the first adopters were actually cycling enthusiasts, people interested/working in the environmental sector. The charge was £30/month.	They only leased around 30 bikes, and the project was dropped. They had problems with the quality of the steel frames, with more failing tests at the factory than making it through to sales. The skills and experience of the project are informing other specialist bike development projects and they are looking to reshore items like frames to England (as a number of others already have).
4. DEC	Described in the international section	
5. PCL	Focussed on providing frames + suspension units to customers who then add the rest. Not sure what they could do from a re-use/circularity perspective.	Would be very interested in finding local partners to provide high quality, premium paint finishes to frames, and then ultimately a local partner for the frames themselves, potentially.
6. HL	Have sold second-hand bikes from time to time in store. Currently have a trade-in pilot in Wales, for Carrera kids' bikes, which will be reworked and sold - not generating much interest/returns at the moment.	<p>The voucher system generated a lot of sales and cycle repair discount vouchers would be a strong incentive in the future. They could probably offer 10 to 15% of the cost discounts as a contribution e.g. for NHS staff, as part of a Cycling Scotland grant scheme.</p> <p>A refurbished components supply chain would be of interest to them. A potential partnership could involve bikes collected being in one location where they could then process these fast with their technician team.</p>
7. WBL	Current focus is sale of ebikes (custom-built), but also provide service and repair. Also have a leasing side to the business, but mainly focused on the tourist market. lease between 1 day and 1 week.	May still be early days with e-bikes i.e. not getting old bikes yet, get good back up from OEMs who have paid for own training to be able to repair the components.

Org.	Current Status	Circular Business Models for the Future
8. IDL	Developing a new integrated motor and gearbox system, using IP-protected design. Very interested in making the gears in Scotland, and assembling the units in the country, but to date the potential for doing this is in other parts of the UK and continental Europe.	The products are for high quality, new, ebikes. Currently is going through pre-commercialisation research at the moment, and is thinking about the potential for also selling reconditioned units, as well as providing the repair centre for their units as part of a future business model (rather than repairs being done by bike shops).

6.2 Discussion Points

Views expressed by a number of different stakeholders was that developing bike assembly facilities in Scotland could in turn facilitate the development of a more sustainable re-use sector. It could do so by:

- Increasing the supply chain of parts (associated with new build);
- Generate a clustering effect with more employment opportunities for trained staff.

Another potential benefit may be that social enterprises could provide assembly and/or other services for new bikes and components. It was commented by an international stakeholder that this is something which happens in Belgium, but is not advertised.

In addition, as indicated earlier in this report, Decathlon in France is beginning a project to pilot the leasing of children's bikes, which after the child has outgrown i.e. (may be one year) will then be serviced and resold as a second-hand product. By setting up this model a spare parts supply chain is developed for a range of standard bikes. There is then also the added benefit of a commercial return which is based on both leasing revenue, plus the sales value of a well-maintained, second-hand bike, which also extends the life of the product.

In the UK, retailers such as Halfords are undertaking a pilot trade-in project for Carrera children's bikes (in Wales), and at the time of writing feedback on the throughput of this suggests little take-up in the weeks since the pilot began. However, it is still early days in terms of this pilot, and Halfords have indicated their interest in selling second-hand bikes from stores in the future. They have also indicated that they are increasing the number of staff employed in a bike mechanic role, with a small number of mobile mechanics now being recruited. The latter is an area where both Halfords and the company Cycletrade (Glasgow-based) are expecting to see growth over the coming years.

7.0 E-BIKES

The sale of e-bikes has increased significantly in Europe over the past three years and, at a wider European level, these are currently estimated to represent about 17% of EU bicycle sales, increasing to 50% in some countries²³ (Figure 4 illustrates this growth). This is driving down costs which is opening e-bikes to a larger market. Discussions with e-bike sellers in Scotland, as well as a small company based in Peterculter Aberdeenshire, that converts pedal bikes to e-bikes, confirms these high levels of growth within a Scottish context.

²³ European Mobility Atlas 2021, source: https://eu.boell.org/sites/default/files/2021-07/EUMobilityatlas2021_2ndedition_FINAL_WEB.pdf?dimension1=euma2021

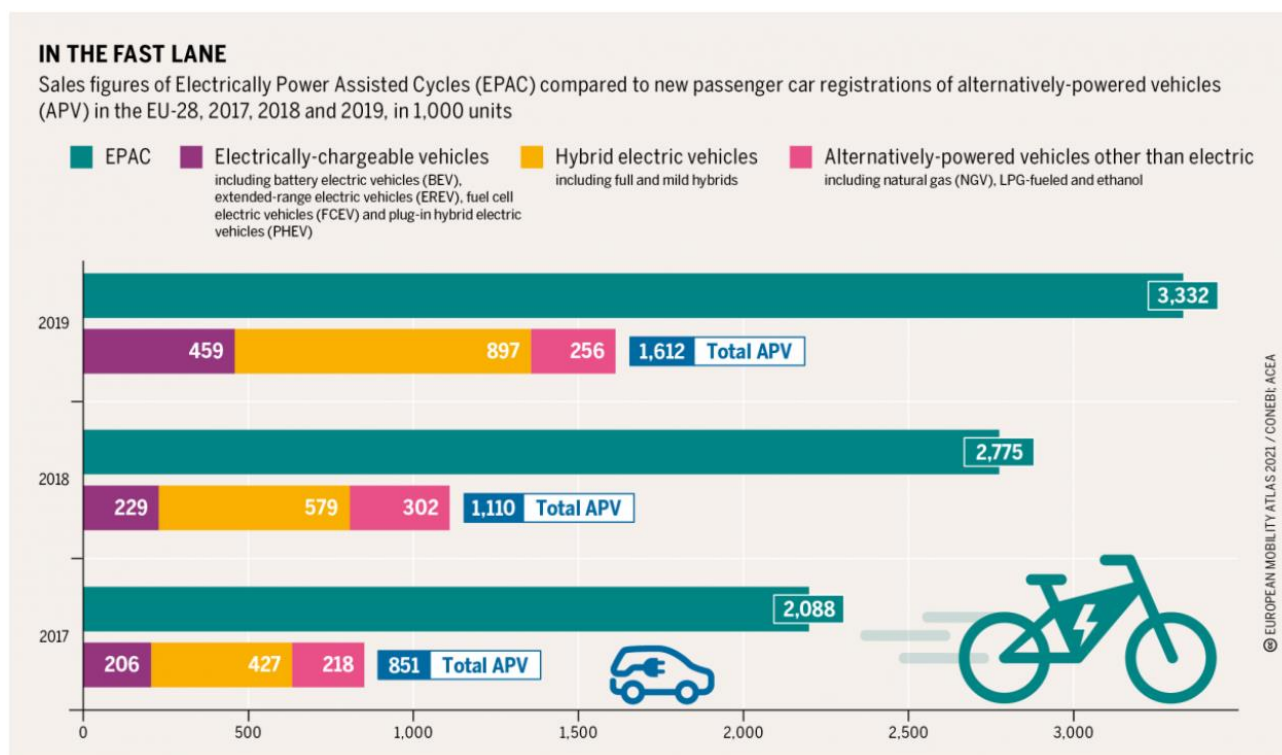


Figure 4. -E-bike growth (European Mobility Atlas, 2021)

E-bikes are now emerging in the re-use sector, with batteries being an area under discussion. For example, some OEMs do not want these touched, preferring them to be returned as part of a supply chain process to them, or partners, for a certified repair. However, a number of organisations have decided to repair these, regardless of the loss of warranty.

A concern was raised about the lifecycle of e-bikes e.g. an, unpublished Life Cycle Assessment (LCA) undertaken by OVAM in Flanders indicates that they are four times the impact of standard pedal bikes. It was also commented that in a country with a cycling culture their use could be a sign of people, in particular children getting less exercise, and this has to be questioned in terms of whether this is a positive situation. However, on the other it was also recognised that e-bikes can be important incentive in getting older people out cycling.

E-bikes will present additional challenges to the reuse market. Although the overall bike can be maintained and repaired in the same way as a standard bike, e-bikes include a motor and electronics that can go wrong and eventually they will need a battery replacement. For the reuse organisations engaged in this project, a number are now starting to see small numbers of e-bikes coming through, but these are not yet requiring battery replacements (smaller repairs needed). These are seen as both a challenge and opportunity for the future. Some companies selling e-bikes undertook repairs initially through the manufacturers' warranty and report good back-up from the OEMs. A number of observations were made:

- Due to the higher value of e-bikes it is likely/possible that they will remain in circulation for longer.
- The repair of the electronic elements of e-bikes is not universal. Software for checking systems is specialist to the manufacturer as are motor components that are designed to fit within specially designed frames. Specialist training is therefore required by the manufacturers which the bike shops have to pay for. Bike shops tend to therefore specialise in the repair of the brands that they stock.
- The need for specialist training is likely to be a challenge for third sector reuse organisations who do not know what makes they are likely to get. One third sector organisation in Austria had decided to only repair one type of e-bike (Bosch) as this is the most popular make. These issues will be a consideration for the future reuse market for e-bikes.

As mentioned in the 2021 Zero Waste Scotland report (unpublished at time of writing), "Battery Use in Scotland Now and In the Future":

"... the major challenge to the feasibility of Scotland's potential to develop a large-scale refining and manufacturing capability is competition from other areas of the UK. The UK's automotive manufacturing hub is in the West Midlands and as such the battery manufacturing industry may well gravitate to that region also."

During the course of this project, the company Ecoshed was engaged, which is planning to set up collection infrastructure for e-bike batteries in partnership with Specialise UK. These batteries will be collected, pre-treated in England (may involve shredding) before being exported to other European countries, such as Belgium, where there are large-scale smelting facilities, able to recover a number of the metals (though not all). For businesses in Scotland to generate business models related to the logistics (storage, collection, movement) of e-bike batteries the challenges highlighted here will need to be addressed head-on and opportunities for added value identified and supported, where needed.

8.0 POTENTIAL FUTURE BUSINESS MODELS AND INVESTMENT FOR GROWTH IN AFFORDABLE BIKES

8.1 Overview

Figure 2 of this report highlights a wide range of business opportunities associated with bike re-use and circular business models. All of the features highlighted are currently being implemented by organisations, though very few, if any are delivering all of these at the same time. The table below takes each of these service features and comments on the opportunities and challenges identified in the delivery of this project.

One of the examples mentioned in Table 9 is the recovery of good/high quality components, cleaned, repaired where necessary and sold (ideally online) with a warranty. A stakeholder offering this service commented that many repair shops will say that there is not any value in old components. As an experiment they took the waste bin from one shop and realised £400 value from this. The “sweet spot” at the moment is part exchange where someone brings in a bike to get a deal when buying an ebike. The shop will send them photos, they will give a price for the parts, which the shop can then use to make a deal.

In terms of e-bikes a concern expressed is that any subsidies for new ebikes in the future will make it harder for the re-use sector to compete. It was also commented that the £50 “voucher” repair scheme in Scotland had limited value, because people wanted to take advantage of the £50 to have a fully repaired bike, not for this to be a part payment of a much larger bill to get the bike on the road. However, more is commented on this later, with respect to interim data on the repair scheme.

In terms of long-term subscription/leasing models, feedback from stakeholders is that one job per hundred bikes could be created, and if a project such as this were to gain traction in Scotland, there could be the potential for 100 jobs to be created for a business leasing 10,000 bikes across the country. Bespoke software and app system developments are now increasingly being offered to support the management of such systems.

For information, the way in which free-floating systems work, referred to in the table, is illustrated in the following figure.

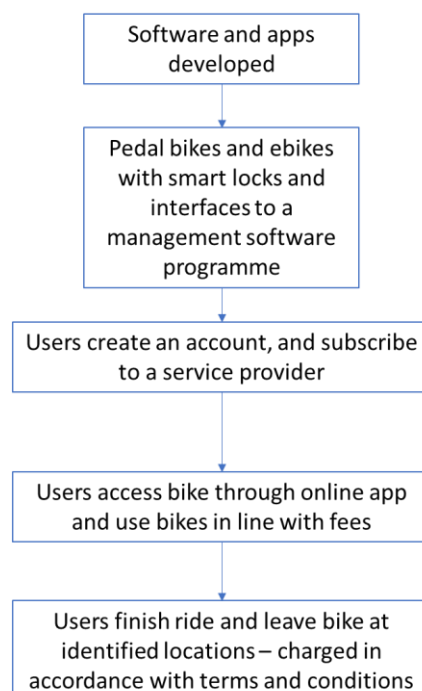


Figure 5. Indicative illustration of a free-floating bike sharing system

Table 10. Summary of stakeholder views involved in new bike and component initiatives in Scotland

Service	Opportunities	Challenges
Funded training	Bike training, as part of a wholistic and inclusive community service can provide health (physical and mental) benefits to a wide range of people and assist in getting those into work who otherwise may have challenges. As in continental Europe where many social enterprises provide this service this requires funding commitments that go beyond the short-term.	If organisations depend on this funding, rather than developing a range of other funding routes they will be vulnerable to future changes in policy and funding commitments.
Bike sales – increase output	<p>Second-hand bikes can provide a reasonably predictable income stream when operating in an economic climate that is not stressed and negatively disruptive.</p> <p>Stakeholders have identified that they can recover more bikes for resale than is currently the case. However, they also need to be selective, to work with higher value bikes where the resulting sales prices offer a viable business model.</p> <p>A stakeholder in the Netherlands and Scotland commented that they needed to buy and sell new bikes, to increase the range of income generating sources, and this may be an opportunity for any organisations in Scotland that are only focussed on selling second hand.</p>	<p>Many organisations have commented that they need more space and skilled staff to add value to bikes and recover parts.</p> <p>There are no margins on low value bikes, so businesses which accept everything made available (e.g. from HWRCs) are under pressure to have the storage and capacity to deal with these – where selling them as a job lot, or from scrap covers costs.</p>
Component recovery	<p>Second-hand components from disassembled bikes could be an increasingly valuable business model in a context of increased global demand for components. However, as with bikes there is likely to be a need to be selective and to choose higher value bikes where the resulting sales prices offer a viable business model. Second-hand components are already being traded in Scotland, and an important part of any offering is providing a warranty.</p> <p>An online sales presence could be an important factor in maximising value, in particular for spares which can be easily posted for a low cost around the country.</p> <p>Collaborative working with other bike shops can be important, in particular where a trade-in price for bikes is on offer and a value can be placed on these by the business that would recover parts from such bikes – allowing a trade-in price to be agreed with more confidence.</p>	Many organisations have commented that they need more space and skilled staff to add value to bikes and recover parts. Such scaled-up facilities will in turn offer more training scheme and employment opportunities.
Bike sharing	The adoption of free-floating systems, without docking stations is gathering momentum – see Figure 5 for more information. Social enterprises and/or existing private bike companies have an opportunity to be collaborators in such schemes, with skills not just in bike mechanics, but in logistics, marketing and	Bike sharing projects are profit driven and often involve local social enterprise partners to support their delivery. However, this type of collaboration is not always the case, or the scheme operators progressively take in-house the services delivered by

Service	Opportunities	Challenges
	<p>customer facing/sales roles.</p> <p>These sharing schemes involve the intensive use of bikes to be profitable, and therefore can be considered to be very much run with circular principles underpinning them.</p>	<p>partners.</p>
Roadside assistance	<p>The Forth Valley Bike Medic scheme, although used very sparingly, was considered by FEL to have provided confidence to bike users, some of whom were new to cycling, that if there was a problem they would not be left to solve it themselves.</p> <p>Stakeholders have indicated that they anticipate mobile mechanics to be a significant area of growth in the future, and businesses which provide this kind of service could be well-placed to include roadside assistance as a part of this. There could also be value in this being incorporated within a subscription service (see below).</p>	<p>In the short-term a roadside service which is not support funded may be a difficult commercial service for organisations to adopt. However, if it can be demonstrated as being likely to encourage more users, as part of a subscription service, and taken as a whole, project to be self-sustaining with financial support (e.g. within a three to five year period) then it could merit consideration within the package of green funding initiatives being delivered in the country.</p>
Leasing – subscription models	<p>Leasing as a subscription model is an increasingly targeted business model, as demonstrated in this report by Decathlon’s pilot project in France and Bike for Good’s plans for Scotland and beyond. From a cost benefit perspective these models provide a continuous income over a period of time, with the supply chain for parts developed to suit. The sale of a leased bike once this makes sense to do, means that there are two opportunities to cover costs and make profit (leasing and sales income).</p> <p>Company leasing schemes are considered to be a large growth opportunity in countries such as Belgium, with some large businesses leasing circa 1,000 bikes for their employees to move about their sites (significant numbers are also leased by a number of universities for staff and students to use).</p> <p>Bike libraries are also a type of leasing scheme, and in Belgium these are increasingly being used as a means of providing bikes to low-income households – for both adults and children.</p>	<p>Bike leasing is relatively new and untried in Scotland. The Isla Bikes leasing model (for children’s) in England was unsuccessful, with a number of factors likely to be associated with this – price, preference and marketing/awareness. All of these need to be considered and factored into any business model.</p> <p>The Bike Club has a leasing model which for children ranges from £3/month to £12.50 per month (compared to £30/month for Isla Bikes). A typical cost for adult bikes is £15 per month, and there is also a re-used bike option.</p>

8.2 Business Models and Addressing the Challenge of Lost Resources

To minimise the loss of valuable resources e.g. to recycling or landfill routes, the question has been considered of what can be done to keep and add value to used bikes, ebikes and parts. The business models referred to in Table 10 are very much at the heart of this, as most of these involve re-using more, adding value etc, which incentivises processes that encourage re-use in particular. However, some further considerations are summarised briefly here.

Awareness raising was identified as a way of encouraging householders to make bikes available for collection or to take them to HWRCs which have separate collection containers. This report has already highlighted research that indicates the significant numbers of bikes that are being hoarded in this way, and one stakeholder has emphasised that when householders are informed that their bikes will be re-used there is a significant increase in the numbers of bikes being made available.

A potential challenge in the future for organisations collecting bikes concerns the quality of those uplifted from HWRCs. If higher value bikes are targeted, then to avoid landfill disposal of bikes systems need to be in place that ensure bikes not uplifted are taken to the appropriate scrap metal containers, where they can then be recovered for scrap value and used in recycling markets.

A number of the stakeholders engaged with in this project are accredited with the Zero Waste Scotland Revolve Scheme, which seeks to encourage best practice in the systems employed by the re-use sector when managing and processing items. The methodology employed for this is most effective when it is incorporated as part of an online system for controlling stock, and an example of this was seen in a site visit (Stella's Voice) where data on bikes repaired and available for sale was managed in this way.

From a different perspective it has also been commented that demand for bikes has increased to a level which re-use businesses are currently not able to satisfy. The additional demand for bikes has meant that there are now many people who now own bikes for the first time and know very little about them. To discourage people from abandoning their bikes in the future, there needs to be more work carried out on simple bike maintenance training - to enable people to keep their bikes going.

9.0 SOCIAL RETURN ON INVESTMENT

9.1 Overview

Consideration is given here to the Social Return on Investment (SROI) from growth in:

- Bike refurbishment projects; and
- Investment in circular business models for bikes.

This work is informed by the research undertaken and described in previous sections, which considers:

- Public/grant funding support for bike organisations to grow and develop; and
- How public funding has supported community and circular business models.

Parameters considered include impacts related to health, social/community benefit, economic benefit. The analysis incorporates:

- Indicative data on potential costs and income generation; and
- Jobs and salaries provided.

An important aspect of the project involves consideration of the affordability of bikes, and how re-use can improve access. Affordability is also considered in the context of the government's manifesto pledge to "provide free bikes for all children of school age who cannot afford them."

9.2 Affordability and Accessibility

9.2.1 Comparisons of schemes and costs

A number of Scottish social enterprises are delivering services with affordability of bikes and services as a core part of their operational models/objectives, and this includes providing services for bike sharing, leasing/subscription schemes – these providing a source of income, capacity building potential as well as providing the basis for training more employees/volunteers. Growth and capacity building can potentially be further expanded to assist in delivering more affordable access to bikes e.g. through second-hand bike sales, bike libraries and/or leasing models more generally and this is covered in more detail in terms of potential costs and funding later in this section.

The type of bike sharing schemes that have been developing across Europe (e.g. Antwerp-Velo), including Scotland, in the last 5 to 10 years, have not been focused on affordability and do not in themselves provide

more affordable methods of cycling if considered as transport modes on a daily basis, when compared to the purchase/lease of second-hand bikes²⁴. Discussions with organisations involved in bike sharing schemes in continental Europe (described previously) have confirmed this - that bike sharing schemes can often be considered to involve significant levels of costs over the course of a year. It has also been commented that a focus in the past, with such schemes, has been to have them geographically accessible at strategic locations (e.g. next to train stations). This is highlighted here only for clarity, although some bike sharing schemes such as Next Bikes in Glasgow have introduced limited affordability elements.

The table below compares the cost of purchasing a second-hand bike versus the average costs for using a bike from sharing schemes. The price range for standard second-hand bikes and e-bikes (the latter with very small numbers available at the moment) can vary considerably. Depending on where a buyer is, and the availability, type of bike etc, bikes can be bought for significantly lower and higher prices than those shown. However, from conversations with stakeholders the range of prices shown tends to be the more common level at the time of writing.

Table 11. Indicative prices associated with second-hand bike purchases and sharing

Operating/Business Model	Standard Bikes	e-bikes
	£ Purchase Price	£ Purchase Price
Second-hand bike resale	~£80 to £150	~£800 to £1,200
Bike sharing / subscription	£ pa	£ pa
Less than 20 minutes/day	£60	£940 ^a
2 x 40 minutes/day	£280	£1,820 ^b

a) Based on 220 days (5 days / week for 44 weeks pa), £4/day x 220 days = £880 + £60 subscription

b) Based on 220 days (5 days / week for 44 weeks pa), £8/day x 220 days = £1,760 + £60 = £1,820

The above indicates that where users require/want bikes for daily use beyond 20 to 30 minutes, purchased, second-hand bikes are much cheaper options than those often available in bike sharing schemes. However, for shorter duration journeys the differences are not as marked and could be argued to be cheaper, for standard pedal bikes, depending on the period of time considered.

In Glasgow, the Bike for All scheme has been operating in parallel and in collaboration with Next Bikes, Bike for Good and the city council, where people referred to this are offered an annual subscription for £3.00 instead of £60. If their journey can then take place in less than 20 minutes the annual charge for bike sharing is £3.00. The cost of this scheme is offset by grant funding and is used by a relatively small number of people – the Next Bike scheme as a whole includes 870 standard bikes and 126 e-bikes i.e. 1.5 standard bikes for every thousand people living in the city. Aberdeen City Council announced in March 2021 that it would also begin a free-floating bike sharing scheme, with the Big Issue a partner in this, its role being to recruit locally, to undertake the maintenance for tasks such as bike re-distribution, bike maintenance, contact centre, and battery charging. It is not clear at the time of writing what the fee structure will be for this, and whether there will be a discounted option such as the one available in Glasgow.

However, the wider variety of business models in place across Europe, described previously in this report, is increasingly available across Scotland, with different levels of accessibility/affordability associated with all of these. The re-use of bikes to support accessibility and provide more affordable options is an important part of this, with 16 Scottish organizations participating in this research operating in this area.

9.2.2 Scottish Cycle Repair Scheme (SCRS)

Cycling UK were responsible for delivering the SCRS for Transport Scotland, with the aim being to assist with repairs and maintenance, and support people across the country to use their bikes. The original grant of £1.5 million was expected to return around 30,000 repairs as the maximum repair value was capped at £50 (except for adaptive bikes, where the cap was £100). As some repairs were completed for less than £50, the total number of repairs recorded under the scheme by June 2021 was 31,562. All funds were awarded

²⁴ At the time of writing Aberdeen has announced a free-floating bike sharing scheme in partnership with the Big Issue, and the pricing structure for this has still to be announced.

under the scheme by 31st March 2021. Repairs were booked in or carried out until 31st May 2021. Other additional information on the scheme, with respect to its uptake includes:

- Shops were asked to record the total cost of the repair and from this data, SCRS recipients paid for approximately £629,800 further work on their bikes beyond the £1.5 million funded by Transport Scotland;
- It is difficult to estimate how much of this demand was created by SCRS and how much would have happened without the scheme. Around 25% of recipients of the scheme indicated that they were “planning to get the bike repaired anyway”;
- Cycling UK asked survey respondents (4,842 or 15% of all SCRS recipients) whether cost had been an issue in getting a bike repair. 47%, almost half of respondents (2,267) said that cost had been a barrier, indicating they were the intended targets of the intervention on the grounds of financial difficulty.

The above is provided to highlight recent experience with respect to how important it is to have an availability of bikes, in good condition and at an affordable price, for many people to renew or begin cycling.

9.3 Cost Benefit Analysis and Grant Funding

Cost Benefit Analysis (CBA) work has been undertaken to consider the example of a bike business managing second-hand bikes, to support discussion on how volume and grant funding levels impact on cash flow and viability. The findings from the CBA are then built on in following sections, to illustrate how such a business could then deliver a government-funded programme for bike leasing and ownership – for children and adults where affordability is an issue.

The CBA has been developed and considered to also illustrate how sensitive a hypothetical bike business is to the number of bikes managed, and the point at which grant funding is required. This is illustrated for a bike business which is focussed on second-hand bike sales, with two levels of throughput considered - 3,500 and 5,000 bikes per annum. In terms of the split of bikes, this is 75% adult and 25% children’s bikes received, with 50% of the adult bikes re-used/sold (£100 each) and 20% of the children’s bikes re-used/sold (£50 each).

Appendix D provides summary tables of data from the CBA, and Appendix E is the Excel spreadsheet used with details in terms of costs and incomes.

The outputs from the CBA demonstrate/emphasise that, with the cost and income structures as shown, the number of bikes the business can access and then convert to sales has a significant impact on its viability i.e. like many business models, volume, and the effective management of this is fundamentally important. The tables show that with 3,500 bikes being accepted the business model **is not viable**, and grant support is needed. With 1,500 more bikes accepted and processed by the business there is a healthy annual cash flow **and no grant support is needed**. The challenge for any bike business, however, is to get access to bikes of the required quality and throughput, and to then focus its activities on those which provide commercial returns.

For social enterprises taking a wide range of bikes, of unknown condition, in large quantities (e.g. from HWRCs) and with a social purpose which involves providing training, capacity build for vulnerable people in some circumstances, having a business model which fits the above profile may be difficult to obtain. Those social enterprises engaged in this research project which are dedicated to bike re-use were all receiving some level of grant support – this applies to both Scottish and international organisations.

However, the above is only one of a number of potential business models, and an alternative, equally viable one could be where sustained, long-term funding is provided to a social enterprise bike business for the provision of health and social services to the community e.g. providing a social good, through training to excluded groups, those finding it challenging to get into employment etc. If/when funded as part of a government programme this can be viable operating model, in effect redirecting the primary focus of these social enterprises, where refurbishing bikes in itself is not viable.

9.4 Cost Benefit Analysis - Providing Free Bikes to Children and Low Cost Leased Bikes to Adults

This section considers, indicatively, the potential costs to businesses, of providing more affordable bikes than is currently the case, doing so through the provision of free bikes to children, and low-cost bikes to adults. These costs then represent the scale of subsidy that government would need to pay businesses to provide specific levels of affordability. As mentioned in Section 9.1, one of the reasons for considering the cost to government of a free bike for children scheme (where affordability is an issue) is that this was a manifesto pledge in the 2021 SNP election campaign. It is an approach which is not unique, with the example given

earlier in the report of a scheme being taken forward in Lille, France, where 10,000 schoolchildren will be given free bikes (second-hand bikes will be a part of this), and in Belgium bike libraries are providing extremely low-cost bikes in what is a leasing scheme for children – at a cost of circa £1 to £1.40 per month (15 to 20 Euros per annum).

Using the CBA approach referred to in the previous section, consideration is given to providing free bikes for children and low cost leased bikes for adults using the following baseline and scenarios:

- Baseline, or Business As Usual (BAU) – standard processing and sale of second-hand bikes, as well as providing a number of bikes for a sharing scheme (incidental to the scenarios), with repair and maintenance services also provided;
- Scenario 1 – provision of free children’s bikes for ownership;
- Scenario 2 – provision of children’s bikes as part of a free leasing model; and
- Scenario 3- provision of adult bikes as part of a discounted leasing model (£7.50 per month – 50% of other leasing scheme costs identified).

It should be noted that the baseline/BAU CBA used involves there being no need for grant support, an approach that is used to simplify the description of this analysis, and to assist in making comparisons with the scenarios. This is achieved by having 5,000 bikes received at the hypothetical organisation being modelled per annum (which as discussed previously is a key parameter in terms of being able to operate profitably).

The detailed costs and income are shown in Appendices D and E, with the turnover shown as being £585,680, with annual cashflow £120,544, the major part of this being income from bike sales, derived from the following:

- 50% of the adult bikes (1,875) recovered and sold for £100 (adult); and
- 20% of the children’s bikes (250) being recovered and sold for £50 each.

The below summarises the cashflow for each of the scenarios, compared to the baseline, and the resulting cost per bike is shown.

Table 12. Annual Cashflow Summary for the Scenarios

Parameters Measured			
Baseline cashflow, £	120,544		
	<i>1. Free Kids’ Bike</i>	<i>2. Free Kids ‘Lease</i>	<i>3. Low-Cost Adult Lease</i>
Scenario Cashflow, £	62,241	63,491	-83,406
Scenario cashflow difference compared to baseline, £	-58,304	-57,054	-203,951
Cost of scenario per bike, £	-233	-228	-218
Additional Jobs/Employees Required (FTEs)	0.7	1.0	2.6

In summary, the table above indicates that the Scottish Government would need to grant fund free bikes for children and low cost, leased bikes for adults for between £218 to £233 per bike per year, on the basis of the cost assumptions made (see Appendices D & E). This may appear to be a costly approach at first glance, however, the services being provided include:

- A bike built/prepared and serviced by a qualified bike mechanic;
- A service provided in the first year free of charge; and
- A heavily discounted (80%) repair service for a breakdown.

For the costs above the purchase of an average new kid’s bike is possible, as well as a budget adult’s bike. However, servicing and break-down can involve significant costs, and act as a barrier to continued bike use, particularly exacerbated for people with affordability challenges. The above also represents a circular model, with local benefits through direct, indirect and induced jobs, and the resulting value to local economies.

The above data is used later in the Social Return on Investment (SROI) calculations and discussion.

9.5 Growth, Jobs and Value to the Economy

At the beginning of this report (Section 2.1) it was estimated that there may have been in the order of 213,666 bikes purchased in Scotland in 2019, 205,407 of which were pedal bikes, the remainder e-bikes.

In Section 5.2 it was estimated that for the organisations engaged, 16,277 second-hand bikes were sold, and that the organisations providing this service employed 135 people (involved in more than bike repairs, maintenance etc). Most of the organisations engaged with considered that they could grow their operations for example, by 50% in some cases. If applied to all of the organisations this would lead to an additional 67 jobs. In section 8.1 it was indicated how a further 100 jobs could be created, associated with a subscription scheme for 10,000 bikes across the country (circa 5% of the new bikes total estimated to have been purchased in 2019).

The potential value of growth of the kind above is considered in this section on the basis of additional jobs created, each paying the real living wage. The cost of one Full Time Equivalent (FTE) staff member earning the living wage is estimated on the basis of the hours, national insurance (employer) costs etc shown below.

Table 13. Real living wage salary costs

£/hr	Hours/Wk	Weeks pa	£ pa	£ pa, incl. NI & Pension Costs
9.30	38	52	18,377	21,317

The value to the Scottish economy of 50 and 100 additional jobs created through circular business models in the bike sector are provided in Table 14.. This covers growth in jobs associated with selling more second-hand bikes, or jobs in leasing of new bikes only (or a combination of both).

Table 14. Additional Jobs and Incomes²⁵

Additional Jobs				Additional Incomes per year			
Direct	Supply Chain (Indirect)	Wider (Induced)	Total	Direct	Supply Chain (Indirect)	Wider (Induced)	Total
50	20	15	85	£1,065,850	£426,340	£319,755	£1,811,945
100	40	30	170	£2,131,700	£852,680	£639,510	£3,623,890

One stakeholder had indicated that they may be able to provide a subscription/leasing model where one employee/job is created per 100 bikes (adult bikes). However, business models such as this need to be implemented to understand the reality and further work done to understand how these can evolve e.g. would implementation of the model prove that 50 direct jobs is actually what is required? Also, would these be sustainable over a period of time and/or is there a case for public intervention (funding support)?

It should be noted that one current subscription model (the Bike Club) is providing adult bikes for leasing at prices of £180 to £300 per bike per annum i.e. leasing alone would generate between £1.8 million and £3 million income per 10,000 bikes, with the resale value of the bikes then to be added to this once the leasing period is finished. In terms of this last point, for emphasis, a subscription model can be viewed as circular (depending on how it is operated), with the bikes maintained to last, and once their leasing life is finished, they can then be resold.

9.6 Skills and Benefits for Society

There are two broad areas of scope for Social Return on Investment (SROI) from developing circular bike models (involving re-use, extending life etc):

- 1) Supply chain benefits
 - a. Upskilling
 - b. Volunteering

²⁵ Figures based on repair and maintenance SIC code 33 (in absence of code 7699). For multiplier tables (latest year 2017). Source: Supply, Use and Input-Output Tables: 1998-2017 - gov.scot (www.gov.scot)

- c. Increase in *good quality or accessible* jobs
- 2) User and societal benefits
 - a. Improved health of bike user
 - b. Reduced pollution through displacing carbon-consuming activities
 - c. Reduced cycle waste
 - d. Long term habits
 - e. Increased happiness / wellbeing

This project and the financial considerations made in this section are based on the potential for commercial and social returns that are related to the number of bikes leased, sold etc i.e. are highly volume-related considerations, where one extra bike being used creates a social return in itself. This has strongly positive implications for policy because a per-bike analysis and logic for assessing social return is largely possible. The benefits and costs associated with changes in behaviours, attitudes and the creation of a critical mass for cycling lanes and infrastructure is outwith the scope of this report.

An equality of access argument should, in some respects, be averaged over the whole of the bike use volume rather than that which is subsidised to aid access. So, if 1 million bike users are encouraged, and 100,000 bikes are provided subsidised or free at point of use, then some costs might be reasonably assessed across 1 million users rather than 100,000. Nevertheless, this report will set out policy options using the subsidised or targeted volume for the most part.

The embedded social return on investment per additional bike user can be set out here – some SROI measures have associated quantitative values (associated with numbers of people using bikes), but it is also important to consider the wider benefits, by taking a holistic policy approach.

Table 15. SROI impacts, evidence and valuation

Social Return	Impact, evidence, valuation (click on links shown in blue below)
Health benefits	<p>There are studies and resources assessing the health benefits and avoided health costs of bike use:</p> <p>The economic benefits of walking and cycling - GOV.UK (www.gov.uk)</p> <p>Cycling could cut billions from public health costs - Urban Insight (swecourbaninsight.com)</p> <p>DMBinS Mountain Biking & Mental Health Programme 2018</p> <p>DMBinS - National Mental Health Awareness Week</p>
Reduced pollution / improved environment	<p>Analysis of benefits from avoided pollution:</p> <p>Health_costs_environmental_pollution_FB21_en.pdf (europa.eu)</p> <p>How does walking and cycling help to protect the environment? - Sustrans.org.uk</p>
Reduced waste	<p>Large volume programmes are likely (from evidence from private sector providers such as Decathlon) have drivers to rationalise the parts ecosystem and have simplified supply and recycling models, i.e. it is in providers' interests to rationalise provision and minimise parts and waste.</p>
Long term habits	<p>Embedding good long-term habits:</p> <p>2019 record year for Big Pedal competition - Sustrans.org.uk</p>
Increased happiness / wellbeing	<p>Encouraging cycling for improved wellbeing:</p> <p>Cycling for wellbeing - Cycling UK</p>
Supply chain	<p>Creating 100 jobs by adding 10,000+ pre-funded bike subscriptions costing around £2m to taxpayers would be met by a £3.6m dividend in generated salaries across direct employment, supply chain and economy.</p>
Upskilling, good quality and	<p>Improving skills and long-term employability: Lantra offer grants to those seeking to upskill, and accessible jobs for school leavers is as important as tertiary education / high</p>

accessible jobs	skilled jobs. The decentralised nature of bike repair would make it a very well distributed platform for upskilling hundreds of people. Equivalent investments to achieve such training: Get help with training costs Lantra - Scotland
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Given the *per-user* benefits for society of supporting sustainable bike use, a key question is “how can this be translated into policy”? In principle, those who can afford bike use (either through ownership or a subscription / lease scheme) can be encouraged to avoid waste through commercial schemes. But there will be a cohort of bike users who are unable to take part due to accessibility and affordability issues – not only in purchasing, but also maintaining a bike. This may be a fundamental challenge to the whole system of supporting responsible bike use. By taking the total cost of providing a bike to those who would otherwise be unable to access one and considering how benefits can create a benefit “ladder” to reach the full cost of subsidy, this can inform policies such as the recent SNP manifesto commitment.

Subscription and leasing schemes vary in design and monthly charges, but there is some consistency across commercial offers at around £200 charge per year per user, or between £15-20 per month. This is close to the cost of provision per bike in the Cost Benefit Analysis (it should be noted that where a scheme has charged £30 per month for a higher quality bike, it has met with demand problems).

For the cohort of Scottish potential bike users, including children and adults, there will be a proportion whose ability to pay is not sufficient to cover £200 per year – especially if in a low-income family there are multiple potential users (children, adults). In such a case, the SROI (as described above) for supporting those users must either:

- Be justifiable per user, i.e. funding the cost of bikes for each user will derive or help create £200-worth of social benefit per year; or
- Be justifiable within a holistic model of total accessibility, i.e. covering costs for some users may be higher than individual social benefit, but over 5 million people it is a negligible cost.

An English study estimates up to £13.50²⁶ of avoided health costs per user benefiting from activity, though this seems a very low annual per capita estimate.

9.7 Calculating the benefit of a subsidy to ensure equal access for bike use

To recap, the costs of introducing subsidised bike leasing and/or ownership schemes is summarised indicatively in Table 12 – the range being costs that lie between £218 and £233 per bike. £200/bike is now used in the discussion below, as an approximation for these costs (for ease of description and rounding purposes).

The *per direct beneficiary* SROI on bike access might be lower in value (e.g. the £13.50 mentioned above per user) than the *per-beneficiary* £200 per year cost of a subsidised scheme for people with affordability issues. Even when increasing this to further consider the benefits of avoided pollution, the supply chain, training benefits etc it may be that it is difficult for these, when aggregated, to add up to £200 in benefit overall i.e. to compensate for the subsidy cost.

However, with regards to the importance of an equitable system, it is worth considering accessible use as part of the total bike use in the country and calculating benefit *across the whole system of users*. The illustrative model in Box 2 below is provided to explain this further.

Box 2. Illustrative model for 1 million bike users and consideration of disability policies and legislation as a comparator

If the aim of government policy was to encourage 1 million people to become bike users, and it was identified that 10% of these (100,000 users) would have affordability issues, then the cost of providing bikes to the latter would be £20 million (~£200 per bike). However, if the £20 million is considered across the population being targeted as a whole then the cost would be £20 per user.

A useful comparator for dividing an equality cost across all users (not just specific users) is disability legislation, which seeks accessibility in the interests of a whole-system approach to human rights. In such a case, if a building requires adaptation to allow access for all, it is not appropriate to divide the cost of, say, a wheelchair lift, by the number of wheelchair users, but by the whole-system number of users – the latter being a population that has voted for, and supports a society that has equal access for all.

²⁶ PHE standard publication template (publishing.service.gov.uk)

In the 2016 report for the UK Department of International Development (DFID), “Disability Considerations for Infrastructure Programmes”, it was stated

A summary of the discussion is available here:

“Infrastructure is critical to social functioning with direct impact on social wellbeing, earnings, education and health [our italics/emphasis]. When infrastructure is inaccessible to any social group, that group is at risk of social exclusion, unable to participate in and contribute to society. Transport Infrastructure is critical, as it is the means by which other services are accessed, including health, education, employment, etc. Urban environments without a universally accessible transport system will exclude people living with disabilities, marginalising them and breaching their human rights.”²⁷

Following the above approach, the cost of disability infrastructure, or in this case the funding of holistic bike-related schemes, the total cost should be measured across all users rather than those who require support to make the whole system equitable. This is illustrated further in Figure 6.

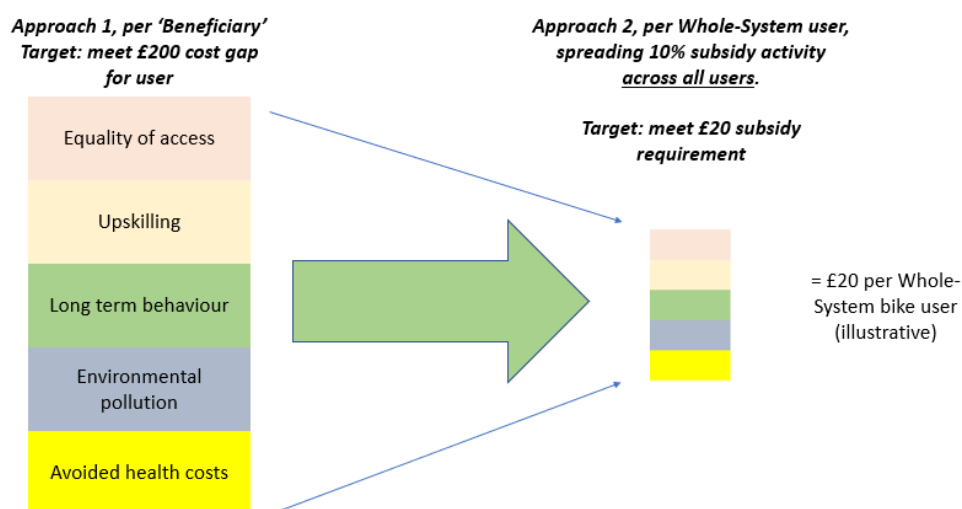


Figure 6. Per direct beneficiary cost vs Per Whole-System all-user cost

Despite the relatively high *per subsidised bike cost* (around £200 based on commercial examples and CBA modelling) there is a relatively low *whole-system bike per-user cost* (£20), which may be desirable to ensure that the equality of access to bikes is achieved, and which is essential for effective policy. There are three factors that give assurance of *Value for Money* in this context:

- 1) In practice, there will be a high recovery rate of bikes under a subscription / leasing scheme, so a bike may be reused after a year and if the asset is valued at, say £120-150, this reduces the total per-year cost to as little as £50-80 per user;
- 2) Using the whole-system approach of £20 subsidy per user, the benefits up the ladder (avoided health costs alone covering £13.50 of the £20) have the potential to justify public investment in such policies; and
- 3) In the most ambitious scenarios, there is an upper limit of around £20 million in costs for a subsidised scheme (described more below) for leased kids' bikes, plus policy implementation costs.

9.8 Summary - Subscription/Leasing Models & Bike Purchasing

The average cost of a bike in the UK stands at £263 to buy outright (see Section 2.1), but this is not the whole cost, with repairs, maintenance/servicing costs that need to factored into this so that bikes can be maintained in an accessible and affordable manner. Given that rental and subscription schemes have more material control over the bike and the asset can be recovered into the system, it seems reasonable to consider that rental/subscription at £200 per annum would be the more effective way of keeping bikes in use (than standard ownership models).

The total cost of a subsidised leasing scheme to address affordability issues need not be excessive – for example, if 100,000 bikes were funded centrally, that would total £20 million plus policy implementation costs.

²⁷ [EoD_HDYr3_21_40_March_2016_Disability_Infrastructure.pdf \(publishing.service.gov.uk\)](#)

At a lower volume, where a further 50 to 100 jobs could be created, associated with a subscription scheme for 10,000 bikes across the country (circa 5% of the new bikes total estimated to have been purchased in 2019), this would come to £2 million per year for implementation, more affordable to assist policy objectives.

10. OPTIONS FOR FUTURE RESEARCH AND DEVELOPMENT

10.1 Re-use and Circular Business Practice in Scotland and other European Countries

A wide range of whole bike, component re-use and circular business models are well established now in Scotland, as they are in many other parts of Europe. The sector in Scotland is comparable in many ways in terms of the type of activities and services being offered, compared to many countries that may traditionally have been considered to be further ahead e.g. the Netherlands, Belgium etc. A key difference is the number of bikes and accessibility/proximity to second-hand bike businesses. It should be noted that COVID-19 does not appear to have had long-term negative impacts on most of the Scottish organisations engaged, however there are a number of challenges with some.

An aspect of the bike sector, where Scotland is particularly underperforming, compared to many other European countries, concerns the number of bikes/parts manufactured and therefore jobs involved. This is not necessarily related to the number of people that actually ride bikes, since the largest producer of bikes and components in Europe is Portugal which does not have high cycling rates and exports 95% of its production. The European stakeholders engaged in this project have identified the importance of social enterprises in delivering bike re-use, leasing/subscription and sharing projects, as well as being important providers of social benefits by employing people who otherwise may find challenges getting into employment. They are also important providers of training for both staff, volunteers and, generally, members of the public.

Company leasing is a significant, new and growing opportunity. Maintaining these bikes, managing them in a circular way at the end of their lease is a way of making them last, with the potential for sales income after the leasing period. This could make enterprises more sustainable and through volume leasing provide significant income streams. The collection/donation of bikes for re-use and resale is a significant source of income for many organisations, however, for this to be a viable proposition bikes have to be of sufficient quality to command significant second-hand prices.

Many social enterprises have developed their business models to incorporate a diverse range of income generation activities in addition to bike resale, leasing and the provision of logistics services to bike sharing schemes. These include the earning of funding/grants to provide training, as well as partnering in bike sharing schemes, or the more traditional provision of servicing and bike repairs. In continental Europe, the buying and selling of new bikes is an important and complementary activity for many bike shops.

There are many social returns on investment in circular bike models involving re-use, and access for all is possible. Countries such as France, Belgium and the Netherlands are taking forward circular business models to support accessibility and affordability, with a special focus on children, with different leasing schemes (including bike libraries) being developed to provide free and/or heavily subsidised bikes. In France (twelve times the Scottish population) there are many hundreds of small, co-operative bike businesses, working at a small-scale to provide re-used bikes for sale at an affordable cost, as well as to provide training and employment opportunities. However, it is also understood that the French Extended Producer Responsibility (EPR) regulations 2021 mean that there will be increasing levels of incentive for larger, more general social enterprises to enter the bike re-use sector.

10.2 Potential Options for Further Research

The following table provides a summary of a number of potential options for government (and associated agencies) support to the bike sector in Scotland, with “do nothing” also considered, which in this context refers to the current funding and policy environment. This is further reflected on in the recommendations at the end of this report.

Consideration of opportunities to improve accessibility to bikes for, circular business models etc should take place in the context of a major, high-profile cycling event coming to Scotland. In 2023, Glasgow will host the UCI Cycling World Championships. This is an event that has the potential to create significant interest and enthusiasm in cycling, and there may be an opportunity to shape its legacy in terms of impacts on cycling levels in Scotland, bike ownership, leasing etc. There may be value in discussions taking place with the organisers to understand how Scotland’s bike sector can be involved and benefit from this. Circular business models associated with bike use and re-use are developing apace across continental Europe and Scotland, however, many innovations and business models in Scotland are at an embryonic stage.

Table 16. Summary of options for key partners, including social & profit-making enterprises, local authorities etc, involved in circular business models for bikes

Option	Advantages	Disadvantages	Comments
No change to current funding and policy environment	<p>Evolution of the sector is driven by individual business priorities and innovation.</p> <p>No further investment and no demands on the public purse.</p>	<p>Nascent, indigenous businesses may suffer in terms of realising potential growth aspirations through lack of risk capital.</p> <p>Social enterprises, providing a wider social good, continue to survive on a hand-to-mouth basis and lack long-term funding driven by strategic planning.</p> <p>Uncertainty about the way in which re-use and recycling rates will change.</p> <p>Issues with spare parts supply chain left to a market outwith Scotland,.</p> <p>Opportunities to develop more affordable options for bike leasing/sales not exploited.</p>	<p>Engagement with organisations in continental European countries has identified where Scotland has the potential for growth, in term of the private sectors, and in provided a social good.</p>
OEM support	<p>Developing an indigenous bike and component manufacturing and/or assembly sector, underpinned by circular business models, will generate high quality jobs and support supply chain development.</p>	<p>Targeting public funding/support at businesses in their early stages involves risks and uncertainty in the use of public funds.</p>	<p>Any programme aimed at supporting innovation will be associated with risk, however, in Scotland the growing interest in cycling, circular business models and business interest makes this a particularly fertile area for support.</p>
Development and delivery of national, optimised bike reclamation activities	<p>Greater numbers of bikes processed.</p> <p>National programmes for releasing unused bikes feasible.</p> <p>Increase in domestic spare part supply chain.</p>	<p>Potential to distort existing logistics supply chains for bike businesses if systems are not set up to incorporate feedback from across the sector.</p>	<p>Could be mitigated by assisting organisations to focus on profit-making activities.</p>

Option	Advantages	Disadvantages	Comments
Invest in a National Training/Certification programme	This would be supported by a number of enterprises and provide a recognised qualification - with the potential to extend this to a wider bike business training opportunity.	A number of key players are heavily integrated with existing, private-sector training programmes such as Cytech and Velotech and do not believe there is value in further complexity.	More capacity to process, build, remanufacture bikes will result from an increase in trained bike mechanics.
Engage with health and social care partners to identify long-term collaboration opportunities involving bike social enterprises	Circular business models associated with bike enterprises provide a valuable opportunity for training and work, targeting people with employment, mental health challenges etc. Developed with a longer-term perspective this will enable businesses to operate more strategically.	The development of the social enterprise sector to work in a more integrated way with health and social care partners requires complex stakeholder engagement and budget setting processes.	In Scotland a number of social enterprises are already providing employability and training services. They will be well-placed for engagement to develop approaches for longer-term strategic budget setting. The Scottish Parliament Health and Sport Committee in a 2019 report ²⁸ concluded: <i>"Systems and processes need to effectively support people to participate in and organisations to deliver ... essential preventative action. Upstream funding for infrastructure, utilisation of community spaces and support for organisations to deliver prevention activities highlighted in this report is required."</i>
Develop Scottish Bike Re-use Membership/Co-operative Organisation	Greater opportunity for small businesses to collaborate. Greater exposure to wider audience with improved online presence	Would require formal, legal structure. Not all businesses may want to participate, fragmenting the impact.	Would require support of Co-operative Development Scotland and seed funding from public sector to establish.
Develop a local charter/framework for sustainable cycling (including access to affordable bikes) - for local authorities and other organisations (private, not for profit, voluntary etc) to sign up to	Would provide a framework that everyone can sign up to e.g. to have shared commitments to make cycling accessible to the wider community.	Not all local authorities may want to participate, fragmenting the impact.	Could learn from the development of Sustainable Food Places - where each place (city, local authority etc) signs up to a charter/ framework for delivering sustainable food solutions - across procurement and all other levels of access to food.

²⁸ Health and Sport Committee, 2019, "Social Prescribing: physical activity is an investment, not a cost."

11.0 CONCLUSIONS AND RECOMMENDATIONS

Table 17. Summary of conclusions and recommendations against each of the main project themes.

Theme	Conclusions	Recommendations
Funding and Viability	<ul style="list-style-type: none"> Research finds that international reuse social enterprises have wide-ranging social purposes supported by grant funding. Internationally, a predominant social purpose is to provide experience, training and employment for those challenged in finding work. A key difference between a number of international organisations and Scotland is that funding for the former is more secure and longer-term. Internationally and Scotland, a significant challenge for a number of social enterprises is the low margins associated with the low-quality bikes and components that make a commercially viable return and business operation difficult. In Scotland, formal collaborations involving a charter/framework for organisations to sign up to, in terms of shared goals (e.g., bike accessibility) could be an effective driver of change. 	<ul style="list-style-type: none"> More work is required to understand: <ul style="list-style-type: none"> How the viability of third sector organisations can be improved in terms of providing bike-re-use services, and How subsidies/support funding, if appropriate, can be targeted in the longer term to achieve the delivery of affordable bikes, training and managing resources effectively Secure data on the levels of bikes sales (new and second-hand) in Scotland - to aid understanding on how and where to focus future support. Carry out work to understand the value of a charter/framework for local authorities, the private, not for profit, voluntary sectors etc to sign up – for delivering change.
Managing Resources More Effectively and Reducing Waste	<ul style="list-style-type: none"> Research suggests significant numbers of bikes are being hoarded. Leasing schemes have the potential to offer a more rationalised range of bikes, with greater parts availability and efficiencies – therefore less waste, lower costs of access using high quality second-hand bikes. Better information to householders on reuse pathways may bring more bikes into circulation. Stolen bikes collected by police authorities in Scotland - re-use and sales generation where return to owners is not possible. Extended Producer Responsibility regulations in France are now being considered as a potential behaviour change mechanism. 	<ul style="list-style-type: none"> Awareness raising is required for householders on where to take their old bikes so that they can be reused and stay in circulation e.g. through repair, refurbishment from existing/future bike shops. This could be an important role for an organisation like Zero Waste Scotland which has specific remits to communicate to consumers opportunities for more circular behaviour. Explore opportunities to deliver more bike maintenance training - to encourage long-term use and to discourage people from giving up their bikes in the future. Improve systems at HWRCs to ensure bikes not uplifted for re-use are taken to the appropriate scrap metal containers, to be recovered for scrap value and used in recycling markets. Encourage public organisations to play a useful role, supporting the development of company leasing schemes, running pilots and initiating access schemes. Further work should be carried out to ensure that stolen/abandoned bikes are donated, e.g. from police authorities across the country, to bike enterprises for re-use. Further work should be taken forward to identify how Scottish businesses can generate maximum value from second-hand e-bike batteries in the future. More work is required to consider how potential Extended Producer Responsibility regulations could drive a more efficient bike re-use market in Scotland.

Training	<ul style="list-style-type: none"> Approaches across Europe vary from regional vocational training centres that provide national qualifications involving bike mechanic skills (as well as more holistic business skills), for training schemes and/or on the job training. There is no single/dominant view on how training within the sector in Scotland could be improved. Stakeholders noting improvements could be made to the current set-up suggested that the development of modern apprenticeship scheme and or more holistic training would add value. Understand potential support to develop apprenticeships similar to Dutch regional vocational training centres across Scotland. Existing initiatives for developing modern apprenticeships across Scotland should be explored identifying interest across colleges more widely. Where this interest is confirmed, those organisations currently involved could be invited to join a project team that works with other colleges, on the creation of a template that could be rolled out more widely. The potential of organisations such as CRNs, and initiatives such as Zero Waste Scotland's Revolve programme to support further developments in training should be considered.
Spare Parts	<ul style="list-style-type: none"> International supply chain issues for new bike parts are a challenge for many organisations. Majority of re-use organisations in Scotland contacted continue selling second-hand bikes by using existing/legacy stocks of components. Majority of bike businesses/organisations contacted are interested in growth, with bike disassembly for spare parts being viewed as both lucrative and mitigating against current supply chain challenges. Availability, at an affordable cost level, of trained staff able to take bikes apart for components and/or rebuild them when required is a challenge An area with significant room for growth is the development of a recovered spares model, where these are sold with a warranty. In terms of e-bikes, three key parts are the big opportunity – the motor, battery and electronic display and the provision of a battery cell replacement service in Scotland. Further work could be carried out to understand how to support the growth of whole bike assembly businesses in Scotland that in turn create a more rational supply chain for spare parts; and Opportunities should be considered by support/funding organisations to understand how the provision of a battery cell replacement service could be developed and delivered - to maximise benefits to businesses in Scotland and taking into account recent research in this area e.g. as undertaken by Zero Waste Scotland.
Delivering Affordable Options	<ul style="list-style-type: none"> Affordability of cycling is a significant social issue in Scotland indicated by the number of social enterprises for which this is their primary purpose. Report finds that a circular business model based on leasing may deliver more affordable bikes as well as meeting circular economy objectives. Report contains detail on potential opportunities and implications with respect to providing affordable bikes for adults as well as free bikes for children. Further work required to develop a cost model associated with a subsidised system that makes bikes available free of charge to children where there are affordability issues, and at a discounted level for adults - to include leasing as this supports circular economy objectives.

Supporting Growth	<ul style="list-style-type: none"> Engagement with 16 Scottish organisations has identified opportunities for growth in: <ul style="list-style-type: none"> Employment; Bikes/components recovered; Fostering more circular business models (including subscription schemes). Report finds potential for an additional 50 jobs in bike/component recovery and around 100 in a large subscription service were identified and these could in turn contribute to a further 35 and 70 jobs respectively (indirect and induced jobs). Limitations for some, in terms of realising growth, relate to storage and processing space, as well as associated costs. Challenges exist in terms of the availability, at an affordable cost level, of trained mechanics to take bikes apart for components and/or rebuild them where required. 	<ul style="list-style-type: none"> Economic development agencies should consider the potential to support businesses to develop circular business models, increasing the number of people buying and leasing bikes. The potential to create a “national network” of places where people can drop off their bikes for reuse should be explored, to include HWRCs with separate containers provided. Further engagement with the sector to look at how better collaboration could help to open up wider opportunities for third sector organisations to support each other including options such as shared space for storage, selling etc. Organisations such as Zero Waste Scotland (e.g. comms teams) and CRNS to develop case studies, including podcasts, videos etc of successful bike reuse models to encourage more similar schemes in Scotland.
Company Leasing Schemes	<ul style="list-style-type: none"> In countries such as Belgium, people get the opportunity to use a bike in a leasing formula with their company as well as getting a fee/km they cycle to work, to cover the maintenance cost of the bike 	<ul style="list-style-type: none"> The Scottish Government (Transport Scotland) to consider supporting company leasing schemes in Scotland through support to businesses.
Collaboration	<ul style="list-style-type: none"> Membership organisations for small bike shops involved in re-use, repair, training etc, such as L’Heureux Cyclage in France provide a collaborative and engaging support opportunity Local authority HWRCs can be an important source of bikes for re-use, as well as providing challenges to some organisations in terms of the quality of bikes collected. However, the availability of bikes from HWRCs is not consistent across the country. 	<ul style="list-style-type: none"> Understand more about collaborative, co-operative membership models such as L’Heureux Cyclage in France – with the aim of developing a Scottish bike re-use co-operative organisation. There would be value in an organisation such as Zero Waste Scotland carrying out work to identify how many HWRCs have specific bike donation containers and to understand what potential there is for improved practices – to enable local social enterprises and other businesses to work collaboratively with local authorities to extract maximum re-use value from unwanted bikes. Investigate the potential of the Zero Waste Scotland local authority recycling fund (£70m) to support future collaborations of local authorities, social enterprises or other business to work together to extract maximum re-use value from unwanted bikes.